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A Completely Indexed Catalogue Filing System
of
Industrial Plant and Engineering Materials,
Equipment and Supplies

Seventh Annual Edition

Compiled, Edited and Published Annually by

SWEETS CATALOGUE SERVICE, INC.

119 West 40th Street, New York

Boston, 114 Federal Street

Philadelphia, 1821 Chestnut Street

Detroit, Penobscot Building

Pittsburgh, Bessemer Building

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TO THE USER OF
SWEET'S ENGINEERING CATALOGUE

SWEET'S ENGINEERING CATALOGUE is a Catalogue Filing System in which are described the products of approximately seven hundred manufacturers of materials, equipment and supplies relating to the practical construction, equipment and maintenance of all projects of an industrial or engineering nature.

In this, the seventh annual edition of SWEET'S, we have made certain revisions in the products index whereby you can more readily locate the information you desire. We have obtained much more complete data from the manufacturers and have arranged their products to make them more accessible.

Our aim in compiling SWEET'S has been to make it so comprehensive that you can use it to replace, to a large extent, the bulky and disorderly catalogue files of other days, and, by *buying through* SWEET'S, obtain from one volume the specific and comparative information necessary for intelligent purchasing, otherwise possible only after long drawn out correspondence and irritating delay. The changes incorporated in this edition have been made with this object in view, rather than to conform to the preferences of individual manufacturers.

SWEET'S has been improved over its former high standards. It is still capable of further improvement, and it is to you, the user of SWEET'S, that we must look for suggestions along this line. SWEET'S is a catalogue service; by co-operating with us and commending or criticizing this service you assist us in bringing it up to the 100 per cent. mark in point of benefit to our clients and to You.

THE EDITOR.

INFORMATION SERVICE

Users of SWEET's are invited to write for information concerning any special class or make of engineering materials or equipment. We have on file detailed information concerning the products of the principal manufacturers of materials of construction, power plant equipment and allied lines.

If you notice the omission of the catalogue of a firm in whose products you are interested, or find that any of the catalogues herein contained are lacking in the specific data required, you are requested to advise us of the deficiency. Such cooperation will be helpful in making subsequent editions increasingly comprehensive.

Address inquiries to our New York office:

SWEETS CATALOGUE SERVICE, INC.,
119 West 40th Street, New York City

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Trade names (shown in *italics*) follow the firm names listed under the various products except where such trade names would appear simply as an unnecessary repetition of the preceding firm names without giving any additional information.

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- Wire and Cables, Electric—Flexible Steel, Armored**
(See also Conduit, Electrical, Flexible Steel)
Youngstown Sheet & Tube Co.... 416-417
See also pages..... 668-669
- Wire and Cables, Electric—Lamp and Portable Cord**
American Steel & Wire Co..... 594-611
Americore..... 594-611
- Wire and Cables, Electric—Lead Incased**
American Steel & Wire Co..... 594-611
General Electric Co..... 550-575
Habirshaw Electric Cable Co., Inc. 612-615
United States Rubber Co..... 1171
Paracore..... 1171
- Wire and Cables, Electric—Paper and Varnished Cambric Insulated**
American Steel & Wire Co..... 594-611
General Electric Co..... 550-575
Habirshaw Electric Cable Co., Inc. 612-615
- Wire and Cables, Electric—Rubber Covered, Light and Power Wiring**
American Steel & Wire Co..... 594-611
General Electric Co..... 550-575
Habirshaw Electric Cable Co., Inc. 612-615
United States Rubber Co..... 1171
See also pages..... 90-91
Americore..... 594-611
Amerite..... 594-611
Am-pack..... 594-611
Hevea..... 550-575
Paracore..... 1171
Red Core..... 550-575
Tricoat..... 550-575
- Wire and Cables, Electric—Rubber Covered, Telephone**
American Steel & Wire Co..... 594-611
- Wire and Cables, Electric—Submarine, Mining, Deck, Car, Elevator Control, Theater, etc.**
American Steel & Wire Co..... 594-611
General Electric Co..... 550-575
Habirshaw Electric Cable Co., Inc. 612-615
Americore..... 594-611
Globe..... 594-611
- Wire and Cables, Electric—Telephone, Annunciator, Signal, etc**
American Steel & Wire Co..... 594-611
Stromberg-Carlson Telephone Mfg. Co..... 630-631
- Wire and Cables, Electric—Telephone and Telegraph (Galvanized)**
American Steel & Wire Co..... 594-611
- Wire and Cables, Electric—Weather-proof and Slow Burning**
American Steel & Wire Co..... 594-611
General Electric Co..... 550-575
Reliance..... 594-611
- Wiring Data—Industrial Plant**
American Steel & Wire Co..... 594-611
- Wiring Devices**
D & W Fuse Works..... 621
General Electric Co..... 550-575
Ivanhoe-Regent Works..... 625-627
See also pages..... 616; 618-619; 632-634; 794-795
- Wood Blocks, Creosoted**
See Blocks, Wood, Flooring and Paving, Creosoted or Treated.
- Wood Pipe**
See Pipe, Wood.
- Wood Preservatives**
See Preservatives, Wood.
- Woodworking Machinery**
Novo Engine Co..... 50
Ransome Concrete Machinery Co. 118-119
See also pages..... 590-591; 651
- Wrenches, Alligator**
See pages..... 90-91
- Wrenches, Chain**
Walworth Mfg. Co..... 432
- Wrenches, Stillson**
Walworth Mfg. Co..... 432
- Y**
- Yarn, Sisal—Lath and Ring**
Whitlock Cordage Co..... 80-81
- Z**
- Zinc Work**
See page..... 263

ECONOMY DRAWING TABLE & MFG. CO.

Drawing Tables and Sectional Filing Cases

ADRIAN, MICH.

Products.

DRAWING TABLES and SECTIONAL FILING CASES.

Special Furniture in Wood or Steel for schools, colleges, drafting rooms.



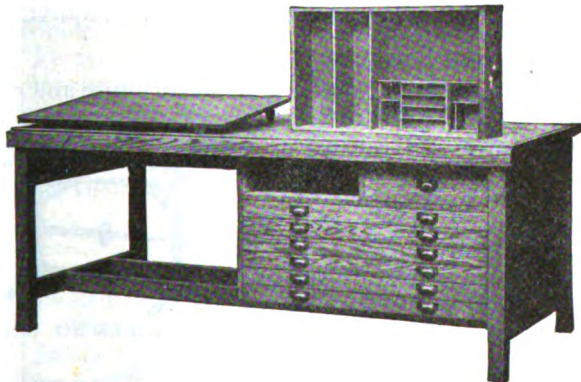
Specifications for Standard Wood Tables and Cases.

Material—Drawing boards and tops of tables of soft white pine; all other exposed parts of standard tables and filing cases, plain oak. Drawers and slides of cherry or other hardwood; drawer bottoms a single panel of 3-ply veneer; other unexposed parts of light, soft wood. All material air seasoned, kiln dried and kept at an even temperature during manufacture. Material heated before gluing.

Construction—Workmanship is best cabinet work; all joints mortised, tenoned and glued. Drawer sides dovetailed to front and back. Tops fastened to frames, with buttons in slots, allowing expansion and contraction. Frame of tables independent of top, firmly constructed and thoroughly braced. Height of tables adjusted by use of 1-, 2-, or 3-in. raising blocks, dowelled into legs.

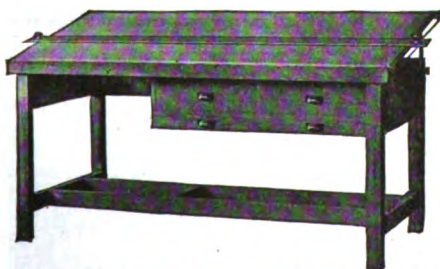
Finish—3-coat, dull rubbed. Work is finished in antique; other finishes as ordered.

Attachments—Furnished as extras, include: loose inclined drawing board and sliding tool tray and frame for use in tool drawer (both illustrated with table No. 0); 24 to 108 in. parallel ruler attachment for either loose board or table top (illustrated with table No. 30A); locks, ordinary or master-keyed, usually on tool drawer only; spring cover or holding-down wires for use in plan drawers, which increase the drawer capacity from 30% to 50%.



STANDARD WOOD DRAWING TABLE, STYLES NOS. 0, 1 AND 2

Made also with adjustable top, Nos. 30, 31 and 32.
Top: Nos. 0, 1, 30 and 31, 39 x 84 in.; Nos. 2 and 32, 34 x 72 in.
Drawers: Small (2), Nos. 0 and 30, 21 x 24 x 5½ in.; Nos. 1, 2, 31 and 32, 18 x 24 x 5½ in. Large (6), Nos. 0 and 30, 32 x 44 x 2 in.; Nos. 1, 2, 31 and 32, 26 x 38 x 2 in. All inside dimensions



ECONOMY 3-DRAWER DRAWING TABLE

Nos. 30A, 31A and 32A, as illustrated, adjustable top; made also with solid top, styles Nos. 0A, 1A and 2A.

Adjustable top hinged to the rubbing strip at front; equipped with 2 adjustable metal supports at back with patent locking device for holding top inclined at any angle. A panel is placed over cabinet to protect contents of drawers and forms an extra shelf.

Top: Nos. 0A, 1A, 30A and 31A, 39 x 84 in.; Nos. 2A and 32A, 34 x 72 in.

Drawers: Small (2), Nos. 0A and 30A, 21 x 24 x 5½ in.; Nos. 1A, 2A, 31A and 32A, 18 x 24 x 5½ in. Large (1), Nos. 0A and 30A, 32 x 44 x 2 in.; Nos. 1A, 2A, 31A and 32A, 26 x 38 x 2 in. All inside dimensions



STANDARD WOOD DRAWING TABLE, STYLE NO. 34

Also made without adjustable top, Style No. 4.
Top: 33 x 60 in. Drawers: Small (1), 13 x 26 x 4 in. and (4), 13¼ x 24¼ x 3¼ in. Large (1), 26 x 38 x 2 in. All inside dimensions



MONARCH KNOCK DOWN DRAWING TABLE

Four sizes: No. 102, 36 x 72 in.; No. 103, 36 x 60 in.; No. 104, 36 x 54 in.; No. 105, 36 x 48 in. One small drawer with tool tray: Nos. 102 and 103, 13 x 26 x 4; Nos. 104 and 105, 8 x 3½ x 26 in.

Standard Filing Cases.

Standard filing cases are made in sectional units and with same care and class of work as the tables. Drawers are dovetailed together and not doweled or nailed. Drawers work smoothly, and are provided with a 6-in. cover at the top and back to prevent contents from curling and creeping. Sections are held in position in all directions.

Drawers 2 in. deep are suitable for tracings; deeper drawers required for blue prints and other non-packing papers.



TYPICAL STANDARD WOOD SECTIONAL FILING CASE

Style No.	Drawers		Over all dimensions of section, in.
	Number	Dimensions, inside, in.	
226	6	26x38x2	29x41x17½
224	4	26x38x3	29x41x17½
221	1	26x38x4	29x41x 5½
232	2½	26x18x4	29x41x 5½
206	6	32x44x2	35x47x17½
204	4	32x44x3	35x47x17½
201	1	32x44x4	35x47x 5½
212	2½	32x21x4	35x47x 5½

Steel Cabinets.

A complete line of steel cabinets, similar to the wooden designs, is carried in stock.

Catalogue, with full information and illustrations, sent on request.

THE C. F. PEASE COMPANY

Blue Printing Machines, Drafting Room and Architects' Supplies

TELEPHONE:
SUPERIOR 9475

840 North Franklin Street, corner Institute Place
CHICAGO, ILL.

CABLE ADDRESS:
"PEASECO, CHICAGO"
Codes Used: ABC 5TH
Edition and Private

Products.

BLUE PRINTING SUPPLIES and ACCESSORIES, which include: Blue Printing Machines; Washing and Drying Machines, single sheets and continuous; Blue Print Paper Sensitizing Machines; Blue and Brown Print Paper and Cloth, sensitized and unsensitized; Blue Print Room Requisites.

DRAFTING ROOM FURNITURE and SUPPLIES of all kinds; **DRAWING INSTRUMENTS and MATERIALS** of every sort; all leading brands of **TRACING CLOTHS**; "SUNBEAM" ART ERASER.

SURVEYING INSTRUMENTS and FIELD SUPPLIES.

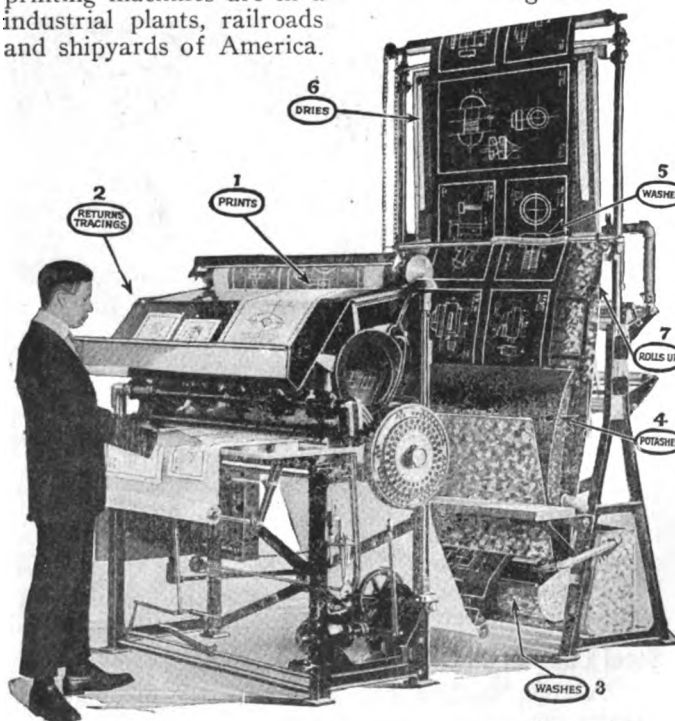
Pease Continuous Blue Printing Equipment.

Saves Labor—One boy and a Pease Peerless automatic continuous blue printing equipment can print, wash and dry more and better blue prints than four experienced men can turn out with any other equipment using independent methods of washing and drying.

Prints, Washes and Dries—A Pease Peerless will print, wash and dry 100 yds. of perfect blue prints every hour at any hour of the day or night, and do it at a lower cost per square foot of finished blue print than is possible by any other method. Each operation—printing, washing and drying—is automatic and continuous.

Economical for Short Runs—Short runs of 5 or 10 minutes are just as economically done by an operator who has other duties.

More than 1200 Pease automatic continuous blue printing machines are in use in the drafting rooms of industrial plants, railroads and shipyards of America.



THE PEASE AUTOMATIC CONTINUOUS BLUE PRINTING MACHINE

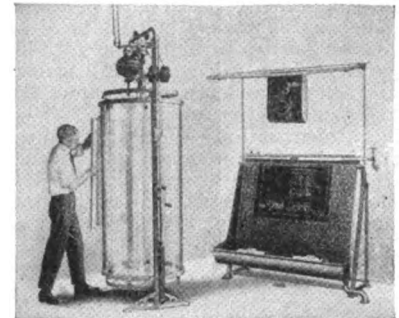
Prints, washes and dries perfect blue prints at the rate of 100 yards an hour

Catalogue—Catalogue No. B-40 contains the information wanted about this drafting room labor saver.

Pease Vertical Blue Printing Machine.

In those drafting rooms where the demand for blue prints does not warrant the purchase of a Pease Peerless automatic continuous blue printing equipment, the Pease vertical blue printing machine and sheet washer will furnish perfect blue prints or negative prints of moderate size. The Pease vertical can be installed in a corner of the drafting room and will furnish a constant supply of blue prints whether the sun shines or not.

The 5 sizes and moderate prices are given in Catalogue No. B-40 which will be sent you on request.



PEASE VERTICAL ELECTRIC BLUE PRINTING MACHINE WITH PEASE SHEET WASHER

Drafting Room Furniture.

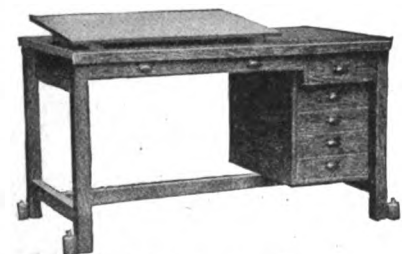
The Pease line of drafting room furniture and engineer's office equipment is very complete. It includes both steel and wood, horizontal drawer, sectional filing cabinets in several sizes; drawing tables with and without drawers, and draftsmen's stools made in steel and wood.

Particular attention is called to a vertical plan safe, made of steel which makes a dustproof container for blue prints, drawings, maps, plates, etc.

Write for Catalogue F-21 which illustrates the complete line of furniture



PEASE TABLE NO. B-02253



PEASE TABLE NO. B-02259



Wood Cabinet Nos. B-02270 and B-02271



Steel Cabinet Nos. B-02266 and B-02267

BLUE PRINT FILING CABINETS

besides drawing stand, drawing boards, ruling attachments and scales.

Drawing Papers and Cloths.

Pease drawing, detail, and tracing papers and cloths are unsurpassed. Sample books or working sample will be cheerfully furnished on request and every effort is made to meet detail requirements.

Printed sheets of tracing paper and cloth (cut to required sizes) with customers titles and appropriate borders are furnished on order.

"Gold Label" Tracing Cloth.



NO. D-091 "GOLD LABEL" TRACING CLOTH

Made in U. S. A.

Low in price—High in quality. Furnished in 26, 30, 36 and 42-in. widths

Blue Printing Supplies.

THE C. F. PEASE COMPANY manufactures everything used in blue print making, from the smallest sun frame and bath tray to the Peerless continuous electric automatic printing, washing and drying machine.

Every blue print room requisite or accessory can be found in this very complete line, no matter how small or seemingly unimportant.

Sensitized Papers and Cloths.

"Veri-Strong," "Royal," "Puritan," and "Superior" blue print papers and "Perfection" blue print cloths are of highest quality stock and carefully sensitized in 5 different printing speeds. Coating is done only after receipt of customer's order and goods shipped same day.

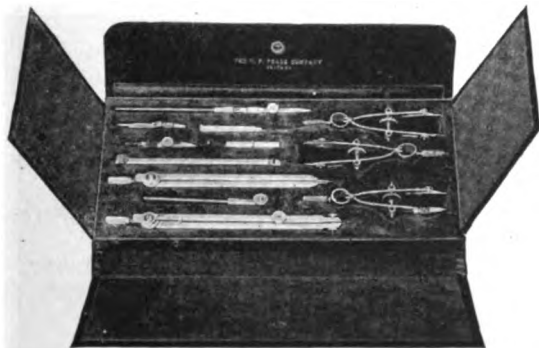
"Perfection" brown process papers and cloths are also unexcelled. Every roll guaranteed fresh coated, full length and continuous. Full credit allowed on any goods found unsatisfactory and properly returned.

Drawing Instruments.

Pease "Made in America" drawing instruments are constructed of carefully selected material by skilled workmen, and are provided with all the latest improvements. They are not surpassed for accuracy, finish and quality by any line of drawing instruments, either domestic or imported. Descriptive literature with prices of complete sets in cases, or of separate instruments, will be sent on request. Write for Catalogue D-21 which illustrates and prices complete sets in cases and separate instruments.



SPRING HINGE PEN



COMPLETE SET OF PEASE "AMERICAN MADE" DRAWING INSTRUMENTS IN GENUINE MOROCCO CASE

Smaller sets equally well made and lower priced are shown in catalogue "D-21"

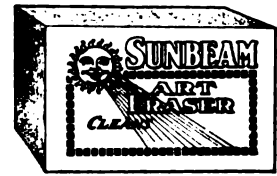
SWEET'S CATALOGUE

T-squares, Triangles and Scales.

A full line, both wood and celluloid. All sizes and qualities carried in stock. Also slide rules for every calculation.

Sunbeam Art Eraser.

The best cleaner on the market today. Cleans better, lasts longer and costs no more than similar articles. Made in 5 sizes. Send 10¢ in stamps for sample. Liberal discounts for quantity orders.



SUNBEAM ART ERASER

Outfitting Blue Print Rooms.

Special attention given to the complete and economical outfitting of engineers' blue print rooms. Efficient and expert advice always at the service of the profession, particularly when located at points difficult of access, or distant from convenient commercial blue print service.

Surveying and Engineering Instruments.

Levels and Transits—Several types of Berger, Gurley and Buff & Buff levels and transits are carried regularly in stock. Instruments for both engineers and surveyors and for architects and builders can be supplied promptly if requirements are stated.



B-05185 CONVERTIBLE LEVEL

Leveling Rods, etc.—A full line of leveling rods for all purposes, together with all the accessories, such as targets, ribbons, plumb bobs, arrows, measuring chains, etc., are also carried in stock.

All Makes of Tapes—Excellent deliveries can be made from a complete line of tapes. Practically all the well-known makes, such as Chicago Steel Tape, Chesterman & Lufkin (in all sizes and dimensions) can be had on short notice.

Inquiries are invited whether engineers are in need of equipment for either inside or outside work.

Catalogue S-21—Space does not permit a complete listing of all the small devices shown in catalogue with surveying and engineering instruments. Hand levels, pocket compasses and magnifying glasses are some of them, the rest are shown in catalogue S-21. Write for it.



B-05183 ROAD BUILDER'S LEVEL

Catalogue B-40 Complete.

The C. F. PEASE COMPANY issue leaflets and pamphlets which illustrate and describe many Pease articles for drafting room and field use. These are forwarded to customers and prospective customers. Pease catalogue B-40, a 272-page cloth bound book, contains every blueprint and drafting room requirement and many articles used by engineers, surveyors, architects and builders in field work. If you have not a copy for ready reference, write for one now.

HAMILTON MANUFACTURING CO.

Manufacturers of Drafting Room Furniture

100 Seventeenth Street

TWO RIVERS, WIS.

Products.

OAK and STEEL BLUE PRINT SECTIONAL CABINETS; VERTICAL PLAN STEEL SAFES; ADJUSTABLE DRAWING TABLES; DRAWING BOARDS.

Also manufacturers of Straightedges; T-squares; Parallel Rule Attachments; Artists' Tables; Typewriter Tables, etc.

Blue Print Sectional Cabinets in Wood and Steel.

Built on the unit plan—add as requirements demand. Thoroughly well made of either seasoned oak or cold rolled furniture steel. Each drawer fitted with label holder, substantial pulls, paper weights and hood.

Carried in stock in two sizes. Units lettered from A to O and numbered 32 and 37. No. 32 units have drawers with inside dimensions 32 by 42½ in., outside dimensions 34½ by 45½ in. No. 37 units have drawers with inside dimensions 25 by 37½ in., outside dimensions 27¼ by 40½ in. Special sizes to order.



BLUE-PRINT CABINET UNITS

Vertical Plan Steel Safe.

Renders the filing of blue prints and drawings as efficient as that of vertical correspondence filing. Keeps plans and tracings at top of folder without compression.

Can be furnished in wood also.



VERTICAL PLAN STEEL SAFE

Drawing Tables.

Fry Drawing Table, Style C—Hundreds of these tables are in use. Frames made of best quality gray iron.

Tops can be adjusted from a horizontal to a vertical position without stooping or moving from the seat. Height adjustable. Very rigid in any position. Three styles, ranging in price from \$15.00 to \$90.00.

Drawing Table No. 37-D—Large shallow drawer is 37 by 25 in. by 2 in. inside. Smaller drawer is 10½ by 23 in. by 3¾ in. inside.

Top is 34 by 60 in. by 1⅞ in. thick, with two hard

maple cleats on bottom and parallel rule can be attached. Adjustable as to slant.

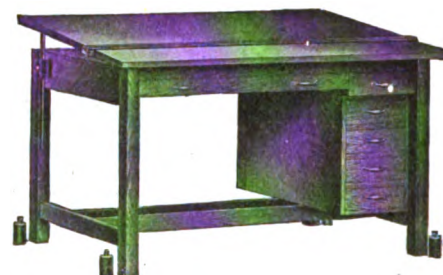
Height of table, 34 in., but blocks supplied to raise it if desired. Made of oak with pine top. Shipped knocked down.

Drawing Table No. 40-D—Made in several sizes. Adjustable both as to height and slant of top.

Practically any drawer units can be used with it but the "K" units or the "K" and "C" units are especially desirable.

"K" and "C" units are of two sizes, numbered 32 and 37. No. 32 units have drawers 32 by 42½ in. inside; No. 37 units have drawers 25 by 37½ in. inside.

Made of oak and nicely finished. Shipped knocked down.



DRAWING TABLE NO. 37-D

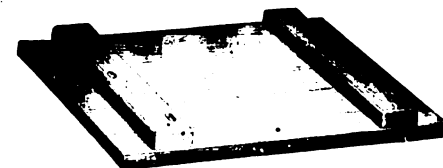


DRAWING TABLE NO. 40-D

Drawing Boards.

This company manufactures six different styles of drawing boards. Made in pine and basswood, in any size, of properly seasoned material.

Style D—1⅞-in. boards with 3 by 1¼-in. maple cleats and oblong washers, staggered.



STYLE D DRAWING BOARD

Facilities and Experience.

The plant is fully equipped with modern labor saving machinery for the manufacture of steel and wood furniture.

About 6,000,000 ft. of lumber are carried in stock to be properly seasoned before going to the dry kilns and tempering sheds.

This company has had over 30 years' experience in making business furniture.

The company has a warehouse at Rahway, N. J., just outside of New York City, so as to insure prompt delivery in the East, as well as in the West.

Special Catalogue.

Special catalogue No. 6 with full details on wood and steel construction furnished on application.

THE TABLET & TICKET CO.

Gummed Paper Letters and Figures for Draughtsmen

CHICAGO, ILL

NEW YORK, N. Y.

SAN FRANCISCO, CAL.

Products.

Sole manufacturers of WILLSON'S GUMMED and CUT-OUT PAPER LETTERS and FIGURES, for draughtsmen.

Uses.

Willson's gummed and cut-out paper letters and figures have become generally known as the draughtsman's "most important instrument." They are now universally used for lettering on tracing cloths from which blue prints are made.

Description.

Willson's gummed and cut-out paper letters and figures are accurately cut out of extra quality waterproof glazed paper, gummed on the back with the best grade of glue. They are furnished in black, white or red.

Sizes and Styles.

Thirty-nine sizes in several styles of Willson's gummed and cut-out letters and figures, from $\frac{1}{8}$ in. to



TRADE-MARK

4 in., comprise the range of selection. Consequently, there is at least one size to exactly meet your requirement.

Advantages.

Eliminate irregular and indistinct lettering and save the draughtsman's time by 100%.

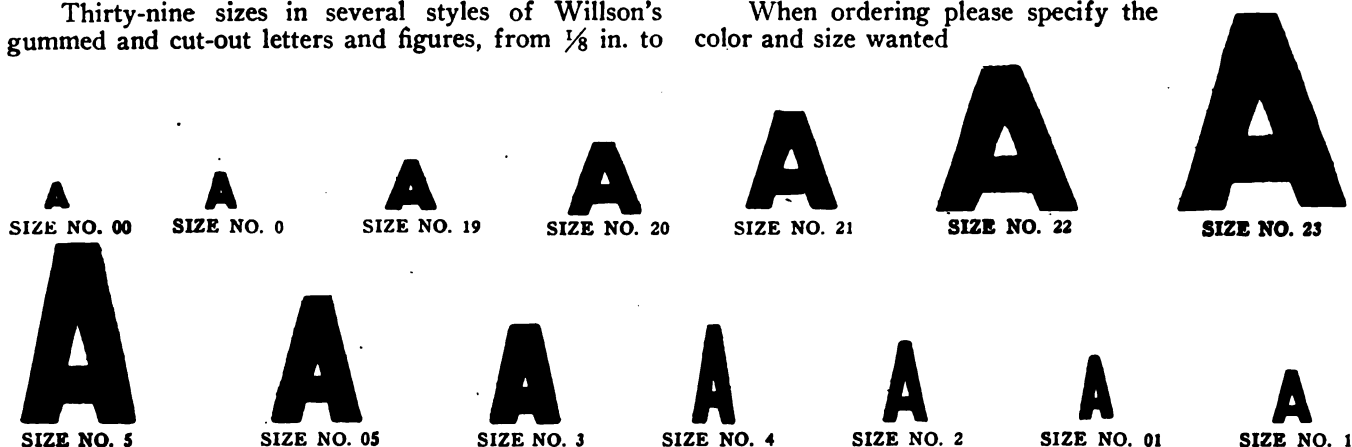
Instructions.

A small piece of *moist chamois* skin, lying flat, should be used to dampen the letters and figures before sticking them on the tracing cloth. Use the blade of a small pocket knife for handling the letters and figures; this will also serve to guarantee perfect alignment.

Catalogue.

An illustrated catalogue containing full information about Willson's gummed and cut-out paper letters and figures will be mailed on request.

When ordering please specify the color and size wanted



SIGNALS BETWEEN						
EFFECTIVE DURING LIFE OF PEAK						
INTERLOCKING HOME AND ABSOLUTE BLOCK SIGNALS						
FIG. 1 LIGHTS: TOP—RED. MIDDLE—RED. BOTTOM—RED.	FIG. 2 LIGHTS: UPPER—RED. LOWER—RED.	FIG. 3 LIGHTS: UPPER—RED. LOWER—RED.	FIG. 4 LIGHTS: TOP—GREEN. MIDDLE—RED. BOTTOM—RED.	FIG. 5 LIGHTS: UPPER—GREEN. LOWER—RED.	FIG. 6 LIGHTS: UPPER—GREEN. LOWER—RED.	FIG. 7 LIGHTS: TOP—MIDDLE—BOTTOM—
INDICATION—STOP—SEE RULE 60V.		INDICATION—STOP—SEE RULES 703 AND 704.		INDICATION—PROCEED WITH CAUTION.		INDICATION

A PORTION OF A SIGNAL CHART ISSUED BY THE NEW YORK CENTRAL LINES

All lettering and numerals shown were made with Willson's gummed and cut-out paper letters and figures on a tracing cloth from which blue prints were made for distribution by the signal department.

Note the perfect alignment and uniformity of size of all letters

THE PARAGON MACHINE CO.

Manufacturers of Blue Printing Equipment

77 South Avenue
ROCHESTER, N. Y.

Products.

PARAGON BLUE PRINTING MACHINES and EQUIPMENT.

Uses.

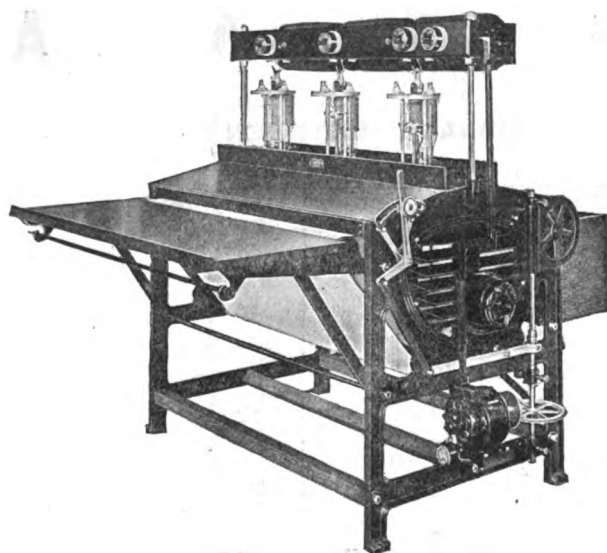
Making of blue prints, brown prints, Vandyke negatives, direct black prints, using either sheets cut to size of tracings or continuous rolls of paper.

Paragon Blue Printing Machine.

Uniformly Lighted Printing Surface—The printing bed is constructed of polished plate glass $37\frac{1}{2}$ in. across (the length depending upon the size machine in which it is to be used) bent to a radius of 12 in., making a complete half cylinder. This is deep enough to accommodate the special blue print arc lamps so that all their light may be used direct without the use of reflectors, and also allowing the lamps to be placed far enough from the printing surface so that the light equalizes perfectly, producing an absolutely uniformly lighted printing surface.

These are all important points, as reflected light means wasted energy and expense, and uneven exposure would mean poor prints.

Perfect Contact—The apron is 2 in. wider than the rated capacity of the machine, which allows the making of full width prints without difficulty. It is driven from



PARAGON BLUE PRINTING MACHINE

the rear of the semicylindrical glass, giving an action similar in many respects to a band brake, pressing every particle of air from between the tracings and sensitized sheet. This gives the excellent contact for which the Paragon is famous. It is positively guaranteed that there is no machine in existence which can surpass the Paragon on this feature—contact.

Speed—As the Paragon now stands it is the fastest in existence, with such a high rate of efficiency as to

make it second to none for low current consumption on a given amount of work.

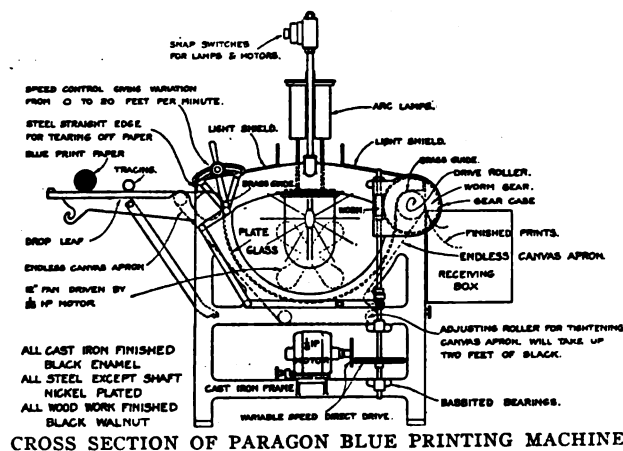
The drive and speed controlling mechanism are most efficient and also the extreme of simplicity.

There are no belts or chains, or other appliances, easy to get out of order on the Paragon. The range of speed is ample for all classes of work. A reliable constant speed motor is used. All changes in the speed of the machine are made instantly through a noiseless drive giving any speed from 6 in. to 20 lin. ft. per minute. This is greatly appreciated by those who desire to make direct black line, sepia or blue line prints.

Conformity to Underwriters' Regulations—The drive mechanism is self-contained, being a part of the machine enclosed and guarded so as to comply with the strictest factory regulations.

The Paragon machines are wired complete in the most approved and advanced manner complying with all underwriters' regulations.

Regular Equipment—The machines, unless otherwise ordered, are furnished with complete equipment, which includes in the 42-in. machine, 3 special high power blue printing arc lamps, the $\frac{1}{8}$ h.p. drive motor and a small motor direct connected to the ventilating fan. The 54-in. machines are equipped with 4 arc lamps, the $\frac{1}{8}$ h.p. drive motor and fan motor. Snap switches are provided for the motors and 1 switch for each lamp. These are located on the box directly in front of the operator, so that the use of one or more lamps can be discontinued when making narrow prints. This box also contains the fuse cutouts for the lamps and motors.



CROSS SECTION OF PARAGON BLUE PRINTING MACHINE

Paragon Print Drying Machines.

The construction of the machine consists of a smooth steel heated cylinder, supported on ball bearing journals. It is driven by means of variable speed device directly connected to an electric motor, which allows any desired speed between 0 and 10 ft. per min. No belts or chains are used in driving Paragon equipment.

Heat source for the cylinder may be gas, electricity

or steam, the machine necessarily being constructed for one or the other at the factory. The machine is so constructed that proper combustion is obtained in the gas heated dryer without the use of a blower.

A canvas apron is carried upon a series of steel



PARAGON PRINT DRYING MACHINE

rollers so arranged as to bring the apron in tight contact with surface of the steel drying cylinder. This apron is kept taut by a steel roller, the weight of which gives uniform tension regardless of the variation in heat and dampness.

A special device is provided for transferring prints from the bath trays to the dryer. Small prints or prints of any length whatever, and of any width up to the rated capacity of the machine, are handled with equal ease.

How Operated—The prints are fed to the apron at one side of the machine and are carried by it into contact with a heated cylinder. The prints are fed from the wash trays to the dryer without the necessity of wringing. The apron holds the paper in direct contact with the heated cylinder until the prints are delivered perfectly dry on the opposite side of the machine. Stripper fingers are provided for automatically running the prints from the heated cylinder and depositing them upon a sorting table, which should be provided at the rear of the machine to receive them.

DATA AND PRICES ON PARAGON BLUE PRINTING EQUIPMENT

Size	Prices					Floor space			
	Printer		Dryer			Printer		Dryer	
	D.C.	A.C.	Gas heated	Electric heated	Steam heated	Wide	Long	Wide	Long
30"			\$350.00	\$400.00	\$450.00			28"	44"
42"	\$725.00	\$750.00	375.00	425.00	475.00	54"	54"	28"	56"
54"	925.00	950.00	400.00	450.00	500.00	54"	66"	28"	68"

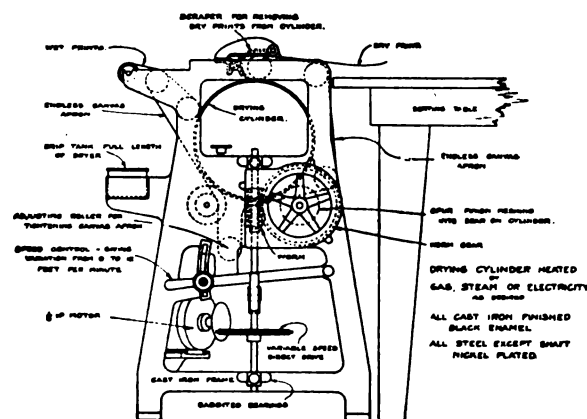
Note—All machines electrically driven.

Catalogues and Prices—Prices are subject to change. Always write for latest complete catalogue B and prevailing prices.

Space Requirements—The Paragon print drying machine here described has been built to meet the need of some method of drying various sized prints in separate sheets of any length, without the necessity of hanging them or constructing ovens with racks and lines in them or other makeshift apparatus. This also permits prints to be washed for any desired length of time without interrupting either the printing or drying process.

The area required to hang up the quantity of prints that the Paragon dryer will dry and iron would be so large as to put it out of the question entirely. The Paragon requires but 8 sq. ft. of floor space.

Scope of Use—The 30-in. capacity Paragon print dryer is intended primarily to dry photographic prints



CROSS SECTION OF PARAGON DRYING MACHINE

and will dry photostat, rectigraph and regular photographic prints perfectly.

Print Paper Cabinets.

Cabinets are constructed of oak and carefully made and well finished; the partitions are removable so that either cut sheets of paper or continuous rolls can be accommodated. The cabinet is of great convenience to the operator of the blue printing machine as all sizes and weights of paper are near at hand and quickly accessible.

Cabinet for 42-in. blue printing machine..... \$150.00
Cabinet for 54-in. blue printing machine..... 200.00

Washing Trays and Trimming Tables.

These are constructed entirely of oak except the corners, which are cast iron, and are filled and varnished to withstand severe use. The legs and table tops are removable to facilitate shipping and moving.

DATA, WASHING TRAYS AND TRIMMING TABLES

TRAYS Height, 34 in.		TABLES	
Inside dimensions	Price	Top dimensions	Price
3'x 3'x 6"	\$25.00	4'x 4'	\$45.00
3'x 4'x 6"	30.00	4'x 6'	50.00
3'x 5'x 6"	35.00	5'x 5'	50.00
4'x 4'x 6"	40.00	5'x 7'	60.00
4'x 5'x 6"	45.00		
5'x 5'x 6"	50.00		

Installation of Equipment.

A receiving box is furnished with the printer which adds 12 in. to the length, but eliminates the use of a table, thus allowing the equipment to be used in smaller quarters. The receiving table, however, allows the work to be handled more rapidly.

Send a sketch showing dimensions of blue print room, and a diagram showing the proper layout for equipment will be forwarded.

Further information on the subject will be gladly furnished on request.

Supplies and Equipment.

Every requisite for the draftsman and engineer in field or office. Price and delivery on application.

PHOTOSTAT CORPORATION

Photographic Copying Machines

299 State Street
ROCHESTER, N. Y.

BRANCH OFFICES

CHICAGO, ILL., 19 South La Salle Street
PHILADELPHIA, PA., 1102 North American Building

NEW YORK, N. Y., 15 Park Row
WASHINGTON, D. C., Tenth and G Streets, N. W.
BOSTON, MASS., 88 Broad Street

Product.

The PHOTOSTAT, a Photographic Copying Machine. The word "Photostat" is registered as a trademark in the United States Patent Office and throughout the world.

Description.

The Photostat which is manufactured by the Eastman Kodak Company is a combined camera and copying machine.

The copy is made through a prism attached to the front of the lens. The prism reflects the subject through the lens so that the copy reads from left to right as in the original.

The colors of the copy are, however, reversed, black showing white and white showing black. If the original arrangement of black and white is demanded, this can be quickly obtained by making a copy of the first print.

Operation.

The copy is made directly on a roll of sensitized paper. No intermediate glass plate, film or other negative has to be made. By copying directly on the paper the copy is made very quickly and at a low cost. Also the copy is a facsimile of the original, so that there can be no mistake in it.

The print is developed and fixed in the apparatus itself, this part of the process, as well as the focusing and exposing, all being mechanical.

The print is removed from the fixing bath to a tank of circulating water, which washes the print free from chemicals. The print is then dried, between blotters, or on a cheesecloth stretcher, or by passing through a hot roll mangle. The process is a rapid one, the average speed per print being from 1 to 5 minutes.

No expert knowledge of photography is required

for the operation of the Photostat as all the processes are mechanical.

Space.

The Photostat when assembled requires a space of at least 10 by 12 ft.

This is not to be construed as the over all measurements of the apparatus, but for the convenience of the operator in making exposures, adjusting the apparatus, washing and drying the prints, a space the size mentioned is advisable and recommended.

Stock Sizes.

Model No. 1—Makes a print 11½ by 14 in. and smaller.

Model No. 2—Makes a print 14 by 18 in. and smaller.

Model No. 3—Makes a print 18 by 22 in. and smaller.

The dimensions are the sizes of the finished prints. The Photostat is not limited, however, to copying subjects of these dimensions, but will copy any subject however large to these sizes.

Scope of Use.

The Photostat copies at original size, reduces or enlarges.

The Photostat makes rapid, inexpensive and facsimile copies of pencil drawings, ink drawings, tracings, blue prints, maps, sketches, documents, letters, telegrams, specifications, data sheets, tabulations, record cards, pages from books, insurance records, shipping lists, reports, contracts, illustrations for salesmen, patent drawings, production sheets, cuts and drawings for advertising, small tools and illustrations for setting up machines, etc.



A PHOTOSTAT IN OPERATION

RECTIGRAPH COMPANY

(An Independent Corporation)

Manufacturers of Photographic Copying Machines and Supplies

ROCHESTER, N. Y.

NEW YORK, N. Y., 212 Broadway

SEATTLE, WASH., 2102 First Avenue

Product.

The RECTIGRAPH, a Photographic Copying Machine.
PHOTOGRAPHIC PAPER.

What the Rectigraph Can Accomplish.

The Rectigraph is a simple and practical apparatus for rapidly photographing printed or written documents, maps, drawings, records, etc., directly upon the surface of sensitized paper.

The finished Rectigraph print is in sharp white lines upon a black background. Prints are clear and distinct and easy to read. A print with black lines upon a white background can be obtained by copying the original Rectigraph print.

Copies can be made with equal facility from either loose sheets or bound volumes.

The Rectigraph will reproduce copies direct from the original, regardless of the material it is drawn or printed on, and whether it be in pencil, ink, color or tone. Drawings need not be carried beyond the pencil stage and their scales can be easily changed by making a Rectigraph copy.

The Rectigraph is being used by hundreds of enterprising concerns, manufacturing, railroad, public service, federal, state and municipal governments, etc., for copying a great variety of work. A few of its important uses are:

Shop drawings for engineering works.

Plans and specifications for engineers, architects and builders. Copies of tracings, blue prints, etc., reduced to convenient size for filing purposes or for reference in the field.

Maps, plats, plans, surveys, etc., for engineers, surveyors, railway companies, contractors, etc.

Laces, embroideries, designs for textile fabrics, wall paper designs, etc.

Financial statements, statistical reports, orders, letters, contracts, invoices, testimonials, ledger pages and commercial papers of all kinds.

Notes, duplicate signature cards, securities and other valuable documents for banking and trust companies; court files, affidavits, exhibits, records, etc., for attorneys; insurance applications and policies; deed and mortgage records, maps and plats for title companies and abstractors.

How the Rectigraph is Operated.

The Rectigraph is as simple to operate as the ordinary blue print apparatus and may be run by any office boy of ordinary intelligence.

The magazine holds a roll of sensitized paper 350 ft. long. The drawing or blue print to be copied is placed on the copyboard, an exposure is made, a turn of the crank runs the paper into the developer, a turn of another crank cuts the paper and places it into the hypo ready to be washed and dried, the entire operation taking but a fraction over a minute.

It is not necessary to place the hands in the solutions—the machine is entirely automatic.

Saves Paper.

Prints of any size within the capacity of the Rectigraph can be made *without loss of paper*. In making prints smaller than the maximum size, it is only necessary that the curtain arranged for the purpose be turned down the proper length, thus protecting that part of the paper not necessary to be exposed. This is an exclusive feature of the Rectigraph, one not to be found in any other photographic copying machine.

Lighting Requirements.

The Rectigraph can be operated under natural light provided there is an even diffusion of light over the subject to be copied; however, mercury vapor lamps will facilitate operation and make the Rectigraph independent of daylight.

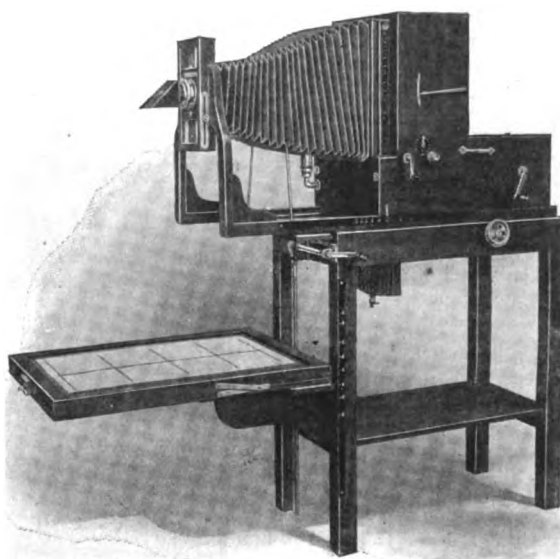
Sizes.

The Rectigraph is furnished in 3 sizes, 11½ by 14 in., 12 by 16 in., and 18 by 24 in. (maximum size of reproduction). Any size original can be reproduced—made actual size, enlarged, or reduced within the limits of these maximum sizes.

Rectigraph Supplies.

Rectigraph paper is a high grade, durable, bromide paper, furnished in rolls 350 ft. in length, any width desired, spooled to fit any photographic apparatus. It gives absolutely permanent copies, is very tough and will withstand much handling without tearing.

All Rectigraph machines and supplies are made by this company in its own factory, the entire plant being devoted exclusively to this line.



THE RECTIGRAPH

Maximum size of print, in.....	11½ x 14	12 x 16	18 x 24
Price, f.o.b., Rochester, N. Y.....	\$500.00	600.00	850.00

Illustrated booklet on request

YAWMAN AND ERBE MFG. CO.

Filing System Service, Equipment and Supplies

ROCHESTER, N. Y.

BRANCH OFFICES

ALBANY, N. Y.
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WINNIPEG

Agents and Dealers in 2000 other cities

Products.

MAMMOTH VERTICAL FILES; FIRE-WALL STEEL FILING CABINETS.

Also manufacturers of Efficiency Desks, Record Safes, Card Record Index Systems and Systems for Every Purpose; Steel Shelving.

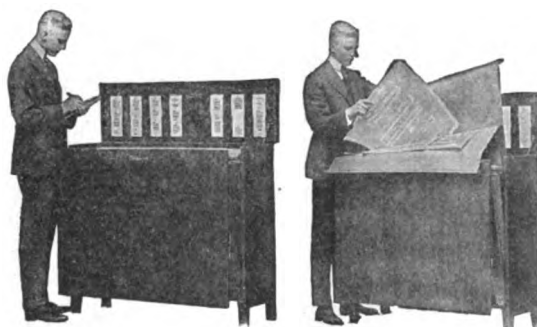
System Service Without Charge.

The services of this company's System Department are at the disposal of engineers and architects, not only in connection with the mechanical end, but also in connection with the planning of entire systems.

Building block sketches will be made to scale, showing exactly how proposed installations will look when installed. All details will be worked out subject to approval.

Mammoth Vertical Files.

These compact files have a capacity of from 700 to



Simple and Efficient Index on Underside of Cover Finding prints a simple matter

Front of Cabinet Opens Like a Drawer Prints removed or filed without removing pocket. Pockets can be lifted out when wanted

MAMMOTH VERTICAL FILES

Oak	Mahogany	For drawings, in.	Width, in.	Height, in.	Depth, in.	Shipping weight, lbs.
036-Q		40x36 or smaller	45 $\frac{3}{4}$	46 $\frac{3}{4}$	14 $\frac{1}{2}$	185
430-Q	430-M	44x30 or smaller	49 $\frac{3}{4}$	40 $\frac{3}{4}$	14 $\frac{1}{2}$	180
836-Q		48x36 or smaller	53 $\frac{1}{4}$	47	14 $\frac{1}{2}$	205

All furnished with 20 file pockets and 8 index cards.

1000 blue prints, tracings, drawings, maps, charts, or other large sheets. Each file contains 20 strong pockets made of tough fiber stock in which the papers are filed flat and indexed, thus any paper can be found instantly—unfolded, unrolled, uncreased, untorn, clean and flat—protected from loss, damage or depreciation.

Each pocket has a capacity of about 50 prints. Pockets are suspended from strong wooden rods, which hang in the file on lateral supports. Alphabetical and numerical indices are furnished for these pockets.

When open, the front of the cabinet becomes a convenient drawing table upon which to study or display the contents of the file. Two small brass posts prevent the papers from sliding off the table.

Made in oak and mahogany in the sizes specified in accompanying table.



MAMMOTH VERTICAL FILE WHEN CLOSED



MAMMOTH VERTICAL FILE WHEN OPEN

Fire-wall Steel Filing Cabinets.

"Y and E" fire-wall steel filing cabinets—"Steel Plus Asbestos"—offer the maximum fire resistance obtainable in a filing cabinet. Their exclusive features add to the safety and efficiency with which office records can be filed for ready reference and security and protection from fire.

Fire-wall Construction—"Y and E" fire-wall cabinets have the advantage of double steel walls interlined with thick corrugated asbestos and dead air chambers all around—drawer fronts, backs, tops, bottoms and sides. This exclusive "Y and E" cabinet construction follows in principle the best types of safe construction. The asbestos is not only a heat retardant, but a buffer between the walls. It keeps the walls separated, no matter how they buckle in a fire, preventing direct contact of outer and inner walls which would conduct the heat from the exterior to the contents of the file.



"Y AND E" FIRE-WALL CONSTRUCTION

Safety Latches—The "Y and E" safety latch is a feature of each drawer. A slight push and the drawer rolls shut and is automatically latched. It can not rebound open; cabinet can even fall forward on its face or side and still be shut. To open, the latch knob must be pressed with the thumb. This knob is located directly above the drawer pull as illustrated.

Roller Bearing Slides—All drawers are equipped with "Y and E" roller bearing slides. A slight tap with the hand sends the drawer rolling shut; a slight pull with a finger, after the latch is released, brings it rolling open.

Strength and quiet operation are additional important features of the "Y and E" slide.

Drawer Strikes All Around—Drawer fronts are set into flanged frames, very much like the doors of safes. The openings are thus effectually sealed against fire, heat, dust, water, etc.

Drawers Open Full Length—All drawers open full length, entirely clear of the cabinet, thus making all the capacity available to actual filing.

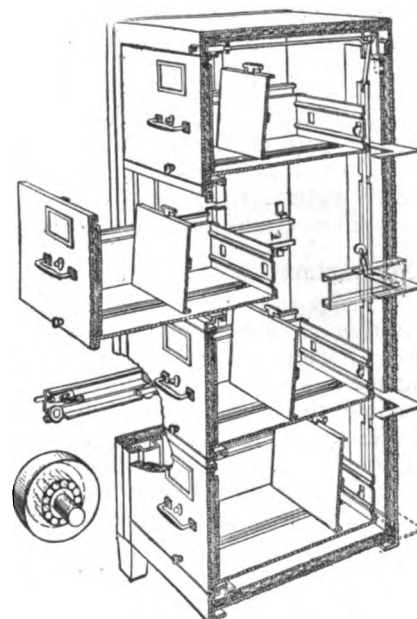
Sectional Construction—Cabinets are sectional as to ends and bases; can be locked together side to side and new sections added as required. One pair of ends will enclose any number of sections. Sanitary bases furnished when desired.

Locks—Aside from the automatic safety latches, sections are furnished with or without the regular "Y and E" pin-tumbler key locks, which, when set, lock all drawers simultaneously without a key. Key is needed to unlock only.

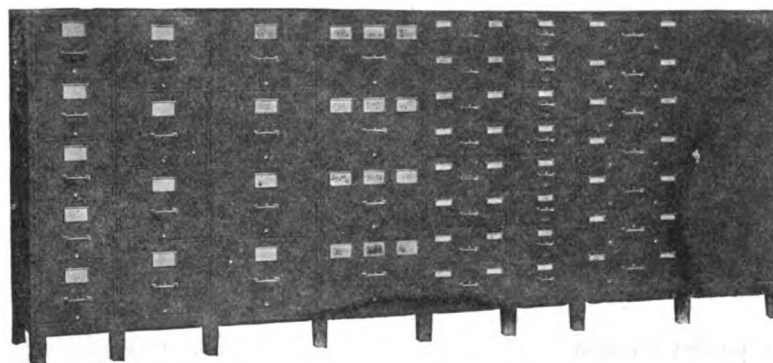
Any individual drawer may be specially equipped to lock separately; flat key or Yale paracentric locks being used.

Finishes—Standard stock finishes are olive, oak and mahogany.

Special finishes to order.



CROSS SECTION PLAN OF "Y AND E" FIRE-WALL STEEL FILING CABINET



BATTERY OF "Y AND E" FIRE-WALL STEEL FILING CABINETS

DATA, FIRE-WALL STEEL FILING CABINETS

No.	Description	Outside dimensions, in.			Inside dimensions, in.			Shipping weight, lbs.
		Width	Height	Depth	Width	Height	Depth	
5800	End panels.....	3 1/4	50 3/4	25 ★	...	...	...	60
5802	5-drawer bill size.....	12 7/8	50 3/4	25 ★	9 1/4	8 1/4	23 1/4	210
5802B10	10 double drawers for 5"x 3" cards.....	12 7/8	50 3/4	25 ★	5 1/4	4 1/4	23 1/4	275
5804	4-drawer letter size.....	15 ★	50 3/4	25 ★	12 1/4	10 1/4	23 1/4	200
5804B2	3 letter drawers; 2 double 6"x 4" (or 5"x 3") drawers.....	15 ★	50 3/4	25 ★	12 1/4	10 1/4	23 1/4	215
5804B4	2 letter drawers; 4 double 6"x 4" (or 5"x 3") drawers.....	15 ★	50 3/4	25 ★	12 1/4	10 1/4	23 1/4	230
5804B8	8 double drawers for 6"x 4" (or 5"x 3") cards.....	15 ★	50 3/4	25 ★	6 1/4	4 1/4	23 1/4	250
5806	4-drawer cap size.....	18 1/4	50 3/4	25 ★	15 1/4	10 1/4	23 1/4	215
5806D4	4 3-compartment document drawers.....	18 1/4	50 3/4	25 ★	5 ★	10 1/4	23 1/4	255
5807	7 double drawers for 8"x 5" cards.....	19	50 3/4	25 ★	8 1/4	5 1/4	23 1/4	265
5808	Cupboard section, hinged door with lock, 3 shelves.....	18 1/4	50 3/4	25 ★	16 1/4	46 1/4	24 1/4	170
5816	8-drawer, check size.....	12 7/8	50 3/4	25 ★	10 1/4	3 1/4	23 1/4	230

ESTABLISHED 1845

W. & L. E. GURLEY

Makers of Engineering and Surveying Instruments

TROY, N. Y.

BRANCH: SEATTLE, WASH.

Products.

TRANSITS; LEVELS; PLANE TABLES; ALIDADES.
Also, Compasses; Sketching Cases; "Beaman" Stadia Arc.

Leveling Rods; Stadia Rods; Flagstuffs; Tripods.
Automatic Water Stage Registers; "Price" Hydraulic Current Meters; Hook Gages.

Dealers in Chains, Tapes, Aneroid Barometers, Anemometers, Binoculars, Field Glasses, Drawing Instruments and Materials, Scientific Books, etc.

Manufacture.

From raw material to finished product every detail is of Gurley construction, thus insuring a perfection of manufacture—a precision of operation and adjustment—which has secured for Gurley instruments merited recognition among leaders of the engineering profession. The Gurley has been the accepted *Standard of Quality* for three-quarters of a century, which is evidenced by its close identification with big engineering accomplishments, both past and present.

Guarantee.

All instruments, when purchased directly of this company, are warranted correct in all their parts; and in the event of any original defect appearing after reasonable use, the company agrees to repair or replace with new and perfect instruments, promptly at its own cost, express charges included; or money and express charges paid by purchaser will be refunded.

Prices, Terms and Catalogue.

Prices will be quoted promptly on request.

Terms: Net cash, f. o. b. Troy, N. Y.; or c. o. d. with privilege of examination, if requested. Safe delivery guaranteed.

Illustrated catalogue describing this company's complete line will be sent to any one free of charge, on request.

General Characteristics of Gurley Transits.

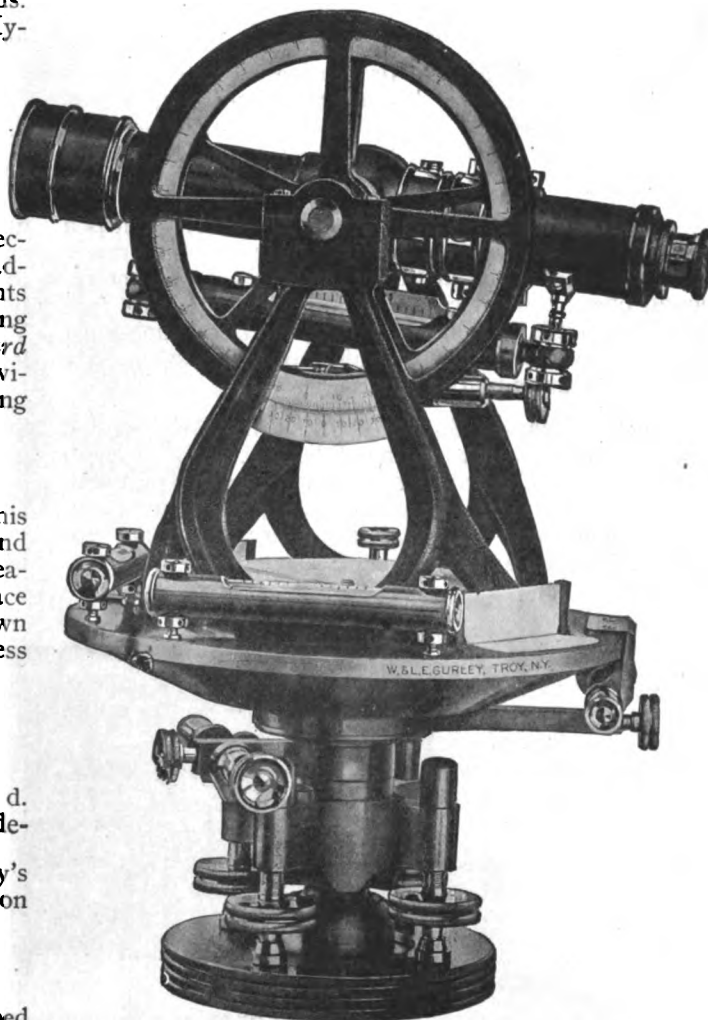
Long compound tapered centers; 4-screw ribbed leveling head; shifting center; radially ribbed and dished limb and plate; horizontal and vertical limbs graduated on *sterling silver*; waterproof flush verniers at 30° to line of sight, reading to 1'; waterproof compass box, with variation arc; sensitive telescope level; superior quality telescope lenses with brilliant illumination, flat field and sharp definition; erecting eyepiece, *platinum* cross wires and stadia wires; telescope reverses either end; center point on top; dust guard. Packed in mahogany box, with plummet, reading glass, etc.

LIMB I—Figured in two rows, the outer row 0 to 360°, the inner row in quadrants 0 to 90°.

LIMB IV—Two rows of opposite inclined figures, 0 to 360°.

Gurley Precise Transits with One Piece Truss Standard.

Designed especially for railroad, bridge, municipal and other work requiring the highest degree of precision.

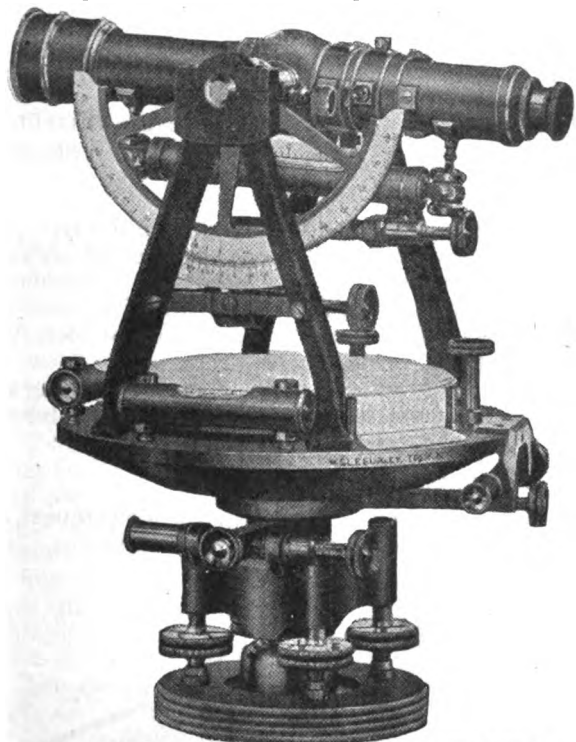


NO. 8-A, or NO. 27-A PRECISE TRANSIT

	No. 8-A	No. 27-A
Diameter of horizontal limb, in.	6.25	5.65
Length of needle, in.	3.5	3
Length of telescope, in.	11	8
Power of telescope, diameters.	26	20
Length of telescope level, in.	7.2	5
Diameter of vertical limb, in.	5	4.5
Vertical limb reads to.	1'	1'
Tripod with cap.	Split legs	Extension legs
Weight of instrument, lbs.	16	12
Weight of tripod, lbs.	11	10
Shipping weight, 2 boxes, lbs.	75	70

Regularly furnished with Limb IV, but Limb I will be substituted if desired. Vertical arc, instead of full vertical circle with aluminum guard, will be substituted, if desired.

A gradienter will be combined with the clamp and tangent to telescope axis, if desired.

Gurley Light Mountain or Mining Transits.**NO. 28 LIGHT MOUNTAIN OR MINING TRANSIT***The best known transit in America*

Horizontal limb, 5.65 in. diameter. Graduated to 30', and figured like Limb I (Limb IV figuring, if desired, at no extra cost). Reading by two opposite double verniers to 1'. Compass needle, 4 in. long. Variation arc. Telescope, 8 in. long. Power 20 diameters. *Platinum* cross wires and stadia wires. Level on telescope, 5 in. long. Vertical arc, 2½ in. radius, graduated to 30' and reading to 1'. Angle-section standards with ample bases.

Extension leg tripod, closing to 36 in., weighs 10 lbs. Instrument packed in mahogany box.

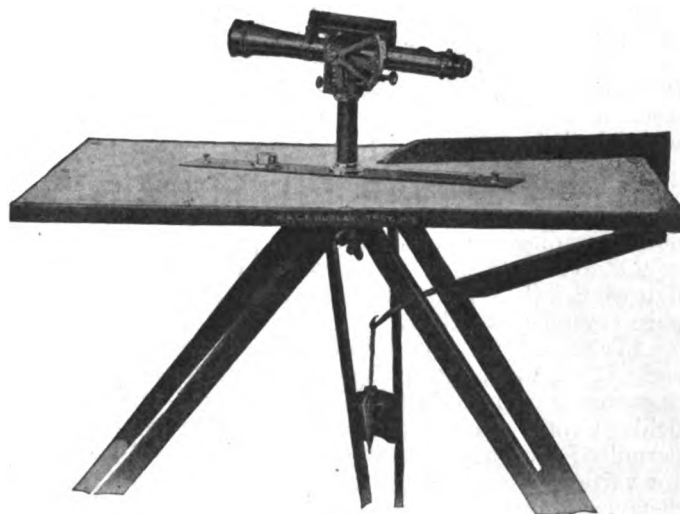
Weight of instrument, 11 lbs. Shipping weight, in 2 boxes, about 65 lbs.

If desired, a 4½-in. diameter vertical circle with aluminum guard, will be substituted for the vertical arc.

A gradienter will be combined with the clamp and tangent to telescope axis, if desired.

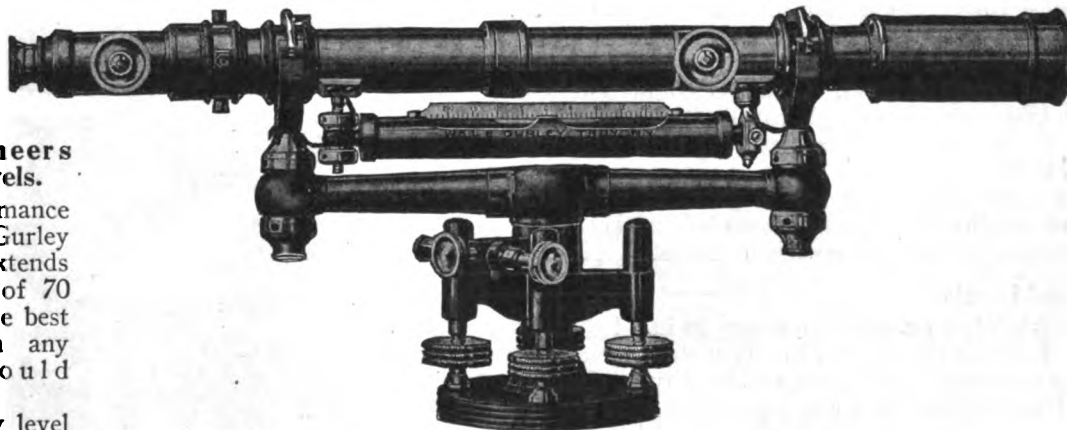
Gurley Plane Table Outfits.

This outfit consists of No. 570 Johnson movement, with split leg tripod, weighing about 10 lbs.; No. 573 drawing board, size 31 by 24 in., with brass screw plate fitted, and with 8 clamp screws and sockets for fastening the paper; flexible canvas case for the drawing board; No. 574 plumbing arm and plummet; and No. 584-C alidade, with 11-in. telescope, inverting eyepiece with diagonal prism, power about 22 diameters, enlarged objective, 1⅜-in. aperture, *platinum* cross wires and stadia wires; detachable striding level; edge graduated vertical arc reading to 1', combined with Beaman stadia arc; clamp and tangent to telescope axis; blade 18 by 3 in., with left-hand edge beveled; circular level, and box compass with 4-in. needle, mounted on blade. Alidade packed in mahogany carrying case.

**NO. 576-C PLANE TABLE OUTFIT WITH JOHNSON MOVEMENT AND NO. 584-C ALIDADE***U. S. Geological Survey Standard***Gurley Engineers Wye Levels.**

The performance record of the Gurley wye level extends over a period of 70 years, and is the best recommendation any instrument could have.

The Gurley level is the standard with which all other levels are compared. It is universally preferred for its accuracy, stability, ease and permanence of adjustment, and long wearing qualities.

**NOS. 375, 377 OR 378 ENGINEERS WYE LEVEL**

	No. 375	No. 377	No. 378
Length of telescope, in.	22	18	15
Power of telescope, diameters.	42	32	26
Aperture of objective, in.	1⅜	1⅜	1⅜
Least focusing distance, from center of instrument, ft.	12	8½	8½
Length of telescope level, in.	10½	8½	8½
Weight of instrument, lbs.	14½	13½	11½
Weight of tripod, with solid round legs, lbs.	10	10	10
Shipping weight, 2 boxes, lbs.	75	65	60

On No. 378, the eyepiece is focused by spiral movement, instead of pinions. The objective slide is without dust guard.

BUFF & BUFF MFG. CO. **Manufacturers of Surveying Instruments**

NEW YORK OFFICE
Hudson Terminal, 46 Dey Street

Jamaica Plain Station
BOSTON, MASS.

CHICAGO OFFICE
231 North Welles Street

Products.

"BUFF" TRANSITS and LEVELS.

Also manufacturers of Theodolites, Tripods, Levelling Rods, Plumb Bobs, Plummet Lamps, Steel Tapes, Range Poles, Marking Pins and Current Meters.

Repairs to Instruments.

"Buff" transits, solidly built to resist blows and falls, have metal generously distributed throughout the construction. At the Jamaica Plain shops, all makes are repaired with economy and despatch. Injured parts of instruments are duplicated from stock in hand. Telegraph orders can be completed in 24 hours.

Specifications 6¼-inch Buff "Precise" Transit No. 1B.

Graduation, 6¼-in. diameter, with 2 opposite double reading verniers to minutes, placed at either 30° or 90° to line of sight. Two rows of opposite inclined figures 0-360. Graduations silvered and covered by pure crystal plate glass.

Telescope, erecting, is balanced and reverses at either end; 12 in. long, 1¼-in. aperture, with power of 26.5 diameter improved eyepiece, unsurpassed large clear field. Center point is provided on top of telescope to permit of accurate centering from above. Adjustment for vertical plane, and line of collimation correct for all distances. Sensitive level bubble, 6 in. long, with clamp and tangent to telescope. Improved lower and upper spring tangent clamps. Shifting center with ¾-in. adjustment. Spirit levels truly ground by special machine, rated and sensitive. Standards are cloth finished. Long taper centers with broad flanges and of hardest bell-metal and phosphor bronze. Compass needle is 4½ in. long and of accepted form. Compass graduation is silvered and figured with a single row 0-90 on each side of N. and S. Tripod improved, split-leg with wing-nuts, weight 7½ lbs.

Mahogany instrument box is provided with strap, brass lock and hooks; contains plumb bob, pocket magnifier, sunshade, wrench, screwdriver, adjusting pins, etc.

Engineers' Levels.

18-inch Wye Level—Telescope, 18 in.; 1¾-in. objective; 36 power; protection to object slide; erecting or inverting eyepiece. Telescope and level tube, cloth finished. Phosphor bronze contact points in wyes for bell-metal collars; hard bell-metal center in socket of phosphor bronze. Line of collimation correct for all distances. Adjusted to finest possible accuracy with sunshade in position and focused on mean distance. Mahogany case with strap and hooks, sunshade, wrench, screwdriver, adjusting pin, etc.

Weight, 10¾ lbs.; tripod, 7 lbs. Price, \$168.00

18-inch Dumpy Level—36 power. Price, \$134.00.

References.

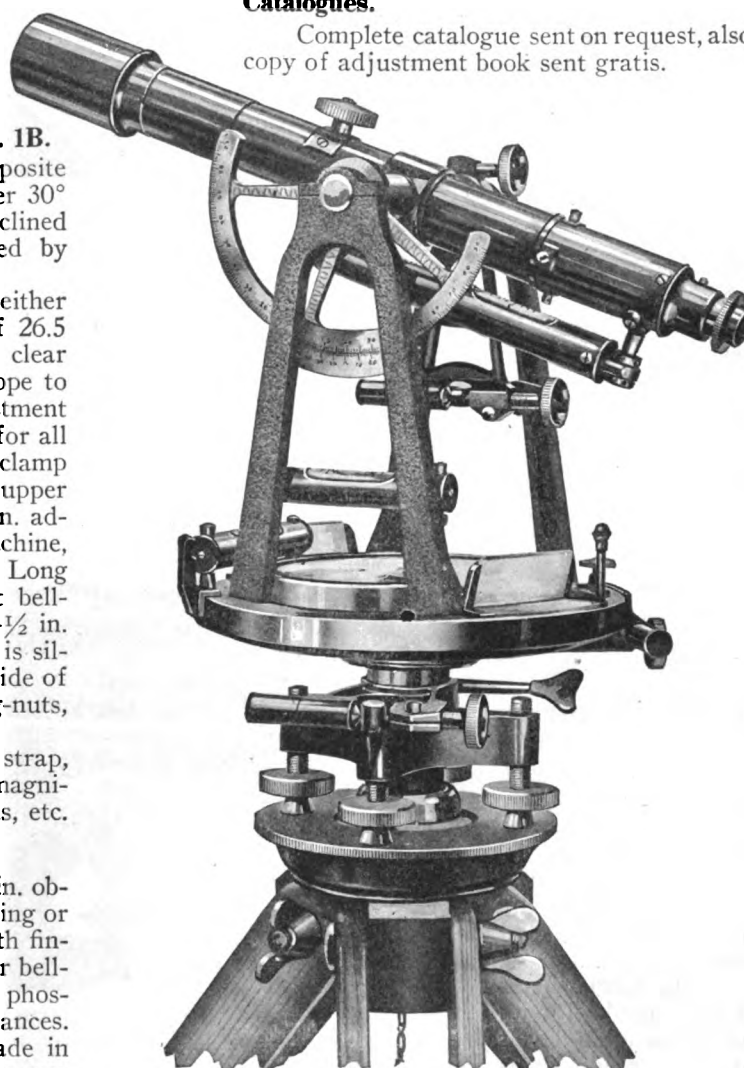
This company are Instrument Makers to the United States Government, many departments; New York Central R. R.; New York, New Haven & Hartford R. R.; New York Water Board; Public Service Commission and Board of Public Works, New York City; Standard

Oil Co.; Guggenheim and Rothschild interests; J. G. White Co., and numberless other engineering organizations. The Pennsylvania R. R. used "Buff" instruments in large numbers in both their North River and East River tunnels. The Subway Commission of New York is now using 150 "Buff" instruments.

Names and addresses of experienced users of "Buff" instruments in the vicinity of any interested inquirer will be furnished on application.

Catalogues.

Complete catalogue sent on request, also copy of adjustment book sent gratis.



6¼-INCH BUFF "PRECISE" TRANSIT NO. 1B

Patented Nov. 6, 1900; Nov. 13, 1900; Feb. 3, 1903

Price, as shown.....\$295.00

DATA, "PRECISE" TRANSITS

Size.....	No. 1	No. 2	No. 3	No. 4
Weight.....	13½ lbs.	10 lbs.	7 lbs.	5 lbs.
Diam. of graduation....	6¼ in.	5½ in.	4½ in.	4 in.
Length of needle.....	4½ in.	3¾ in.	3¼ in.	2½ in.
Power erecting telescope.	26.5 diam.	22.5 diam.	18 diam.	17 diam.
Power inverting telescope.	29 diam.	25 diam.	21 diam.	20 diam.
Length of telescope....	12 in.	10¾ in.	8 in.	8 in.
Length level bubble....	6 in.	5½ in.	4 in.	4 in.
Diam. telescope aperture	1¼ in.	1¼ in.	1¼ in.	1¼ in.

BARTON SPIDER-WEB SYSTEM

(INCORPORATED)

Licensors of Flat Slab Reinforced Concrete Construction

Kimball Building
CHICAGO, ILL.

Services and Licenses.

This company issues DESIGN LICENSES to architects and engineers only for FLAT SLAB REINFORCED CONCRETE FLOOR and ROOF CONSTRUCTION under U. S. Patents No. 1,335,780 and 1,217,645.

Reinforced Concrete Flat Slab Construction.

Patent No. 1,335,780 issued April 6th, 1920, emanating from application filed July 18th, 1911, covers the broad use of combination of two- and four-way belts of rods in reinforced concrete flat slab construction. This combination is altogether distinctive. It insures the maximum economy of design because it makes possible larger effective depths in the slab, and because it enables the designer to use large bars over column head rather than small bars which take "size extras."

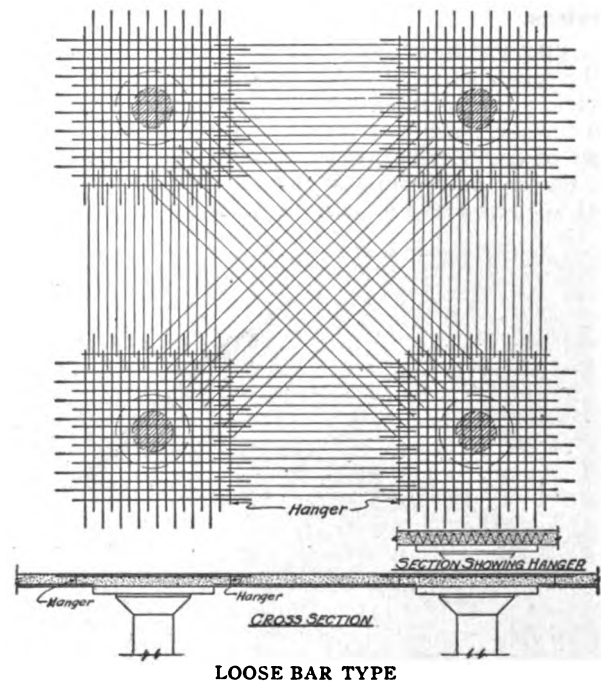
The company will permit only its authorized licensees to design. Infringers will be prosecuted.

Three Possibilities in the Barton Spider-Web System.

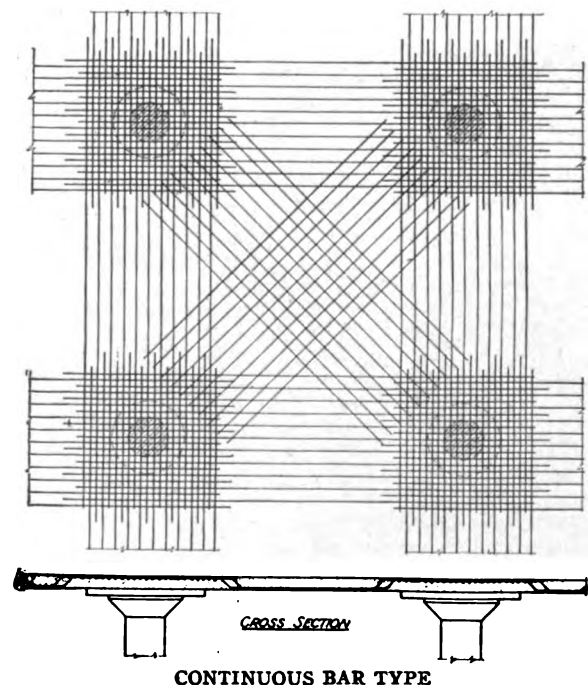
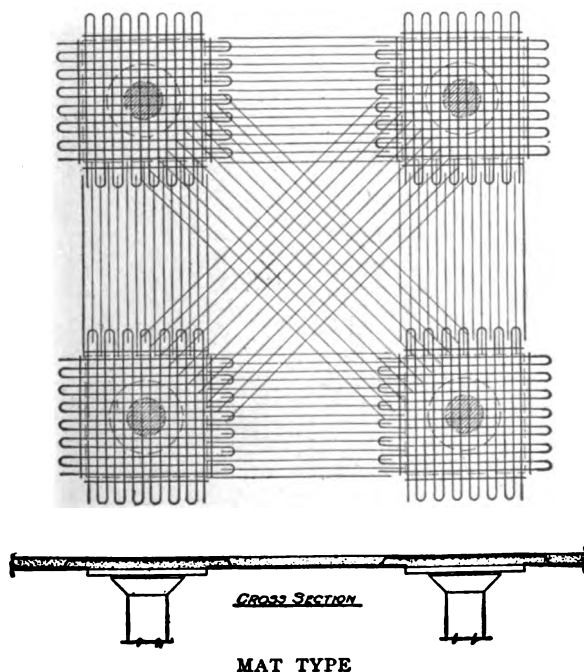
Mat Type—The distinctive feature of the "mat" type is the fabricated units consisting of a continuous bar whose looped ends are bent down to form supports. One such unit or "mat" is placed in each direction over the column head. The bottom slab steel in both direct and diagonal belts consist of short uniform length bars. We consider this type the best to use not only because labor in handling and placing of steel is reduced to the minimum but also because of the proved efficiency with which the mat construction provides for the critical stresses.

Loose Bar Type—The steel in the top of the slab over the column head is composed of the required number of single short lengths of bars supported and spaced

by means of a continuous "W" shaped "hanger," which also serves as a supporting and spacing unit for the direct bands of steel in the bottom of the slab.



Continuous Bar Type—Short diagonal bars are used as in the other methods, but the direct belts are continued over the column head with short lengths of bars added to give the total amount of steel there required.



THE FOUNDATION COMPANY

120 Liberty Street
NEW YORK, N. Y.

CABLE ADDRESS:
"UNDERFOUND"

BRANCH OFFICES

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NEW ORLEANS, LA., Maison Blanche Building
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PITTSBURGH, PA., Fulton Building
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SAN FRANCISCO, CAL., Holbrook Building
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LOS ANGELES, CAL., Higgins Building
VANCOUVER, B. C., Standard Bank Building
MONTREAL, QUE., 222 St. James Street
PARIS, FRANCE, 16 Rue de la Pepiniere
LIMA, PERU, Rifa 332
HAVANA, CUBA, Edificio Horter, Obispo No. 7
TAMPICO, MEX., Apartado No. 44

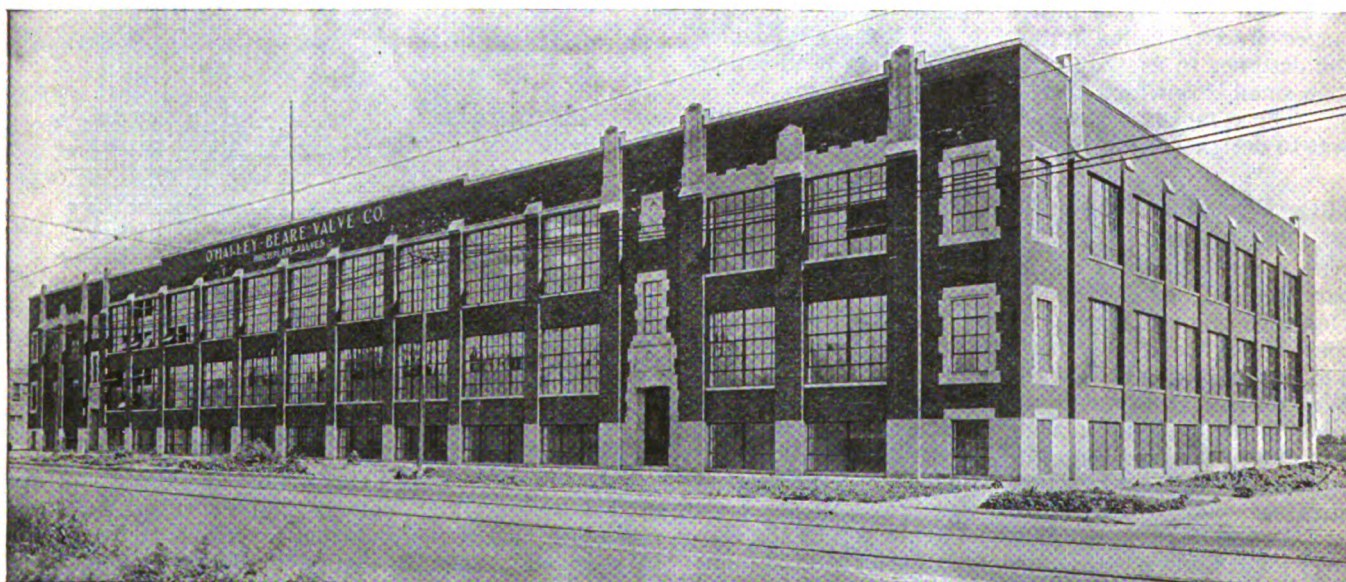
PORTLAND, ORE., 1125 Yeon Building

Services.

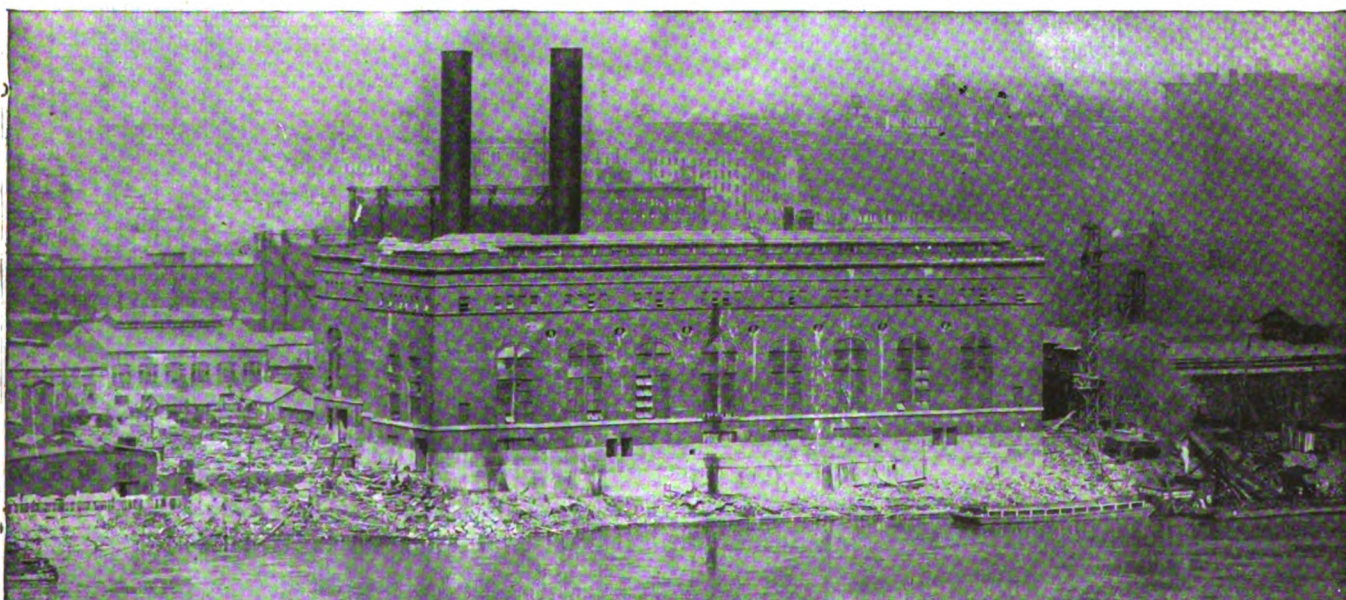
THE FOUNDATION COMPANY is widely experienced in the construction of industrial plants, steam and hydro-electric power plants, railroads, refineries, water supply and sewage systems, river and harbor works, and other types of engineering work. The company specializes in the design and construction of difficult sub-aqueous work such as deep foundations, bridge piers, mine shafts,

tunnels, and the like involving the use of either pneumatic or open caissons.

Affiliated with THE FOUNDATION COMPANY is The Foundation Oven Corporation, designers of the "American Coke Oven" and builders of complete by-product coke oven plants. A coal research laboratory is maintained by the latter organization.



REINFORCED CONCRETE FACTORY BUILDING FOR THE O'MALLEY-BEARE VALVE CO., CHICAGO, ILL.
Rests on 94 reinforced spread footings. Built within contract time and under estimated costs



100,000 KW. STEAM TURBINE GENERATING STATION FOR THE UNION GAS AND ELECTRIC CO., CINCINNATI, OHIO
Steel, concrete and brick construction, 221 ft. by 330 ft. by 100 ft. high. Capacity of indoor coal storage bin, 7500 tons

C. L. INSLEE

W. G. HUDSON

EDWARD BURNS

W. W. RICKER

GUARANTEE CONSTRUCTION COMPANY

Consulting, Designing and Contracting Engineers

144 Cedar Street
NEW YORK, N. Y.**Products and Services.**

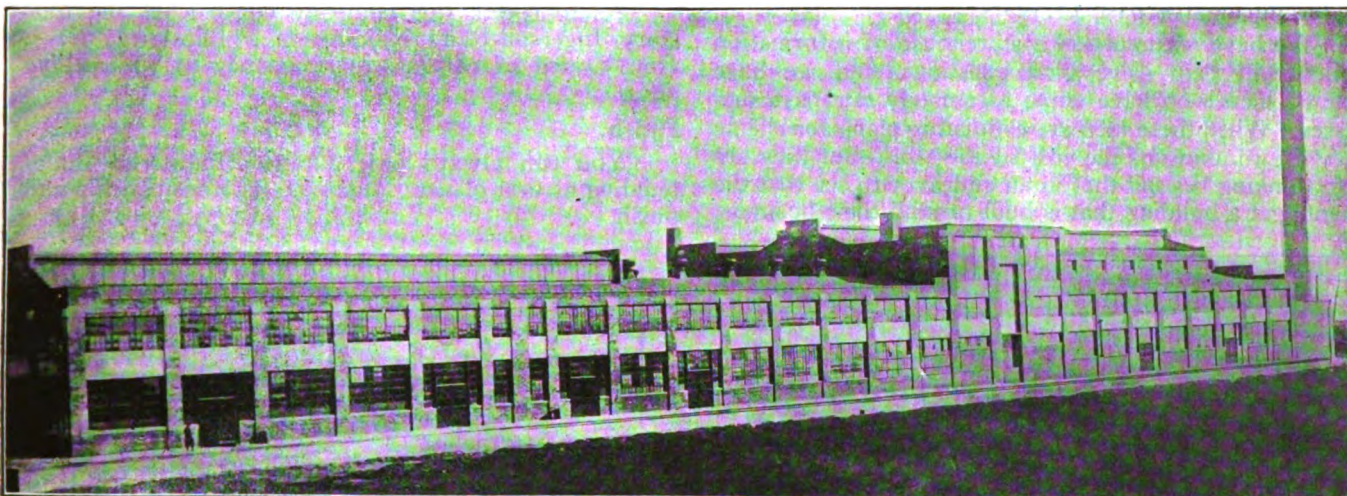
MILL, POWER PLANT and FACTORY DESIGN and CONSTRUCTION.

This company specializes in construction work of a difficult nature, which requires a maximum of engineering skill in design, and demands high class workmanship in the field. An engineering department, skilled in difficult design and the proper use of materials, is maintained and is at the service of engineers and architects.

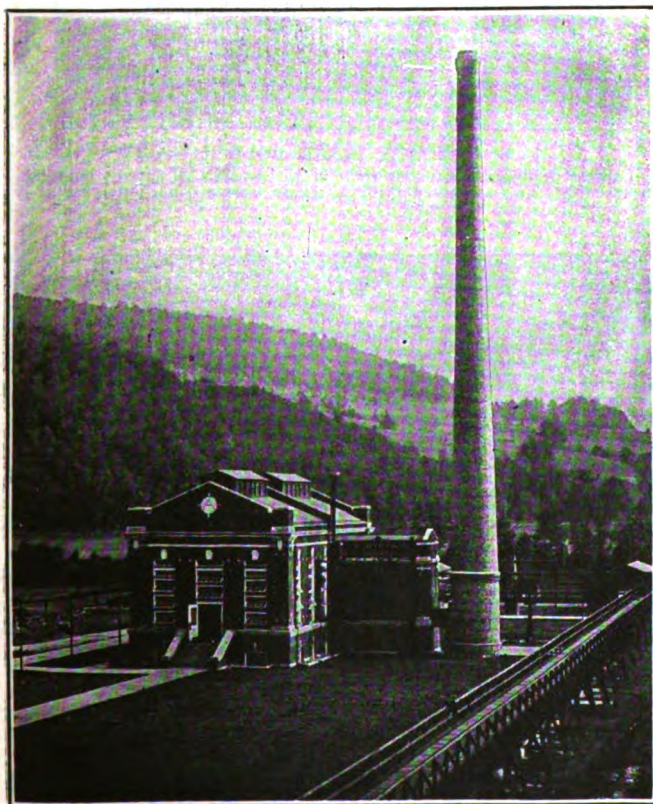
The company undertakes contracts for complete installations, from foundations to equipment, and carries on the work with its own forces and equipment.

This work is done on any form of contract—percentage, fixed fee or lump sum. Entire responsibility is assumed for the designs and workmanship.

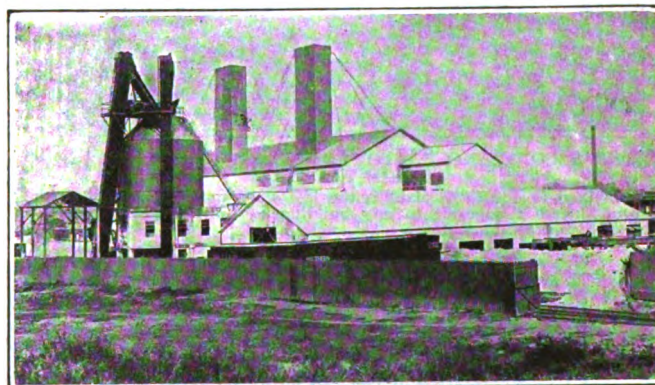
For Coal, Ash, and Materials Handling Equipment, Storage Bins and Bunkers, Pneumatic Conveyors, see pages 698-700.



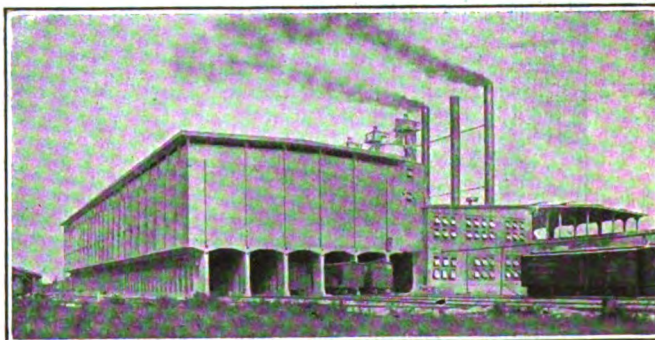
STRUCTURES OF TIMBER, STEEL, BRICK OR REINFORCED CONCRETE



POWERHOUSE DESIGN AND CONSTRUCTION
An important branch of our work



ELECTRIC FURNACE PLANT FOR FERRO-SILICON



35,000-TON DRYING AND STORAGE PLANT FOR PEBBLE PHOSPHATE
Designed and erected complete, and turned over to the owners ready for operation

INDUSTRIAL ENGINEERING CO.

Constructing Engineers

30 Church St.
NEW YORK, N. Y.

Products.

REINFORCED CONCRETE BUILDINGS.

Services.

The INDUSTRIAL ENGINEERING COMPANY is experienced in the design and construction of reinforced concrete buildings as applied to every branch of industry where the well recognized qualities of concrete are sought.

This company has constructed more than 125 industrial concrete buildings throughout the Eastern States during the past 15 years.

We have accumulated a storehouse of information which will help solve vital questions, and we have trained men who have come to embody our past successes. When these men are estimating plans for clients they are thinking of the cost of the work, but they are also thinking beyond that in an endeavor to see that the clients get a building that is built around their business.



Cost.

Money is to be saved once during construction by buying the right material and placing it expeditiously. Money is to be made every year after completion if the building helps along every movement necessary in the business. We offer to owners and architects alike this knowledge of the "Industrial Problems" gained through years of experience.

Speed.

As to speed, this company constructed the four story Ingersoll-Rand building in Phillipsburg, N. J. from award of contract to occupancy in *50 working days*.

Finish.

You can always pick out an "Industrial Built" building at first glance. Just note its workmanship and finish.



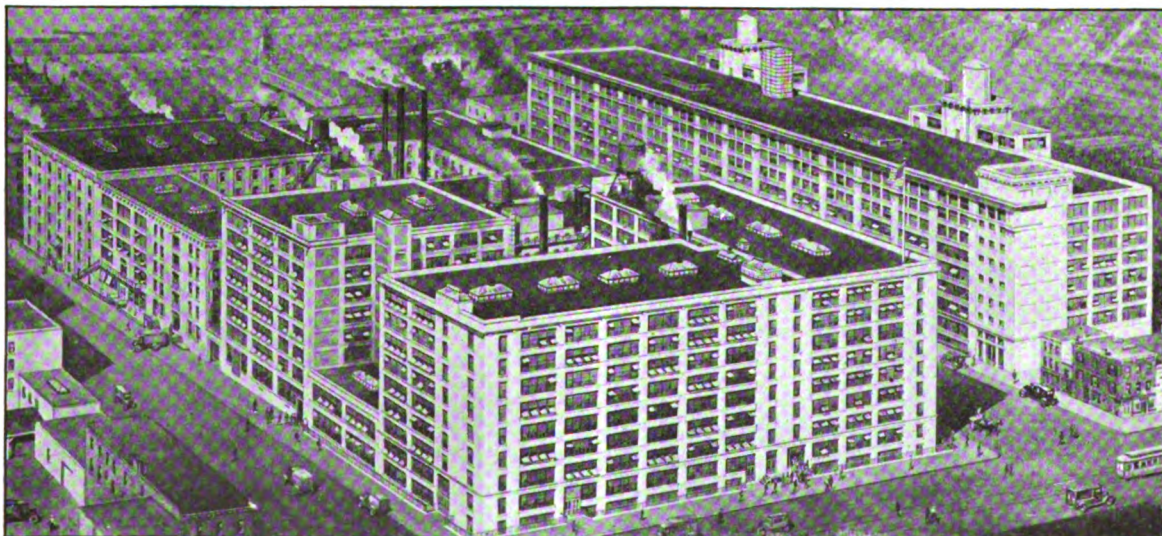
WINTER & CO. PIANO FACTORY, AND STAUCH BROS. PIANO ACTION FACTORY

Combined in one large plant is the last word in its line. An expert has pronounced it superior to any building of his knowledge both for planning and execution



Q. R. S. COMPANY PIANO ROLL FACTORY

Largest producers of piano rolls in the world. A speedy construction schedule was maintained through severe winter conditions just as if these conditions did not exist



MAMMOTH MANUFACTURING SITE OF THE MERGENTHALER LINOTYPE COMPANY, BROOKLYN, N. Y.

This is the home of the "Linotype," the machine that revolutionized printing and opened the way for the spreading of enlightenment in all parts of the world. Linotype matrices now may be had for 40 different languages and American built linotypes are in use in 63 different countries

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Engineers

Bureau of Inspection, Tests and Consultation

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SAN FRANCISCO, CAL., 251 Kearney Street
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MONTREAL, QUE., 905 McGill Building**General Engineering Service.**

CONSULTATION SERVICES in all ENGINEERING FIELDS—MECHANICAL, CIVIL, HYDRAULIC, ELECTRICAL and CHEMICAL.

The SUPERVISION and DETAIL INSPECTION of CONCRETE CONSTRUCTION, including EXAMINATIONS and REPORTS upon the SUITABILITY of AGGREGATES.

REPORTS on EXISTING CONDITIONS of BUILDING and other structures.

Testing, Physical and Chemical.

Duty and efficiency tests of entire plants—engines, boilers, pumps, compressors and other machinery.

Strength tests of materials and systems of construction—steel, iron, cement, brick; columns, beams, floor slabs, partitions and other members.

Chemical tests of all building materials, including steel, iron, cement, paints, oils, slags, limestones, marls and clays.

Structural Steel Inspection.

The inspection of structural material at the mills and foundries, including the identifications and witnessing of physical tests.

The supervision and inspection of workmanship, checking the sections, dimensions and detail connections during the course of fabrication at the shops, resulting in the proper handling of the material, first class workmanship, accurate construction, thorough painting and distinct marking, and thus facilitating the erection at the site.

Estimation of weights from detail drawings, and checking shipping weights of finished work.

The supervision and detail inspection of the structure during erection.

Cement Inspection.

The testing of cement, including the sampling in car load or bin lots at the mills or warehouses, or when delivered on the work. Complete cement and chemical laboratories at principal offices.

Locomotives and Cars.

Car and locomotive inspection service includes inspection and testing at point of manufacture of certain important materials, and supervision of the entire construction of equipment. Careful attention is given to the quality of material and workmanship, and application of safety appliances required by the Interstate Commerce Commission. All locomotives are operated and tested under steam during final inspection before acceptance.

Such thorough inspection assures receipt of cars and locomotives in accordance with specifications.

Complete reports of inspection and tests are furnished for record.

Miscellaneous Materials and Equipment.

All classes of engineering materials, including cast iron water and gas pipe, oil pipe, creosoted paving blocks, relaying rails, etc., are inspected under standard and thorough methods by competent inspectors. Inspection and testing of locomotive cranes, pile drivers, steam shovels, gas engines, pumps, ballast spreaders and other miscellaneous equipment is given special attention.

Motive Power Materials.

Wheels, axles, couplers, springs, hose, castings, journal bearings, and brasses, boiler plates, tubes and staybolts, and all important locomotive and car materials are inspected, tested and identified at the manufacturing plants, where there are facilities for making the proper inspection and tests promptly, efficiently and economically. Inspectors engaged only in the inspection of such materials are assigned to this work.

Rails and Track Materials.**Rails**—Thoroughly experienced and competent rail inspectors, engaged only in inspection of rails, are stationed at all rail mills. In consideration of safety alone rails must be as free from injurious defects as possible; consequently too much attention can not be given in inspection of the rail in every phase of manufacture.

"Special Inspection" inaugurated by this company affords a complete progressive inspection of the steel from time of melting until shipment of finished rail. Specialized inspectors are assigned to the various departments of the mill. From data recorded by inspectors a complete history and the results of tests of each heat are furnished clients for permanent record.

The large yearly tonnage of rails inspected by this company has made possible a low standard tonnage rate.

Track Materials—Tie plates, angle bars, joints, spikes and bolts can be inspected at the mills with a result of decreased installation and maintenance charges. With the advent of heat treated and oil quenched angle bars, joints, bolts and spikes, an intelligent and practical inspection has been demanded. The experienced inspectors of this company are exceptionally efficient in securing delivery of proper tie plates, angle bars, joints, bolts and spikes.**Standard Specifications.**

Booklets containing standard specifications of the American Society for Testing Materials, for construction materials, for buildings, highway bridges, cement, etc., and other standard specifications, as well as booklets describing engineering and inspection service, will be promptly furnished upon request of the general office at Chicago.

THE DANIEL M. LUEHRS CO.

Industrial Engineers

2015 East 65th Street
CLEVELAND, OHIO

Services.

CONSULTATION SERVICES in all ENGINEERING FIELDS:
MECHANICAL, ELECTRICAL, STRUCTURAL, CHEMICAL.
EFFICIENCY STUDIES OF PLANT OPERATION.

DESIGN OF PLANTS or EQUIPMENT; DEVISING NEW
or IMPROVING OLD PROCESSES OF MANUFACTURE; SUPER-
VISION OF INSTALLATION OF EQUIPMENT; DESIGN and
SUPERVISION OF CONSTRUCTION OF STEEL or REIN-
FORCED CONCRETE BUILDINGS or OTHER STRUCTURES.

CHEMICAL and METALLURGICAL ANALYSES.

We are prepared to investigate any running indus-
trial plant of whatever nature; to study its operation;
to design equipment or methods for reducing costs,
personnel or time of operations, or for increasing pro-
duction; and to submit a complete detailed report cover-
ing these features.

We are also prepared to put our recommendations
into practice; purchase standard equipment where re-
quired, design and have built such special equipment as
may be necessary, operate the plant, and turn it over a
working proposition.

Where it is necessary, we will devise new processes
of production—work them out in our laboratories and
develop them into commercial propositions and supply
the equipment for them.

In addition to equipment and processes in the plant
itself, we are prepared to design and supervise the
construction of steel and reinforced concrete buildings.
We have had large experience in medium and low tem-
perature drying and baking—both for metals and food
product industries. We have had large experience in
the design, construction and operation of high tempera-
ture heat treating, carbonizing, and melting furnaces,
material handling, air conditioning and heating and
ventilating.

All of our work is taken at a fixed price per hour
for engineering, superintendence and drafting. A
standard fixed schedule of prices is maintained for com-
mercial chemical and metallurgical analyses. All ma-
terials and labor required on any of our contracts are
purchased for the account of our client, and bills there-
for are paid by him.

The Luehrs Organization.

THE DANIEL M. LUEHRS CO. is controlled, and its
activities supervised, by Daniel M. Luehrs, its president.
In addition to its regular drafting room, erecting super-
intendents and laboratory force, the company has secured
the services of a number of high grade engineers, men
who have had not less than ten years' practical experi-
ence in their respective fields. This staff is composed
of mechanical, electrical, foundry, furnace, chemical and
metallurgical engineers.

Daniel M. Luehrs, President—Mr. Luehrs' experi-
ence covers a period of twenty-six years with such firms
as the American Vapor Stove Co., The Crown

Cork and Seal Co. and several smaller concerns.

Mr. Luehrs was factory manager and chief engi-
neer for seven years with The McCreery Engineering
Co., a subsidiary of The Detroit Shipbuilding Co. This
company manufactured a line of sheet metal specialties
for the United States Navy, was a pioneer in the air
conditioning field and specialized in steamship ventila-
tion. While with this company he designed and in-
stalled ventilating systems in the present steamers, "City
of Cleveland Third," "City of Detroit Third," and the
"See and Bee," the largest side-wheeler steamer in the
world. Several patents were taken out in connection
with humidity control and air washing equipment by
Mr. Luehrs, while with this company.

In 1912 the air conditioning portion of this business
was sold to The American Blower Co. and Mr. Luehrs
was engaged as mechanical head of that department.
He designed their line of air washing, humidifying,
dehumidifying and humidity control systems, and or-
ganized the manufacturing department in the shop.

While connected with the Crown Cork and Seal
Co. as special engineer, he designed and rebuilt their
entire lithographing department, installing thirty-three
conveyor type electric baking ovens for sheet metal.
He reduced the factory cost of printing and baking
sheet metal 74.2%, reduced the number of men 42.2%,
and reduced the time necessary to bake lithograph inks
from thirty minutes to seven minutes, and varnish and
lacquers from ninety minutes to fifteen minutes.

A very complete conveyor system was installed for
removing the tin from cars, handling it through the
various processes in printing and baking, and replacing
it in the cars.

Activities of the Company.

Since the organization of this company we have
been engaged on a wide variety of work and have made
many improvements in the equipment or operating
methods of several large manufacturers, whereby we
have bettered their products, at the same time reducing
labor and other manufacturing costs, and speeding up
production. There follows a brief description of some
of the work we have done, with pictures illustrating a
few of the more important details.

We have been engaged in an engineering capacity
by The Wilberite Roofing Co. and The General Asphalt
Products Co. in devising machinery for the manufacture
of the Glynn Patent Asphalt Mastic for roofing and
paving materials.

We rebuilt the equipment of The Wilberite Roofing
Co. and got them into production. We designed and
installed a splicing table which reduced the time of
making a splice from 7 minutes to 10 seconds; also an
asphalt saturating machine which is capable of putting
into raw felt from 175% to 180% saturation.

We designed and installed in the plant of The Kay-
line Co. of Cleveland (manufacturers of electric light

fixtures), polishing and buffing rooms with their exhaust systems, lacquering and drying equipment, and sand blast department.

Several novel features were worked out in connection with this equipment which have greatly increased the production of the plant. Conveyors and lowerators were installed for handling the work from one department to another. The sand blast department is unique in giving an extremely fine mat finish to work, rehandling and cleaning the sand as it passes through the machine.

Another of the large special propositions that we have undertaken was the design and construction of a machine for making and frying doughnuts. This machine has a capacity of 14,000 dozen doughnuts per 8 hours. It is electrically heated and entirely automatic, involving the use of special materials to avoid metallic contamination of the oil and insure long life of the materials used.

The volume of our business during the latter part of the year became so great that it was decided to incorporate and operate as an incorporated company, although the stock is still owned by Daniel M. Luehrs.

Several patents have been issued to the company on special equipment and quite a few are now pending.

These cover electric oil heaters, electric core baking ovens of the continuous conveyor type, bright annealing furnaces for brass and steel, hardening furnaces, and carbonizing and aluminum melting furnaces. These furnaces are now being put on the market.

The company is now equipped to handle practically any engineering problem which may arise in the industrial plant. We have drafting rooms, experimental department, and chemical and metallurgical laboratories which are fully equipped to handle research work.

We have a well equipped library, and our catalogue file, thoroughly indexed, comprises nearly 3000 separate catalogues. This entire equipment is at the disposal of our engineering staff.

Our engineers are men who have acquired their experience in the shops and in positions of responsibility. None of them have had less than ten years practical experience. They are men who have successfully worked out many large and difficult problems in the past, men who have not been confined to any one class of work and have therefore had very wide experience.

Metal Polishing and Lacquering.

We designed and installed the special equipment used for polishing and buffing, and for applying and drying lacquer to metal parts in the plant of an electric fixture manufacturing concern located in Cleveland. This concern is one of the largest in the country. According to the owner's statement, contained in an article published in "Finance and Industry" shortly after the plant went into commission, their output with the new equipment is three times as large as it was previously.

This increased production has been obtained entirely as a result of the new equipment and has not necessitated any increase whatever in their labor force.

Fig. 1 is a general view in the lacquering and drying room in this plant. All machines and ovens are served by a selective conveyor system; all lacquering is done by spraying, and the drying ovens are electrically heated, with automatic temperature control. In the right foreground is a vertical lacquer drying conveyor type oven. The 4 lacquer drying ovens in the center of the room are

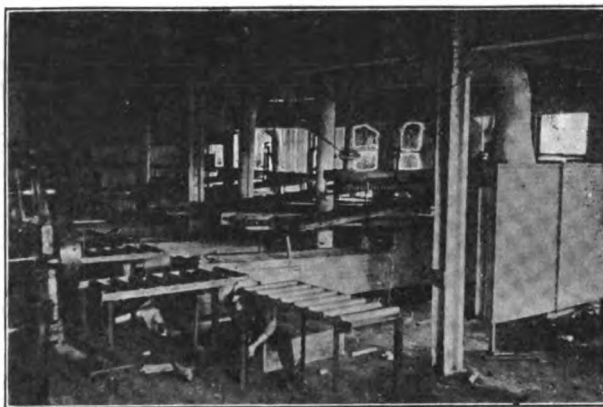


FIG. 1. GENERAL VIEW IN LACQUERING AND DRYING ROOM OF ELECTRIC FIXTURE FACTORY, CLEVELAND, OHIO

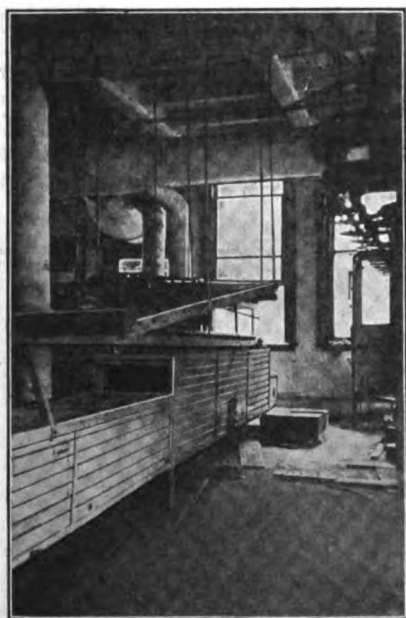


FIG. 2. ONE OF THE HORIZONTAL DRYING OVENS IN AN ELECTRIC FIXTURE FACTORY
Showing conveyors for supplying work to the ovens



FIG. 3. SPECIAL SPRAY HOOD
For lacquering suspension chain and stems used in connection with conveyor type electric heated drying oven opposite

of the horizontal type, also served by the selective conveyor. The selective conveyor is under the direct control of a dispatcher, who can, without leaving his own station, send a lot of work to any oven desired.

The lacquer spraying hoods used in this plant were all designed for the work they would have to handle; special hoods are used for applying lacquer to suspension chains or stems, all served by the conveyor system without the necessity of any rehandling of the work.

The time required for work to pass through this room has been reduced more than half; the labor force has also been reduced to a minimum.

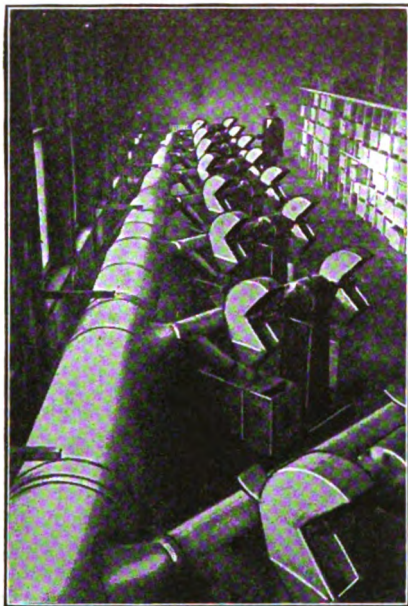


FIG. 4. METAL POLISHING AND BUFFING ROOM IN AN ELECTRIC FIXTURE FACTORY

There are no elbows in the pipe and the arrangement of machines permits light to strike the work at all times while it is on the wheel. Collection boxes, connected with each wheel, retain a large part of dirt and refuse, saving fans and separator from much wear encountered in old system. The dust boxes are quickly and easily removed, dumped and replaced.

Asphalt Roofing Felt.

Fig. 6 is a view in an asphalt roofing felt mill that we entirely re-designed. This mill had been operating inefficiently with an old paper machine. The entire machine was rebuilt, asphalt circulating systems put in, and the mill was put on its feet.

We built an asphalt saturator in connection with this plant, for saturating asphalt felt, in which we suc-

ceeded in obtaining an average asphalt saturation of 178%. The asphalt melting stills were located in a separate building located on the opposite side of a main line railroad; it was thus necessary to carry the supply line above ground for a distance of 50 ft. Although this pipe is continually exposed to the elements, there has never been an interruption to service due to cold. During the winter of 1919-1920, one of the severest on record in that section of the country, this was practically the only plant that was never held up due to freezing or congealing of the asphalt pipe lines.



FIG. 6. RECONSTRUCTED ASPHALT ROOFING FELT MILL

Fuel Oil Conservation.

Fig. 7 shows an underground tank for storing fuel oil. At the time this tank was installed, fuel oil was selling at 5¢ per gal. delivered to the company's private siding. Within four months the price had gone to 17¢; less than two months later it was impossible to obtain at any price.

This system was so designed that asphalt flux could be substituted for standard fuel oil; this substitution was soon made, and asphalt flux has been used for fuel purposes since that time. The price of asphalt flux has never exceeded 5¢ per gal. This fuel is still being used under the steam boilers and asphalt heating stills, and also under the big rotary dryer shown in Fig. 5.

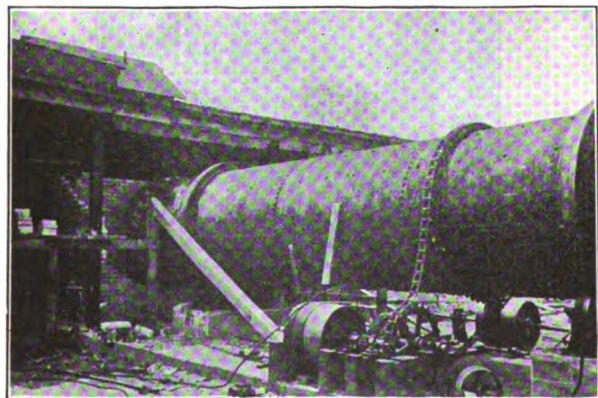


FIG. 5. LARGE ROTARY OIL HEATED DRYER INSTALLED IN AN ASPHALT MASTIC PLANT



FIG. 7. UNDERGROUND STORAGE TANK FOR ASPHALT FLUX USED AS A FUEL OIL

Sheet Metal Lithographing.

Figs. 8 and 9 are views in a large sheet metal lithographing plant. We rebuilt this entire plant, the cost of alterations amounting to approximately \$500,000; the savings resulting from increased output and decreased costs of operation (power, labor and overhead), figured on normal pre-war unit costs, are more than \$330,000 per year.

The cost of printing and baking sheet metal was reduced 74.4%; printing production was increased 32% and varnishing and lacquering capacity was increased 46%. The average increase in thermal efficiency of the baking ovens was 62%; the time necessary to bake inks was reduced from 30 minutes to 7 minutes, and the time for baking varnish and lacquer was reduced from 90 to 15 minutes. The number of men in the plant was reduced by 42.2%.

Fig. 8 is a view of one of four printing rooms. This photograph shows the printing presses with their controls and drives, and also the selective conveyor for carrying the sheet metal to and from the presses. By means of this conveyor system, the despatcher, centrally located with respect to the printing rooms, can deliver an order of tin, approximately 200 sheets, direct to any press in any room desired, with but one handling.

The load of tin leaves the despatching room on a conveyor, is loaded automatically on to a continuous type elevator, is automatically discharged to the selective conveyor which discharges the load to the feed conveyor of the press for which the load was destined, all without handling and without human attention. Upon reaching the press itself and coming to rest on the feed conveyor, the order automatically notifies both the despatcher and the litho control office that it has arrived. The using up of the load of tin on the press, provides room for a new load and sets a signal which notifies the despatcher there is room for the next order of tin for that press.

Fig. 9 shows the drives, the varnish machine and the front of the large varnish baking oven during erection. With this equipment 72 sheets of tin can be handled per minute by the feeder at the varnish machine. After passing through the coater and receiving a coat of varnish, sheets are automatically removed from the machine and fed into the oven, carried through the oven on a conveyor, discharged into the cooling chamber and carried through the cooling chamber and stacked in a pile automatically and without handling. Similar equipment was provided for applying a coat of lacquer with the exception that in this case, the sheet is trimmed

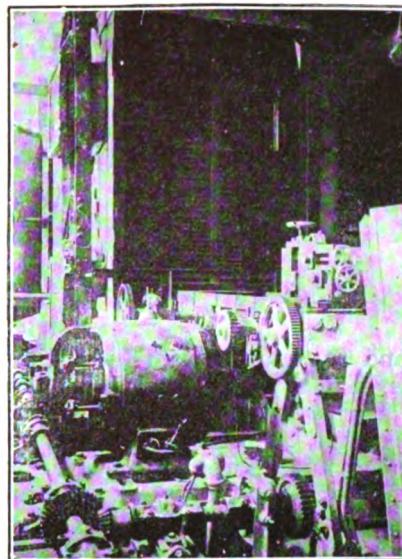


FIG. 9. ERECTION VIEW OF SHEET METAL VARNISH MACHINE AND BAKING OVEN
Handling 72 sheets of tin per minute by feeder at varnish machine

and cleaned in addition to being coated. On the lacquer coating equipment we eliminated 9 men. On the varnish machine 7 men were eliminated.

Bakery Installations.

Fig. 10 is an example of the economies and increased production we have been able to effect in bakeries and other food producing plants. This photograph shows an automatic doughnut making machine being installed in one of the local bakeries.

The frying machine and tank are shown in the center of the background, circulating pump, oil clarifier, electric heaters, etc., being shown at the left. This machine has a capacity of 14,000 dozen doughnuts in 8 hours, cutting them, frying them, draining and delivering automatically. The rate of feed through the cutting hoppers can be varied to suit the consistency of the dough being used. There are many novel features in connection with this machine.

Using electricity as the heating medium, this machine fries doughnuts for less per dozen than if gas fuel were used. It will also produce 14,000 dozen in 8 hours, whereas, previously, with the same crew working 20 hours, this plant could only turn out 5,000 dozen.

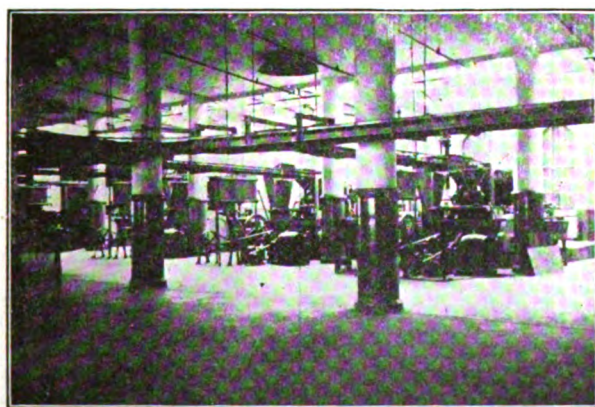


FIG. 8. PRINTING ROOM IN SHEET METAL LITHOGRAPHING PLANT
Showing automatic selective conveyor system

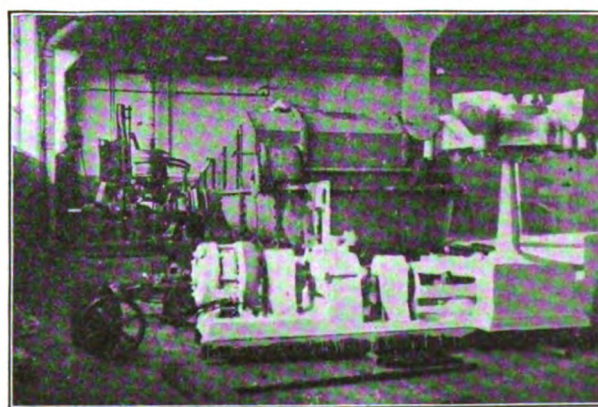


FIG. 10. ELECTRICALLY OPERATED AUTOMATIC DOUGHNUT MACHINE
With capacity of 14,000 dozen doughnuts in 8 hours

THE RUST ENGINEERING COMPANY

Engineers and Contractors

PITTSBURGH, PA.

WASHINGTON, D. C.

BIRMINGHAM, ALA.

Services.

DESIGN and CONSTRUCTION of Industrial and Power Plants, Tanks, Reservoirs, Mine Shafts, Foundations, Furnaces, Kilns, Ovens, Chimneys and Boiler Settings, Linings for Blast Furnaces, Stoves, Chimneys and Flues; all kinds of work involving the use of REINFORCED CONCRETE and BRICK.

THE RUST ENGINEERING COMPANY offers exceptional service in the design and construction of above classes of work.

Its organization includes the highest grade of engineering talent; insuring designs which give maximum efficiency in operation, and are at the same time economical both in first cost and maintenance. Competent field superintendents are in charge of all construction, and the methods followed insure minimum construction costs.

Offices and equipment are maintained at dominating points throughout the United States; and the requisite field force and equipment for the rapid completion of any project, can be placed in the minimum of time and expense, at any location in the United States, Canada and Cuba.

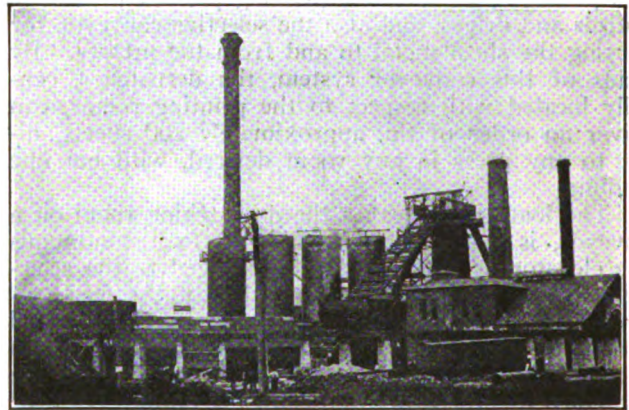
The value to the owner of the above service, where large sums of money are tied up in real estate and construction, is too obvious to require comment. Further,



the past success enjoyed by THE RUST ENGINEERING COMPANY in this field of service is a guarantee of practical, not merely theoretical results.

Correspondence invited.

For Radial Brick and Reinforced Concrete Chimneys, see page 745.



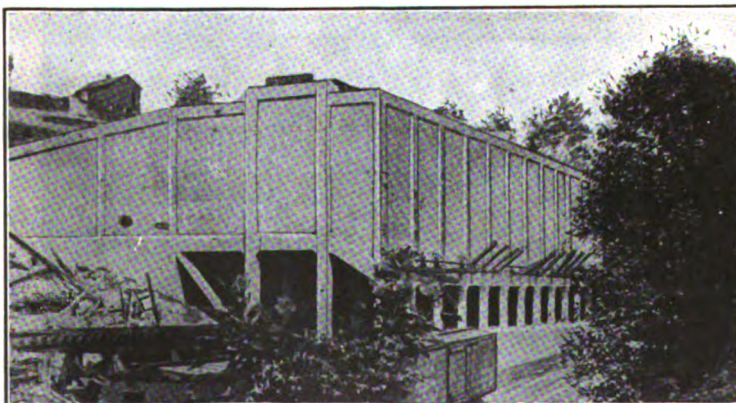
BLAST FURNACE PLANT DISMANTLED AND RE-ERECTED AT MARIETTA, PA.



REINFORCED CONCRETE RESERVOIR, BADEN, N. C.
Capacity, 1,000,000 gals.



BOILER SETTINGS FOR 10 WATER TUBE BOILERS, CHARLESTON, S. C.



REINFORCED CONCRETE COAL BUNKER, HOLT, ALA.
Capacity, 6,000 tons



REINFORCED CONCRETE RAILROAD WATER TANK, FRANKFORT, IND.



REINFORCED CONCRETE ACID TOWER, LYONS FALLS, N. Y.

TRUSCON STEEL COMPANY

(TRUSSED CONCRETE STEEL COMPANY)

Manufacturers of Standard Steel Buildings

YOUNGSTOWN, OHIO

Representatives in Principal Cities—for List, see page 303

Product.

TRUSCON STANDARD STEEL BUILDINGS, both Portable and Permanent.

For Reinforcing Steel, see pages 151-53; for Steel Windows, see pages 303-305.

Truscon Standard Steel Buildings.

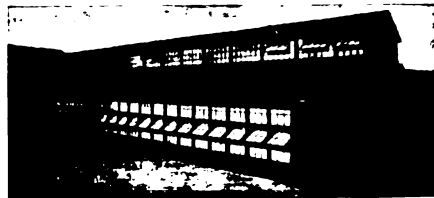
Truscon standard steel buildings are built of heavy steel standard units, of uniform size, interchangeable, and assembled by means of a simple locking device consisting of a slotted bolt and wedge. Roofs and walls are of Truscon alloy steel, a material of proved durability. This construction furnishes a strong, permanent, fireproof structure that can be rapidly taken down and re-erected when necessary in a new location, without any deterioration to the building itself.

The walls of these buildings are formed of panels, that are interchangeable as they are of uniform width. The walls are of heavy gage steel—rigid and substantial. The windows, also of steel, are welded into the steel panels, affording maximum daylight and ventilation. The steel doors are furnished either single or double, and are equipped with Yale locks and Stanley hinges. The steel roof trusses support steel roof plates, tilelike in appearance and absolutely weatherproof. The building is strongly braced throughout and extremely rigid.

Truscon standard buildings, completely equipped, present a very pleasing appearance, and are ideal where daylighted, fireproof construction is desired and where quick expansion is necessary. They can be furnished in all sizes, and are adapted for use as factories, warehouses, schools, churches, hospitals, garages, dining halls, tool sheds, contractors' houses, etc.



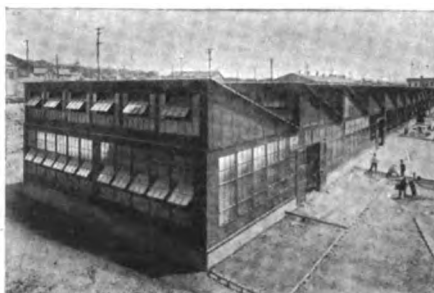
TRUSCON STANDARD BUILDINGS 80 FT. AND 60 FT. WIDE



TYPE 3M (MONITOR) TRUSCON STANDARD BUILDING



INTERIOR OF 80-FT. WIDE TRUSCON STANDARD BUILDING



50 x 500-FT. SAWTOOTH TYPE TRUSCON STANDARD BUILDING

Truscon standard buildings are furnished in any length; widths up to 120 ft., and of various types (see illustrations). Any height of wall is secured by the two heights of panels and varying curb heights. As panels are interchangeable, any desired arrangement of wall, windows and doors can be obtained.

Buildings can be taken down and re-erected, re-arranged, enlarged or reduced as required.

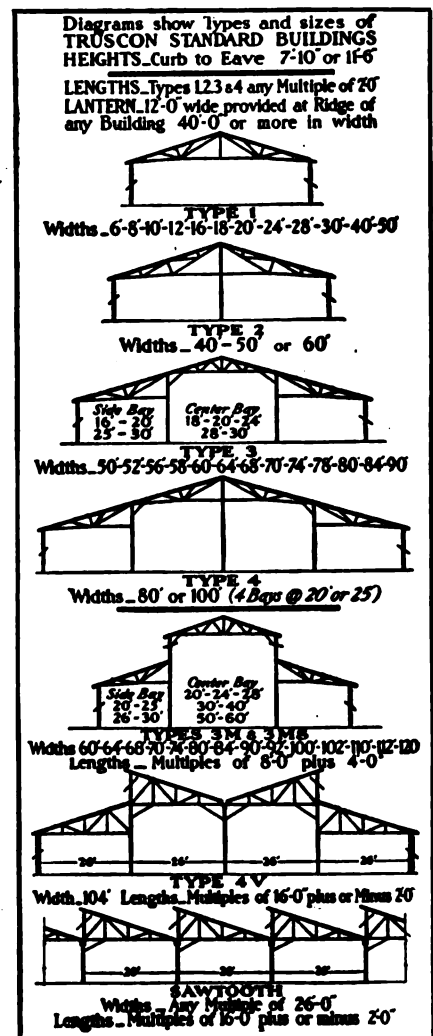
Monitor and Sawtooth Buildings.

The monitor type 3-M is especially adapted for use where additional headroom, light and ventilation are required, such as in foundries, erecting shops, etc. Provision is easily made for traveling crane in central bay.

The sawtooth type is adapted for machineshops and manufacturing generally, assuring maximum lighting and ventilation. Trusses are designed to support 1000 lbs. at any panel point.

Further Information.

For complete information, specifications, etc., write for the Truscon Standard Building Catalogue.



TRUSCON STANDARD BUILDINGS

BANCROFT-JONES CORPORATION

Steel Structures

GENERAL OFFICE AND WORKS
BUFFALO, N. Y.

BRANCH OFFICES

BOSTON, MASS.

BALTIMORE, MD.

DETROIT, MICH.

PHILADELPHIA, PA.

Products.

STANDARDIZED and SPECIAL STEEL BUILDINGS.

Specifications of Standardized Bancroft Buildings.

Dimensions—Buildings may be any length. (For widths see dimension drawings below.) There are 3 standard heights, measuring 10 ft., 15 ft. and 20 ft. from curb to eave. Special heights fabricated to order.

Monitors—Continuous or intermittent monitor can be provided, 8 ft. 6 in. or 17 ft. 6 in. wide, 2 ft. 6 in. or 6 ft. high fitted with ventilating or fixed steel sash.

Frame—The steel framework of Bancroft buildings is constructed of standard rolled structural shapes, with no plates or angles less than 1/4-in. thickness, fabricated and shop riveted into the largest possible standard units convenient for shipment and erection. These units are carefully painted with a high grade structural steel paint. The steel framework is



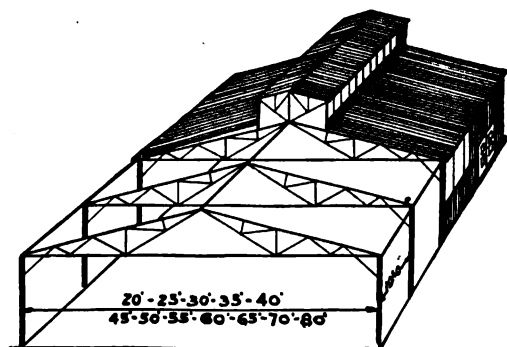
TRADE-MARK

designed as an independent unit and to meet the rigid requirements of city building codes. The trusses are fink type, one-fifth pitch; the purlins are rolled structural channels.

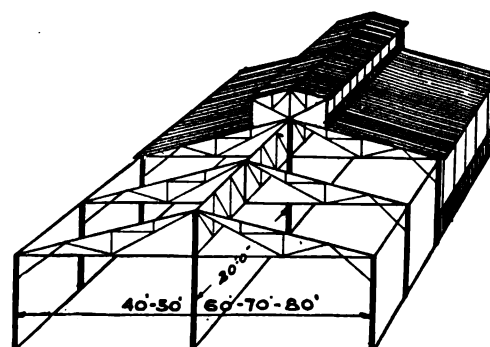
Covering—Because of its permanence without paint, insulating and weather resisting value we have adopted asbestos protected corrugated metal for the covering of the buildings illustrated. Asbestos protected metal, a combination of No. 24-gage solid sheet steel, asphalt, asbestos felt and waterproofing is rustproof and corrosionproof, does not require painting, and is used extensively by many large industrial corporations. Any corrugated roofing or siding material can be used however: plain painted steel, galvanized or zinc sheets. Hollow tile, brick or metal lath with stucco may be used for side walls.

Windows—Solid steel factory sash, ventilating or fixed type, 2-unit sizes, arranged to give any amount of light desired.

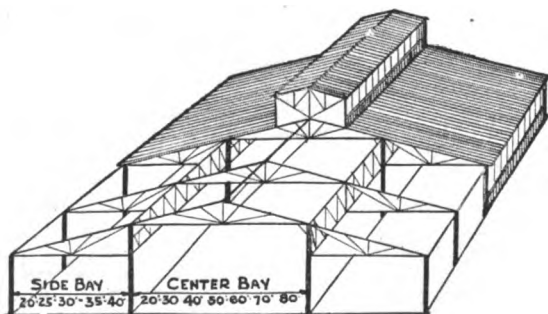
Doors—Sliding or swinging; three standard sizes, 3 ft. by 7 ft. 8 in., 5 ft. by 7 ft. 8 in., 9 ft. 6 in. by 10 ft. Special sizes to order.



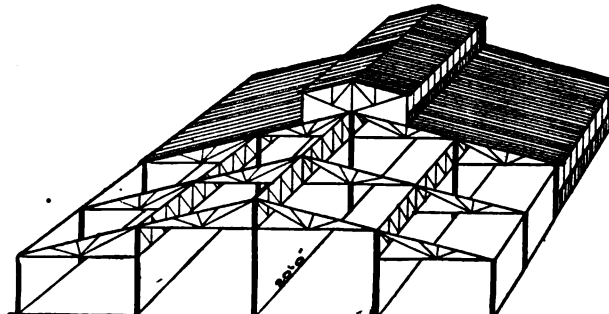
Type A



Type B

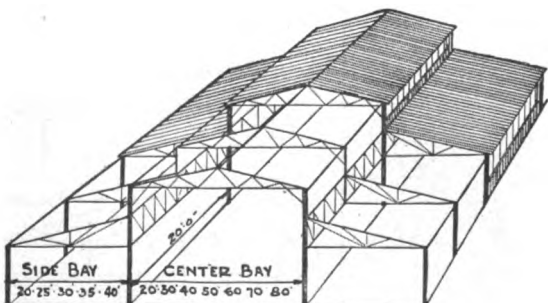


Type C

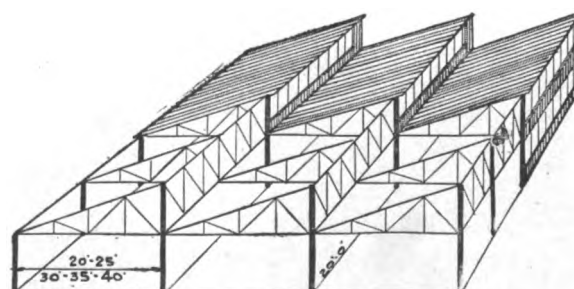


Type D

Width, from 80 to 160 ft., in multiples of 10 ft.



Type E



Type S

DIMENSION DRAWING—TYPES OF STANDARDIZED BANCROFT INDUSTRIAL STEEL BUILDINGS

Representative Purchasers of Bancroft Steel Buildings.

Kellogg Products Co., (4) Buenos Aires, Argentina
 Buffalo Bolt Co., North Tonawanda, N. Y.
 South Penn Oil Co., Bradford, Pa.
 General Electric Co., (4) Schenectady, N. Y.
 U. S. Light & Heat Corporation, (2) Niagara Falls, N. Y.
 H. H. Franklin Co., Syracuse, N. Y.
 Willys-Morrow Co., Elmira, N. Y.
 Welch Grape Juice Co., Westfield, N. Y.
 International Harvester Co., Auburn, N. Y.
 Globe Shipbuilding & Dry Dock Co., (4) Baltimore, Md.
 Standard Guano Co., Baltimore, Md.

Carpenter Steel Co., Reading, Pa.
 Joseph Bancroft & Sons, Wilmington, Del.
 Hooker Electrochemical Co., Niagara Falls, N. Y.
 Henry Disston & Son, (2) Philadelphia, Pa.
 Baltimore & Ohio R. R., Louisville, Ky.
 Semet-Solvay Co., (2) Syracuse, N. Y.
 Oneida Community, Ltd., (2) Oneida, N. Y.
 Buffalo Steel Car Co., Buffalo, N. Y.
 American Plate Glass Co., Kane, Pa.
 Buffalo Foundry & Machine Co., Buffalo, N. Y.
 Niagara Electrochemical Co., Niagara Falls, N. Y.
 American Brass Co., (2) Buffalo, N. Y.
 United Fruit Co., (7) New York, N. Y.



TYPE A BANCROFT CLEAR SPAN BUILDING ERECTED AT NORTH TONAWANDA, N. Y., FOR AUTO WHEEL COASTER CO.
 80 ft. wide, 130 ft. long, 10 ft. high, with monitor 18 ft. wide



PLATE AND ANGLE SHOP, GLOBE SHIPBUILDING & DRY DOCK CO., BALTIMORE, MD.
 60 by 400 by 27 ft., note special height



TYPE A STANDARD BANCROFT BUILDING USED AS STOREHOUSE AT GLOBE SHIPBUILDING & DRY DOCK CO.
 60 by 150 by 10 ft. with continuous monitor 8 ft. 6 in. wide by 2 ft. 6 in. high

HAROLD K. FERGUSON, PRESIDENT

THE H. K. FERGUSON COMPANY

Designers and Builders of Standard and Special Factory Buildings

TELEPHONE:
ROSEDALE 68546523 Euclid Avenue
CLEVELAND, OHIONEW YORK, N. Y., 31 West 43rd Street—Telephone, Murray Hill 3073
CINCINNATI, OHIO, 318 First National Bank Building—Telephone, Main 2739

CHICAGO, ILL., 209 South La Salle Street—Telephone, Harrison 1785

ATLANTA, GA., 815 Austell Building—Telephone, Ivy 3813

BRANTFORD, ONT., CANADA, Temple Building—Telephone, Brantford 3000
RAILROAD DEPARTMENT: CLEVELAND OFFICE**Products.**FERGUSON STANDARD FACTORIES.
Factories complete with POWER PLANTS and EQUIPMENT.
FERGUSON MATERIAL SERVICE.**Services.**

THE H. K. FERGUSON COMPANY designs, builds and equips complete factories of standard or special design. Ferguson standard factory buildings are permanent, well lighted brick-and-steel structures erected in record time at moderate cost, because pre-fabricated steel and other materials are carried in stock or on order. The systematic methods perfected in standard construction operate to shorten the time and reduce the cost of special buildings.

Preliminary Work Free—Plans and data for Ferguson standard factories are ready and on file. If a special building is indicated, the Ferguson engineers will make estimates and preliminary sketch plans free, without obligation. These sketch plans will clearly indicate the adaptation of the building to the owner's requirements, and the best way of meeting special conditions.**Engineering Contract**—After preliminary suggestions are approved, the next step is a Ferguson engineering contract, under which THE H. K. FERGUSON COMPANY furnishes complete plans and specifications.**Competitive Bids**—Plans and specifications furnished under a Ferguson engineering contract can be used by the owner to secure competitive bids if desired.**Awarding the Job**—If the building contract is awarded THE H. K. FERGUSON COMPANY at a lump sum price, the builder absorbs the cost of drawings and specifications. If the building is awarded to THE H. K. FERGUSON COMPANY under some form of commission contract, or to another builder, or does not proceed at once, the owner pays the actual cost of engineers' and draftsmen's time and expenses, plus agreed percentages for overhead and profit.**Form of Contract**—It is usually desirable to build standard factory buildings under "The fixed-fee-limited cost" contract because it combines the advantages of lump sum and cost plus contracts without the disadvantages of either. Under this form, the owner's cost and the builder's fees are limited, while all savings are shared by owner and builder.

Any form of Ferguson contract may include a penalty for delay, providing it also includes a bonus for anticipation.

Ferguson Standard Factories.

Some of the types of Ferguson standard factory buildings are shown opposite. They embody the generally accepted features of modern industrial design, and



TRADE-MARK

represent the thought and suggestions of the engineers of many of the country's leading industrial plants as well as of the Ferguson organization.

They offer the great advantages of quick construction at moderate cost, because, being thoroughly standardized, pre-fabricated steel and other materials can be kept in stock or on order, ready for immediate shipment; yet are so flexible that they can be expanded laterally or lengthwise, or arranged in many different combinations to the owner's individual requirements.

Factories Complete with Power Plants and Equipment.

THE H. K. FERGUSON COMPANY is organized and equipped to handle any industrial project from start to finish; virtually all construction and equipment work, whether of standard or special design, being handled by THE H. K. FERGUSON COMPANY's own men. There is very little subletting. Thus the owner can hold one organization responsible for his results.

Ferguson Material Service.

The particular goal of Ferguson ready-to-erect service is to enable prospective buyers of buildings of limited areas anywhere or larger buildings outside of our construction zone and abroad, to enjoy all the advantages of Ferguson designs and Ferguson economy of materials.

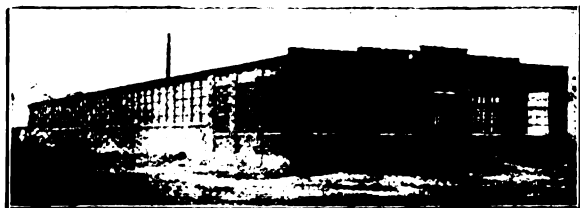
Ferguson ready-to-erect material service provides for the shipment of the following items:

Complete Blueprints—Including erection details and a list of all materials required for the complete building.**Structural Steel**—Including glass, putty, glazing, clips, and sash operating device when required in monitor, roofing composition, corrugated iron or asbestos protected metal.**Roof Lumber**—Including sheathing and purlins.**Doors and Hardware**—The customer purchases the following items locally to save freight charges: material for foundations and floors, brick, roofing and roof lumber, if so desired.**Canadian Service.**

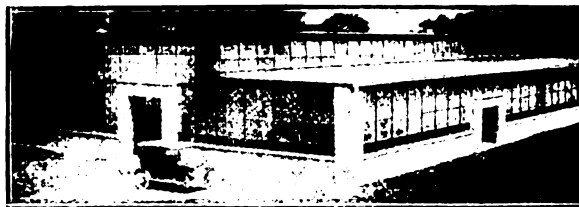
The Canadian headquarters are at Brantford, and are maintained with the double purpose of serving Canadian industry and manufacturers planning the erection of Canadian plants.

Complete Catalogue.

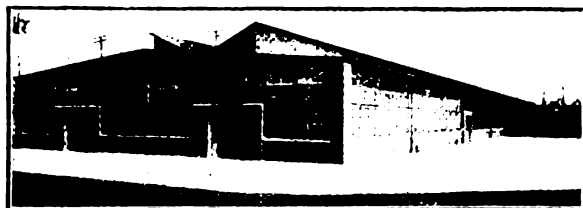
"Better Buildings for Bigger Business" gives full details and illustrations of standard and special buildings as designed and constructed for leader-corporations of the nation.



FERGUSON STANDARD NO. 1 BUILDING



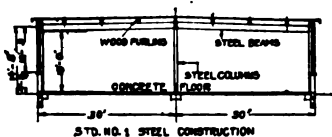
FERGUSON STANDARD NO. 2 BUILDING



FERGUSON STANDARD NO. 3 BUILDING



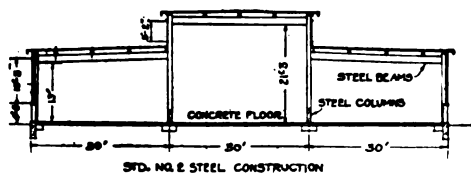
FERGUSON STANDARD NO. 4 BUILDING



FERGUSON STANDARD NO. 1 BUILDING

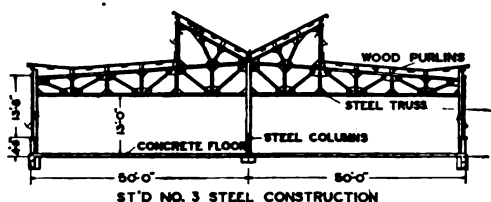
Admirably adapted to use as a warehouse, or for light machine shop work. Amply lighted by wall sash. Construction allows future extension at any time. Can be erected quickly from material shipped from stock.

Width, 60 ft.; length, any multiple of 20 ft.



FERGUSON STANDARD NO. 2 BUILDING

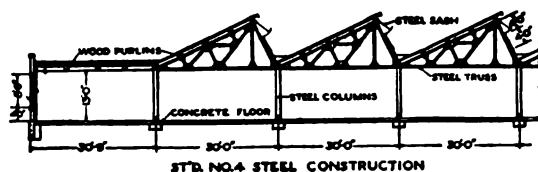
90 ft. wide, with monitor to provide adequate lighting and ventilation. Steel columns and roof beams. Provision can be made for crane-way. Best adapted to machine shop or light foundry use.



FERGUSON STANDARD NO. 3 BUILDING

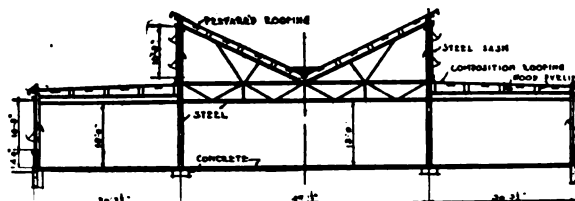
Adaptable to almost any industrial use where a maximum of ventilation, daylight and usable floor space is required in a permanent building. Superior design includes "V" type monitor. Only 1 column to every 2000 sq. ft. of floor space.

Any width in multiples of 50-ft. aisles. Any length in multiples of 20-ft. bays.



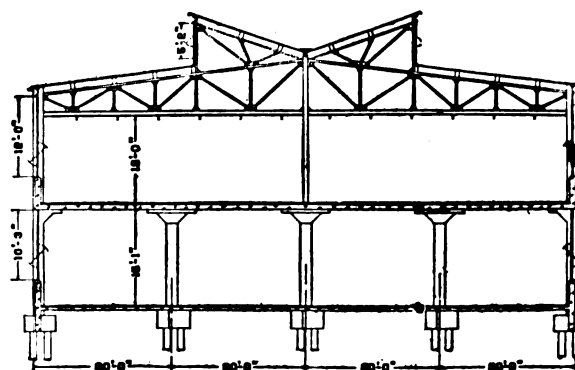
FERGUSON STANDARD NO. 4 BUILDING

A sawtooth building, providing even daylight over entire floor area. Construction readily lends itself to extension in either direction. Trusses will hold 3-ton load at center. Provision for monorail cranes, if desired. 30-ft. aisles; 20-ft. bays.



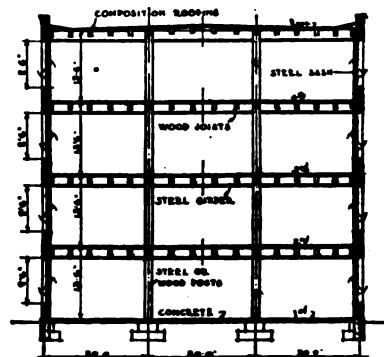
FERGUSON STANDARD NO. 5 BUILDING

May be used for foundry, or building requiring an unusual amount of light and ventilation. Monitor sash and roof slope are designed to expel smoke and gas without interference from cross-drafts. Construction provides for easy installation of crane-ways.



FERGUSON STANDARD NO. 6 BUILDING

Same construction as Standard No. 3 but is 80 ft. wide. Can be used as second story over reinforced concrete building with 20-ft. spacing of columns in each direction.



FERGUSON STANDARD NO. 8 BUILDING

A multi-story factory building with girders of steel, joists of wood or steel. One-third of the sash in the side walls are ventilated at the top to remove dead air at the ceiling line, while other units are standard.

THE HYDRAULIC STEELCRAFT CO.

OF THE HYDRAULIC STEEL COMPANY

Standardized Steel Buildings, Steel Forms and Column Guards

TELEPHONE:
BROADWAY 2480

CLEVELAND, OHIO

CABLE ADDRESS:
"HYDRAULIC"

BRANCH OFFICES

NEW YORK, N. Y., Singer Building
DETROIT, MICH., Book Building

CHICAGO, ILL., Fisher Building
SAN FRANCISCO, CAL., Hearst Building

Products.

STANDARDIZED STEEL BUILDINGS.

Also manufacturers of Wall, Column, Sewer, Tunnel, House, Arch Pan, and Flat Slab Forms; Column Guards; Special Cold Rolled Angles and Channels.



TRADE-MARK

ing with the use of the building. The size and type may be altered and doors and windows inserted or removed.

Hydraulic Standardized Steel Buildings.

Made in many types and for a wide application of uses: warehouses, factories, machineshops, foundries, garages, bunk houses, shop restaurants, pump houses, oil refineries, transformer sheds, and storage buildings.

Fireproof.

Since the buildings are constructed entirely of steel, they are fireproof and tend to lower insurance rates of surrounding property.

Design.

Hydraulic Steel buildings are so designed as to provide strong, substantial structures that can be quickly erected. The buildings are designed according to good engineering practice.

Weatherproof.

An important feature is the absolute weathertightness of all exposed joints. The roof and wall panels are so formed that all joints and connections make a sure weather stop.

Construction.

Hydraulic Steel buildings are made of sturdy steel sections. The roof trusses are built up of open hearth, cold rolled shapes with shop riveted joints. The roof and walls are formed of painted copper-bearing, or galvanized steel sheets pressed in our shops to provide maximum strength and efficient weathertight joints. Bolts are used for all connections between trusses, columns, and bracing.

Appearance.

These buildings have a very attractive appearance, due to correct design and skillful construction. The walls are uniformly paneled and all parts of the building fit perfectly, so that the structure presents a finished and pleasing appearance.

Types.

There are sixteen different types as shown on these pages. These types, or combinations of them meet the needs of practically all industries. When an extra large capacity is desired, two or more buildings may be combined.

Delivery.

Prompt shipments can be made, because Hydraulic Steel buildings are standardized.

Sizes.

The wall plates, roof sheets and trusses have been so standardized that either the length or width of the building may be any multiple of 2½ ft. The height of the building at the eaves may be 10 ft. or 10 ft. plus any multiple of 5 ft. Other heights may be obtained by varying the foundation height.

Erection.

Standardization makes erection easy. A building can be quickly erected by a few men with the assistance of complete erection drawings furnished with each building. All parts of each building are numbered to correspond with the drawings. Complete information is also given on how to put up the building. Or we will handle the erection on contract.

Flexible.

Due to complete standardization, sections of a building may be added after erection without interfer-

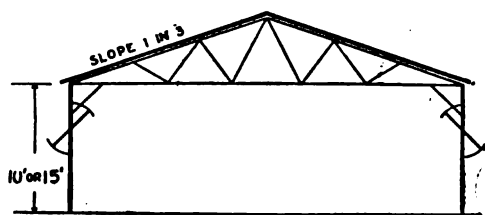
Service.

Hydraulic maintains an engineering department consisting of a staff of trained engineers. This department cooperates closely with engineers, assisting them in handling their building problems most satisfactorily and economically.

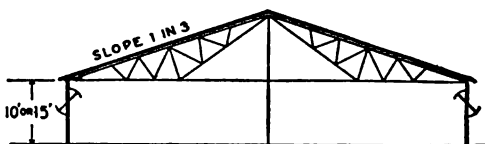
Other Buildings and Parts.

Hydraulic also furnishes lower priced buildings in which corrugated roof and wall sheets are used in place of our standard sheets.

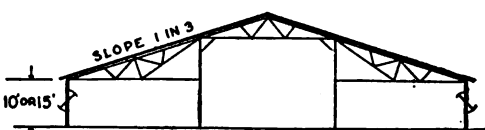
Hydraulic also supplies trusses only, or complete framework without roof or wall covering.



· TYPE A
10' TO 60' WIDE — IN MULTIPLES OF 2½ FT.



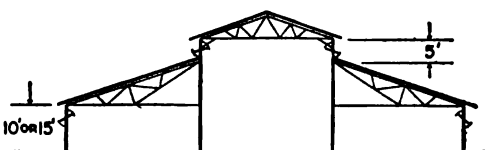
TYPE B
30' TO 60' WIDE — IN MULTIPLES OF 2½ FT.



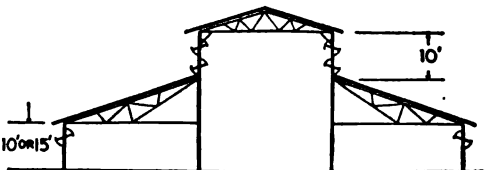
TYPE C
40' TO 90' WIDE — IN MULTIPLES OF 2½ FT.



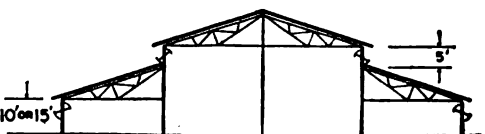
TYPE D
60' TO 120' WIDE — IN MULTIPLES OF 2½ FT.



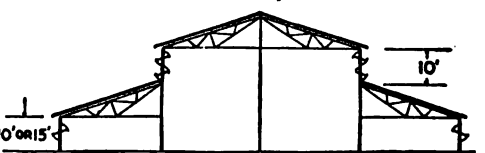
TYPE E
40' TO 90' WIDE — IN MULTIPLES OF 2½ FT.



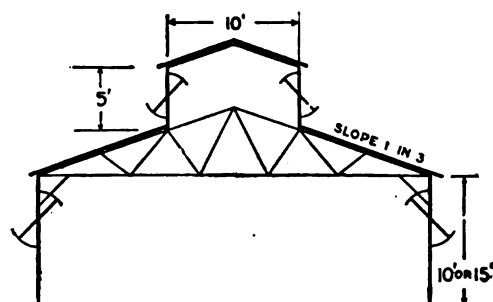
TYPE F
40' TO 90' WIDE — IN MULTIPLES OF 2½ FT.



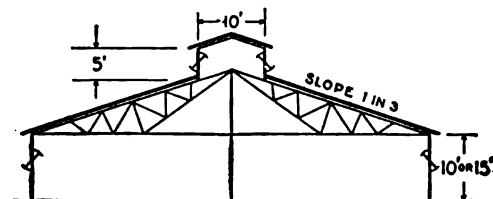
TYPE G
60' TO 120' WIDE — IN MULTIPLES OF 2½ FT.



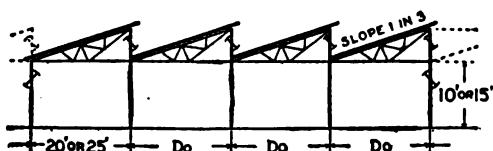
TYPE H
60' TO 120' WIDE — IN MULTIPLES OF 2½ FT.



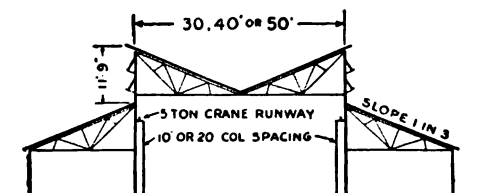
TYPE I
20' TO 60' WIDE — IN MULTIPLES OF 2½ FT.



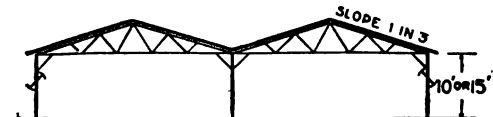
TYPE J
30' TO 60' WIDE — IN MULTIPLES OF 2½ FT.



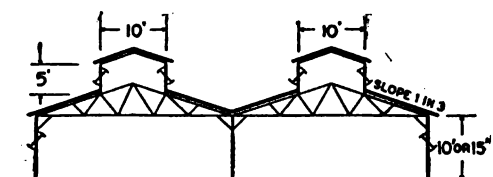
TYPE K



TYPE L
60' TO 110' WIDE — IN MULTIPLES OF 10 FT.



TYPE M
20' TO 120' WIDE — IN MULTIPLES OF 5 FT.



TYPE N
40' TO 120' WIDE — IN MULTIPLES OF 5 FT.



TYPE O
60' TO 120' WIDE — IN MULTIPLES OF 5 FT.



TYPE P
60' TO 180' WIDE — IN MULTIPLES OF 5 FT.

TYPES OF STANDARDIZED STEEL BUILDINGS

ROBERT GRANT, PRESIDENT

A. E. ROBERTS, VICE-PRESIDENT

JOHN L. WATTS, SECRETARY AND TREASURER

MILLIKEN BROTHERS MFG. CO., INC.

Manufacturer of Steel Buildings and Towers

TELEPHONE:
BARCLAY 8860

Woolworth Building
NEW YORK, N. Y.

CABLE ADDRESS:
"MILLIKBROS, NEW YORK"

DOMESTIC REPRESENTATIVES

CHICAGO, ILL., GAGEN SALES CORP., Majestic Building
DETROIT, MICH., BRAYTON ENGINEERING CO., 907 Kresge Building
RALEIGH, N. C., STRUCTURAL SUPPLY CO., INC., 118 West Martin Street
CHARLOTTE, N. C., AMERICAN HARDWARE & EQUIPMENT CO.
CHATTANOOGA, TENN., O. B. STAUFFER, Volunteer Life Building
PHILADELPHIA, PA., A. C. WARNER CO., 1212 Arch Street

ATLANTA, GA., BEAULIEU & APPLEWHITE, 1317 Third National Bank Building
HOUSTON, TEX., DAVID M. DULLER, 503 Houston Land & Trust Co., Building
DALLAS, TEX., MOORE, SHOTTS & WILSON CO., 1504 Commerce Street
TULSA, OKLA., INDUSTRIAL CONSTRUCTION CO., 410 Central National Bank Building
SAN FRANCISCO, CAL., M. W. JOY CO., Pacific Building

FOREIGN OFFICES

LONDON, ENGLAND

HAVANA, CUBA

HONG KONG, CHINA

SHANGHAI, CHINA

BATAVIA (JAVA)

Products.

"MILLIKEN BUILDINGS," Standardized Skeleton Construction; STEEL TRANSMISSION TOWERS and STEEL RADIO TOWERS, painted or galvanized.

Experience.

Since 1857 this company has been actively engaged in the manufacture of steel buildings and towers, and has sold both the Domestic and Export trade in these lines.

"Milliken Buildings" (Patented).

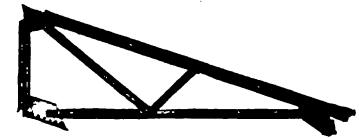
"Milliken Buildings" are constructed with a strong framework of structural steel on the standardized truss unit system. This system of construction consists of unit members, many of which are alike and interchangeable. There are numerous materials that can be used for enclosing the steel skeleton frame, such as: corrugated asbestos protected metal, corrugated asbestos cement sheets, wood sheathing covered with composition,

slate, tin and other materials.

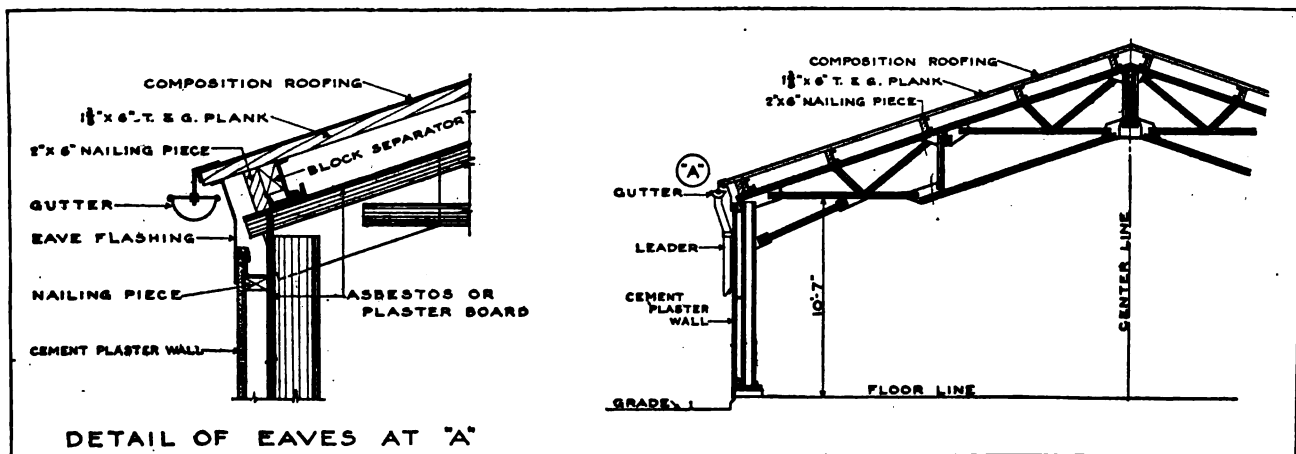
The sides and ends of the buildings can be enclosed with metal lath and cement stucco, cement blocks, hollow tile, brick, etc. In certain localities heavy gage corrugated steel forms an economical and easily applied covering.

The maximum weight of any one piece entering into this skeleton structure is 200 lbs. and can be easily handled by two men. There are no riveted connections, all connections being bolted.

These buildings can be erected in any locality with a few simple tools and unskilled labor. They are either permanent or portable; in other words, when once erected they will stand for a lifetime, or if the purchaser desires to remove them at any time, he can do so and re-erect with a 100% salvage on his material.



TYPICAL UNIT OF A "MILLIKEN BUILDING"



TYPICAL CONSTRUCTION DETAILS, "MILLIKEN BUILDINGS"

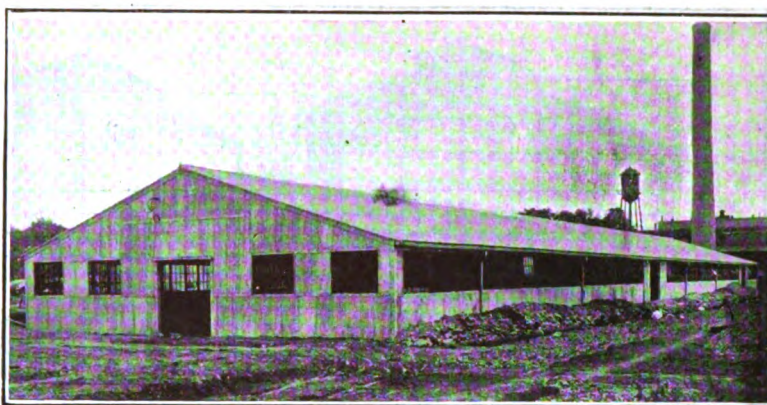
Owing to the light weight of the units, they can easily be transported to the most remote localities, by truck, small boats, or animal back.

These units can be arranged to construct a number of different type buildings, such as shown in the illustrations. These buildings vary in width from 20 to 60 ft. in the clear span and run in any length multiples of 20 ft.

All buildings are one-story in height.

Shipping Facilities—A large stock of material is always carried on hand awaiting shipping orders and the material packs in a small cargo space.

Shipment of the complete building can be had in from 2 to 4 weeks. Foundation bolts and foundation plans shipped in 24 hours after receipt of order. Complete erection details are furnished together with instructions as to the best method of erection.



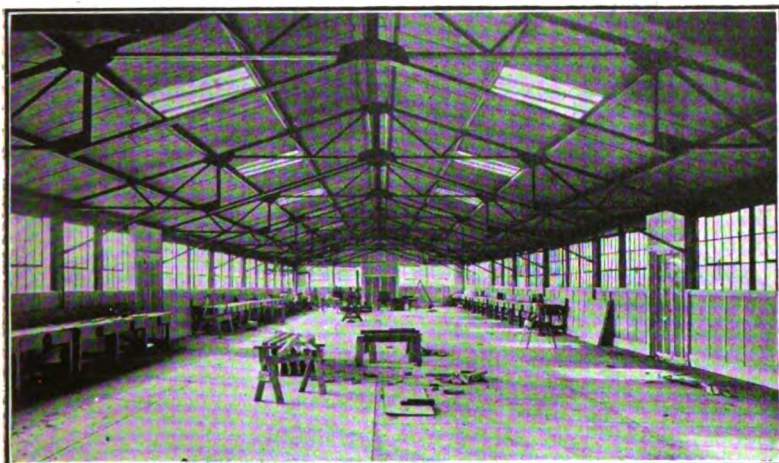
TABLEWARE SHIPPING BUILDING—ONEIDA COMMUNITY, LTD., SHERRILL, N. Y.

skylights and amplifies the illustrations shown on this and the adjoining pages.

Our catalogue, "Choice of a Thousand Buildings," sent free on request.

References—The following firms have found "Milliken Buildings" and Milliken Towers particularly desirable for light manufacturing plants, warehouses, machineshops, storage buildings, service garages; and power transmission and radio work.

- Oneida Community, Ltd., Sherrill, N. Y.
- Prest-O-Lite Co., Indianapolis, Ind.
- United Drug Co., St. Louis, Mo.
- Power Manufacturing Co., Marion, Ohio
- Kearns Gorsuch Bottle Co., Zanesville, Ohio
- Frost Gear & Forge Co., Jackson, Mich.
- Lehigh Machine Co., Lehigh, Pa.
- Matthews Bros. Mfg. Co., Milwaukee, Wis.
- I. B. Kleinert Rubber Co., Long Island City, N. Y.
- Shell Co. of California
- W. R. Grace & Co., New York, N. Y.
- International Products Co., New York, N. Y.
- Caribbean Petroleum Co., Philadelphia, Pa.
- Cuban Sugar Mills, Havana, Cuba
- Lombard & Company, Havana, Cuba
- Guiana Development Company, New York, N. Y.
- John P. Felt, Boston, Mass.
- Eastern Manufacturing Co., Bangor, Me.
- International & Great Northern R. R., Houston, Tex.
- Consumers Cotton Oil Co., Brownwood, Tex.
- Western Electric Company, New York, N. Y.
- Independent Wireless Corporation, New York, N. Y.
- Southern Power Co., Charlotte, N. C.
- Northern New York Utilities, Watertown, N. Y.
- Turners Falls Power & Electric Co., Turners Falls, N. Y.
- Morkfos Solbergfos Transmission Line, Christiania, Norway
- Dorada Railway, U. S. of Colombia
- Bandoeng Government, Java
- Burma Mines, Ltd., Rangoon, Burma
- Government of the Philippine Islands, Manila, P. I.



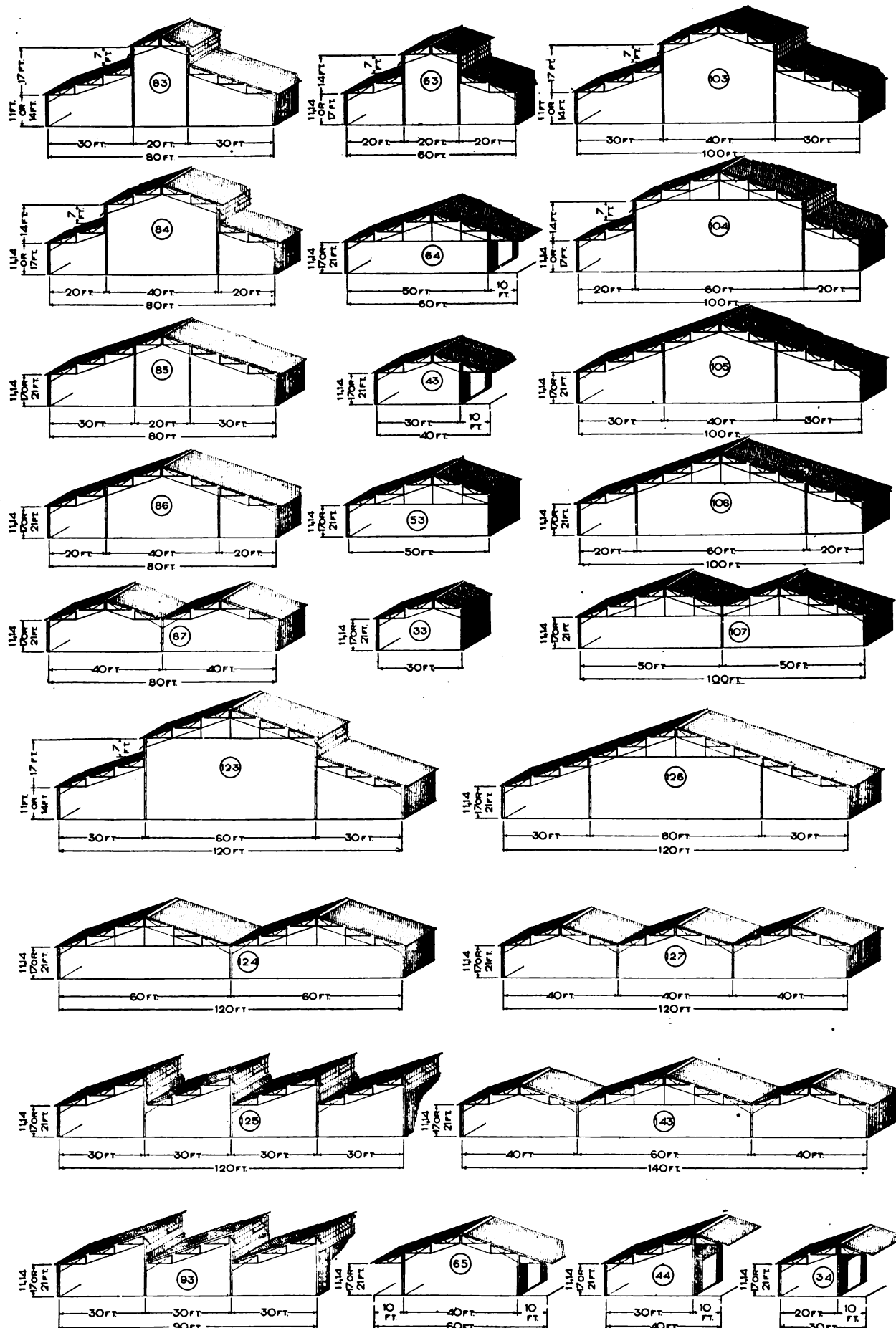
MACHINESHOP—LEHIGH MACHINE CO., LEHIGHTON, PA

Estimates—MILLIKEN BROTHERS MFG. CO., INC., would be pleased to quote on the structural steel frame for any special specifications that the units will fit into. They also will give a complete quotation for any arrangement of doors, windows, ventilators or skylights. They also will quote on furnishing corrugated steel covering with all flashing and trim. All quotations are made f.o.b. New York, and the material is sold on that basis, no erection being undertaken by this company.

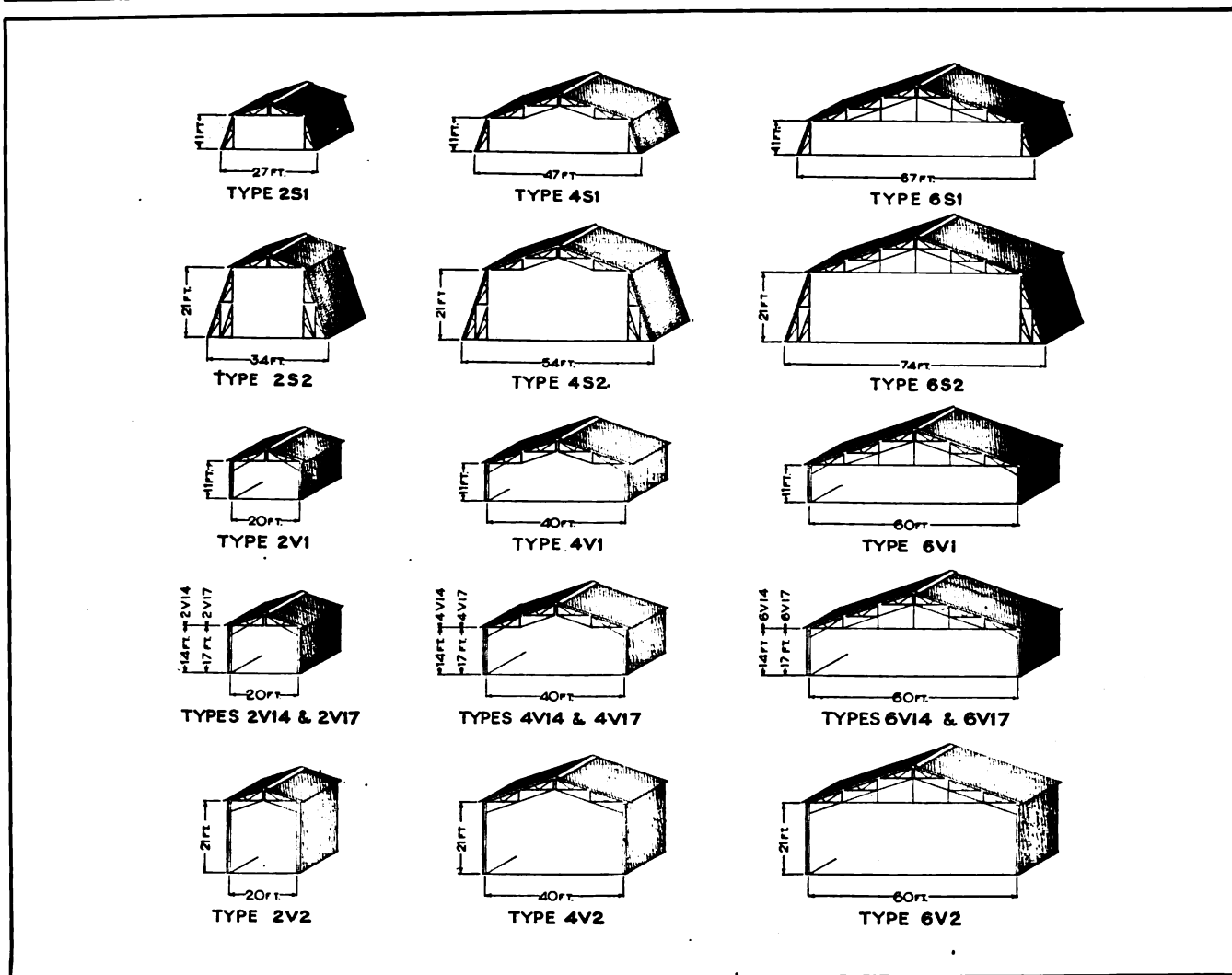
Catalogue—Our illustrated catalogue shows many different arrangements of standardized doors, sash and



WAREHOUSE BUILDINGS, HOBOKEN, N. J.



TYPES OF "MILLIKEN BUILDINGS"



TYPES OF "MILLIKEN BUILDINGS"

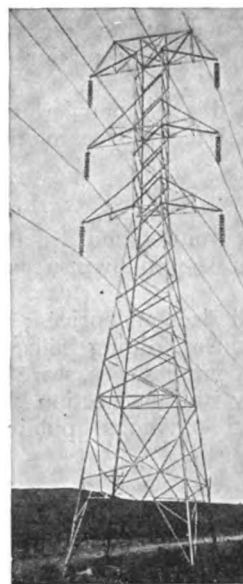
Steel Transmission Towers.

"Milliken" steel transmission towers are built of open hearth structural steel and have high resiliency and maximum strength. They are constructed in types to meet any transmission line condition, and are both for high and low voltage service: Approximately 40% of all transmission towers in the United States are "Milliken" manufacture.

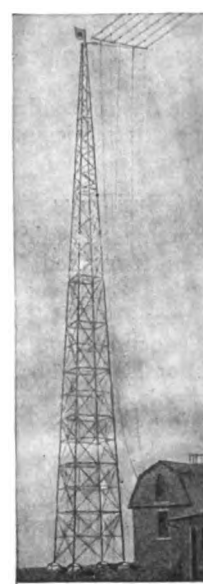
Radio Towers.

"Milliken" standard steel self-supporting radio towers are built of structural steel angle bars, and provide ample rigidity against wind pressure and aerial pull. Made in 2 types, one running in heights from 66 to 165 ft.; and the other in heights from 200 to 300 ft.

The towers of the first group are sold galvanized only, while those of the second group, which are heavier construction, may be purchased either galvanized or painted. They are in general use throughout the United States and abroad.



TRANSMISSION TOWER



RADIO TOWER

THE ALADDIN COMPANY

Manufacturers of Standardized Houses

GENERAL OFFICES AND MILLS

BAY CITY, MICH.

WILMINGTON, N. C.

HATTIESBURG, MISS.

PORTLAND, ORE.

Product.

ALADDIN READI-CUT HOUSES.

Description.

Aladdin houses or the Aladdin Read-cut system of construction are by no means new or impracticable. This method of erecting houses has been in successful operation for the last 15 years.

The two basic principles of the Aladdin system of construction are standardization of parts and substitution of machine for hand labor.

An Aladdin house is identical in construction, designs and sizes of material with the very highest type of frame construction erected anywhere. Only the method differs—method of preparing the materials.

Every piece of material is cut to fit by machinery in the mill, marked and numbered, ready for erection and nailing in place when it reaches its job. This permits standardization of parts, elimination of the usual 18% waste and the substitution of machine for hand labor.

As regularly listed and priced in catalogue, an Aladdin house includes all lumber, millwork, hardware, plaster, paints, nails, etc., above the foundation.

Erection of Houses.

Erection is quick and economical. To ship the complete material in a single car for 1, 2 or 3 houses, and to have it all on the ground at the same time is a tremendous advantage. It eliminates all delay incident to purchase of the many items entering the construction and it insures the quickest possible consummation of the entire project.

Back of each shipment is this company's qualified agreement of sufficient material for the completion of each house.

Types of Buildings.

Standard Aladdin designs from standard materials have been furnished for all of the following types of buildings:

Houses, 1- and 2-story, all sizes and prices; barns, garages, dormitories, guard houses, dining halls, bath-houses, hotels, office buildings, commissaries, store buildings, schools, churches, railway stations, section houses, flag stations, dance halls and pavilions, public rest rooms.



TRADE-MARK

References.

Some of the corporations having purchased and erected Aladdin Read-cut homes in quantities up to 500:

A. J. Julliard & Co.	Interstate Water Co.
Acme Cement & Stone Co.	Ironequit Coal & Supply Co.
Aetna Chemical Co.	Kelleys Creek Colliery Co.
Aetna Explosives Co.	Kent Mfg. Co.
Alan Wood, Iron & Steel Co.	Littlefield Realty Co.
American Zinc & Chemical Co.	Lukens Iron & Steel Co.
Atlantic Elevator Co.	La Belle Coke Co.
Atlantic Mills, Inc.	Louisville Coal & Coke Co.
Atlas Powder Co.	Lowe-Moor Iron Co.
Bristol Brass Co.	Meyers-Crump Stone Co.
Barnes King Development Co.	Monarch Coal Co.
Bay City Homebuilders Co.	M. A. Hanna Mining Co.
Blue Mountain Mining Co.	Manhasset Mfg. Co.
Bridgeport Homes Co.	Manufacturers Gas Co.
British Government	Mark Mfg. Co.
Buchanan River Coal Co.	Moshannon Collieries Co.
Calumet and Hecla Mining Co.	Mt. Vernon Ladies' Association of the Union
Casparis Stone Co.	National Acme Mfg. Co.
Climax Coal Co.	National Vaccine & Antitoxin Institute
Coale Co., Wm. L.	Oneida Community Co.
Consolidation Coal Co.	Pearl Ridge Realty Co.
Cuyahoga Shale Brick Co.	Potter Gas Co.
Central Land Co.	Potter Coal & Coke Co.
Cochran Coal Co.	Postal Hotel Co.
Coghlin & Gray	Pennsylvania Coal & Coke Corp.
Corry Development Co.	Pennsylvania Railroad Co.
Cudahy Refining Co.	Pere Marquette Railroad Co.
Dominion Coal Co.	Pittsburgh Plate Glass Co.
Dow Chemical Co.	Rich Creek Coal Co.
Ellsworth Colliers Co.	Robinson Construction Co.
Federal Fruit & Cold Storage Co.	Rattlesnake Jack Mine
First National Bank of San Jacinto	Solvay Process Co.
Ford Co., J. B.	State of Michigan
Forest Hill Elevator Co.	Sheboygan Valley Land & Lime Co.
Frick & Son	Standard Oil Co.
Goodwin - Gallagher Sand & Gravel Corp.	Standard Silk Co.
G G G Metal Stamping Co.	Tide Water Pipe Co., Ltd.
Wm. Galloway Co.	Thompson Connellsville Coke Co.
General Refractories Co.	Tropical Plantation Co.
Golden Fairview Brick Clay Co.	Tonapah Placers Co.
Gratiot Coal & Lumber Co.	Union Powder Corp.
Haverhill Cement Stone Co.	United States Government
Hazelton Oil Co.	United States Aluminum Co.
Helmar Coal Mining Co.	Valley Mould & Iron Co.
H. E. Bell & W. G. Zoller	Warren Axe & Tool Co.
H. L. Barber & Co.	Western New York Water Co.
Hercules Powder Co.	Willis Coal & Mining Co.
Investment Realty Co.	Wisconsin Zinc Co.
International Powder Co.	Wyoming Sand & Stone Co.



ALADDIN HOUSES

Over 300 were erected by this company in 6 months for the Dupont Powder Co.



A GROUP OF ALADDIN HOUSES RECENTLY ERECTED FOR FORD COLLIERIES CO. IN PENNSYLVANIA

SWEET'S CATALOGUE

THE McCLURE COMPANY

Manufacturers of Standardized Houses

SAGINAW, MICH.

PLANTS: SAGINAW, MICH. and CAIRO, ILL.

Product.

McCLURE HOMES, commonly known as National Homes, standard construction. Complete material furnished cut-to-fit or un-cut.

McClure Homes Cut-to-fit.

From our carefully planned designs, we cut-to-fit a large part of the lumber. By means of modern machinery, we have applied improved, scientific ideas in the manufacture of materials that go into these houses. Many hours of labor are saved in erecting and finishing McClure cut-to-fit homes.

The method of building known as fabricating before erection, by which each piece is cut, shaped, and perfectly fitted before being transported to the building site, is as old as the construction of Solomon's temple. Modern steel structures, including bridges, factories, skyscrapers, etc., are almost invariably cut, shaped, punched, and fitted at the mills, and delivered at the job ready for assembly. This procedure came into special prominence during the war, when it was found that fabricated munition plants and fabricated ships reduced the labor, time, and materials necessary for erection to a minimum.

Industries Favor Cut-to-fit Houses.

This experience with fabricated construction has made American industry especially favorable towards the cut-to-fit house. Realizing that this method eliminates the waste lumber and labor inevitable when houses are hand-cut on the building site, corporations which require additional housing facilities now build cut-to-fit homes.

The greater part of the production of McClure Homes is taken by corporations, in quantities of varied designs. They appreciate the advantage of building houses in the same economical way that they build factories, and of buying them complete at definite prices.

They are accurately cut from the highest grade of Southern and Pacific Coast lumber, and are furnished complete for erection down to the least detail, including window lights, builders' hardware, lath and grounds, paints, stains, varnishes, and putty. McClure Homes are not portable; they are standard houses of high quality.

McClure Homes Un-cut.

We shall be very glad to quote prices on bills of material submitted, with the understanding that we furnish the material un-cut just as it is ordinarily purchased. Our large purchasing power of house material makes it possible for us to give more than ordinary value.

Centrally Located Plants.

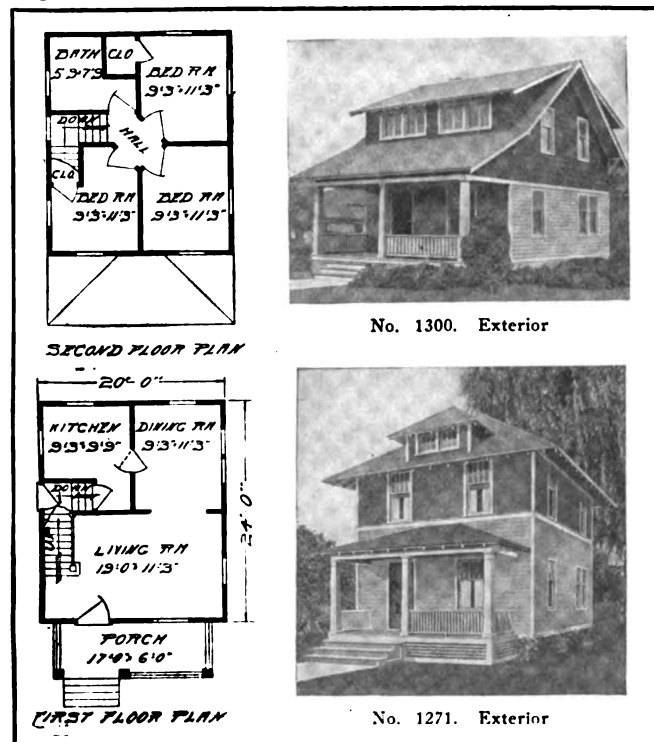
The location of our plants at Cairo, Ill. and Saginaw, Mich., enables us to obtain materials readily and to give prompt service to the great industrial section of the country.

Service to Corporations.

In addition to the three styles illustrated on this page, we have hundreds of other designs to select from, including corporation houses of two rooms and upwards. Our catalogue with specifications and further information is furnished on request.

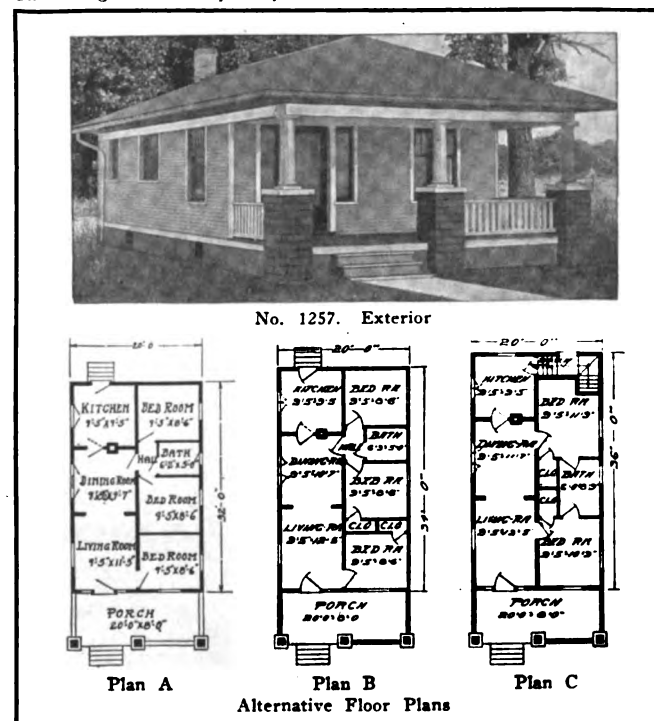
We can furnish housing projects complete including construction.

Consultation with corporations on their housing requirements is invited.



NOS. 1271 AND 1300. TWO-STORY HOUSES BUILT ON SQUARE, TRIM LINES

The plans for both houses are the same, giving more floor and wall space than is usually available in a house of these dimensions. There is a bath in each house, and six light rooms, each ventilated on two sides. The living room is especially commodious.



NO. 1257. A SUBSTANTIAL ONE-STORY BUNGALOW. Three alternative floor plans are shown for this design, all of them equally compact and convenient. The width in each case is only 20 ft., allowing plenty of air and light from both sides of the lot.

TOGAN-STILES

Factory Built Buildings

OFFICES AND FACTORY
GRAND RAPIDS, MICH.

Products.

TOGAN FACTORY BUILT BUILDINGS, which include:

Togan Factory Built Homes
Togan Factory Built Cottages
Togan Factory Built Garages
Togan Factory Built Schools
Togan Factory Built Churches
Togan Factory Built Public Buildings
Togan Factory Built Industrial Housings, Barracks,
Bunkhouses, Offices, Warehouses.

Construction Specifications.

Sills—2 by 8-in. No. 1 yellow pine.

Girders—6 by 6-in. No. 1 yellow pine, 9-ft. maximum spans.

Joists—2 by 8-in. No. 1 yellow pine, 17½ in. on centers with 2 by 2-in. bridging.

Floor Panels—Floor panels are made up in sections 3 ft. wide and from 3 to 18 ft long. Panels are double thickness with asphalt coated paper between. Subfloor ¾-in. hemlock. Finish floor ¾ by 3¾-in. clear yellow pine flooring. Panels machine sanded at factory, underside painted and finish floor oiled.

Wall Panels—Walls are made up in sections 3 by 8 ft. by 10 in., assembled complete with studding and siding. Standard siding is B and better Togan novelty siding, tongue and groove, ¾ in. thick at butt, ½ in. at top, ¾ in. face. In double wall construction, an interior panel made of dressed and matched boards fits into the inside of the wall panels, leaving a dead air space between two inner and outer walls. In addition the inside of the outer wall is lined with heavy building paper.

Windows—Windows are made in double hung and casement styles. Window sections have frames built in complete with sash hung, glazed and fitted. Complete



FIVE-ROOM BUNGALOW MODEL 602
Includes living room, dining room, kitchen, 2 bedrooms and bath

with all hardware, including locks and lifts; casements hung on butts at factory with top and bottom casement fasteners; also fastener on meeting stiles.

Doors—Doors are furnished in style to harmonize with design of building. All doors are fitted and hung at factory; all hardware, including locks and keys, is furnished.

Roof—Rafters are 3 by 6-in. No. 1 yellow pine with tie beams on each pair of rafters. Verge boards 2 by 8 in. Verges and exposed ends of rafter primed at factory. Roof panels are of 1 by 6-in. boards, average size 3 ft. 6 in. by 6 ft. Cornice panels are 1 by 4-in. beaded ceiling; ends of panels cleated with oak strips. Cornice panels are oiled at factory. Shingles are individual mineral surfaced shingles, or 3-ply roll roofing.

Interiors—Interior partitions are made up in sections 3 by 8 ft. by 10 in. In double wall construction, the walls and ceiling are covered with ¾-in. thick "Bestwall" plaster board, nailed on at the job. Door and window casings, apron, stool, base, shoe, closet shelves are all furnished.



WORKINGMEN'S HOMES—MODERATE PRICED, FOUR-ROOM COTTAGE TYPES



MODEL 406—A FAVORITE DESIGN
Like all Togan buildings, complete, even painted

Hardware—Hardware consists of all bolts, lag screws, nails, window and door hardware necessary to complete the building. All finish hardware is in brush brass finish.

Paint—The buildings are painted 1 coat of white at the factory, and sufficient of the best grade of white mixed paint securely boxed is furnished for the second coat.

Blue Prints—Complete erection blue prints are furnished for each model, showing foundation plan, sill plan, floor plan, plate plan, roof framing plan, and elevations. All the parts are stenciled and the location of every piece is shown on the drawings.

Togan Factory Built Buildings.

Construction, all wood; planned and designed by registered architects, construction will pass all building code requirements.

All Togan buildings are made up in completed units; include all rough and finish hardware, roofing material; exteriors are painted 1 coat at factory with paint for second coat furnished. Floors, walls and roofs are made in sections; all framing material like joists, rafters, trusses, domes, accurately cut and fitted ready to set in place and bolt. All bolt-holes are bored at the factory by boring machines, insuring an accurate fit.

Made in standard single or double wall construction, with floors single or double according to requirements.



BUNKHOUSE
Size 24 by 36 ft. Contains six rooms, each 12 by 12 ft.



MODEL 506—CHARMING COTTAGE TYPE
Four rooms and bath conveniently arranged. Erection time, 4 men, 1 week

Service.

All standard parts and materials are carried in stock ready for immediate shipments. Houses, five and six rooms, require a car each; lunch houses load two to three per car. Estimates of special plans and layouts utilizing standard stock sections, will be made up and furnished on request.

Erection Superintendent furnished, with entire crew if necessary to erect buildings. Complete specifications and blue prints for all masonry, heating, lighting and plumbing will be included.



WORKMAN'S BARRACKS AND MESS HALL



BUNKHOUSES UNDER CONSTRUCTION
Average erection time three hours each

HAGGARD & MARCUSSON COMPANY

Manufacturers of Steel Bunks and Berths

1121 West 37th Street

CHICAGO, ILL.

Products.

"TIGER" BOLTLESS STEEL BUNKS; CANTONMENT or HOSPITAL COTS; HOSPITAL RECLINING CHAIRS.

Also manufacturers of "Tiger" Steel Ship Berths.

"Tiger" Boltless Steel Bunks.

Adaptability—These indestructible bunks meet every requirement for lumber camps, construction camps, etc., and are designed especially for use in bunk-houses and barracks, hospitals, and sanitariums.

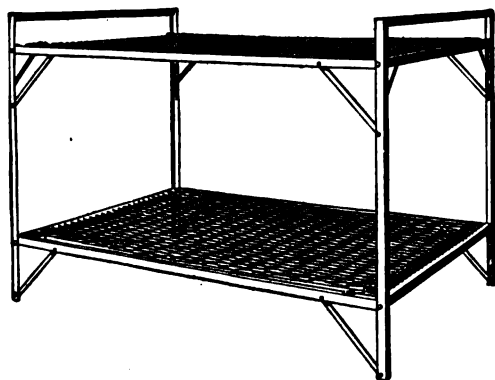
Locking Device—These bunks are equipped with a locking device, which is exclusively used in the "Tiger" bunks, dispensing with bolts or loose parts.

The importance of this feature can not be overemphasized, enabling the bunk to be set up in two minutes without tools. Produces a perfectly tight joint which can not work loose.

Construction—Frame is "hard angle" steel. Sleeping surface is diamond shape wire link fabric with high carbon, oil tempered helical springs. The diamond shape of the link distributes tension diagonally and affords elasticity crosswise, dispensing with the need of small helical springs for fastening fabric to side rails, so common when straight link fabrics are used, and which easily become overstretched.



TRADE-MARK

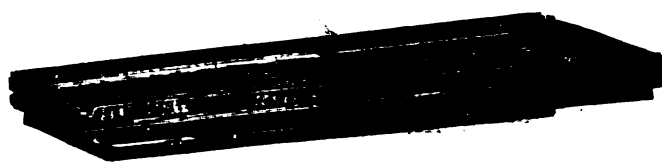


NO. 1585 "TIGER" BOLTLESS DOUBLE DECK BUNK
Height, 57 in.; floor to first bunk, 14 in.; to second bunk, 36 in.; head rail, 7 in.

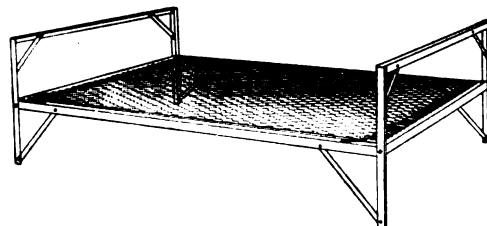
SIZES AND WEIGHTS "TIGER" BOLTLESS STEEL BUNKS

NO. 1585 DOUBLE DECK		NO. 1586 SINGLE DECK	
4 ft. 6 in. x 6 ft. 5 in.	142 lbs.	4 ft. 6 in. x 6 ft. 5 in.	75 lbs.
3 ft. 0 in. x 6 ft. 5 in.	93 lbs.	3 ft. 0 in. x 6 ft. 5 in.	49 lbs.
2 ft. 6 in. x 6 ft. 5 in.	85 lbs.	2 ft. 6 in. x 6 ft. 5 in.	45 lbs.

Also furnished in triple deck
Frames: Side rails and head and foot sections, $1\frac{1}{2}$ x $1\frac{1}{2}$ x $\frac{1}{8}$ -in. angle steel. Braces, $\frac{3}{8}$ x $\frac{1}{4}$ in. Fabric, wire link.



BUNK KNOCKED DOWN FOR SHIPMENT



NO. 1586 "TIGER" BOLTLESS SINGLE DECK BUNK
Height, 20 in.; from floor to bed, 14 in.; head rail, 6 in.

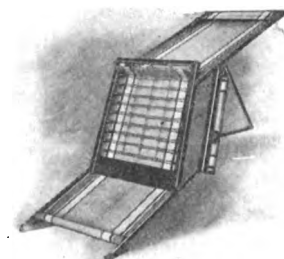
Hospital Reclining Chair.

Especially suitable for hospital convalescents and tuberculosis sanitariums. Automatic adjustment makes the chair follow every change of posture without requiring a thought. It works on its own standard, taking up little space.

No. 28 has double steel spring seat and adjustable strap support across the back, for comfort. A pair of helical springs at the top keeps the khaki cover drawn snugly.

The construction is such that it is opened or closed by simply pressing the head and foot parts together. To set up the chair requires the insertion of only two small bolts, taking but a minute or two.

Framework and standard are of steel, riveted and well braced, and finished in black enamel *baked on to stay*. The chair folds down flat for crating.



REINFORCED SPRING SEAT
Patent applied for



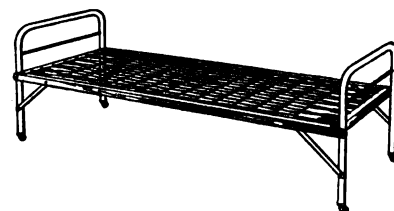
HOSPITAL RECLINING
CHAIR

Cantonment or Hospital Cot.

This is the standard type of cot adopted by the United States Government and installed in the army cantonments all over the country.

The head and foot parts fold under, and the cot is equipped with locking device to prevent it from folding when in use.

The head and foot units are made of $1\frac{5}{16}$ -in. outside diameter tubing, and the spring frame is made of 2 by $1\frac{1}{2}$ by $\frac{1}{8}$ -in. tubing.



NO. 1052 CANTONMENT OR HOSPITAL COT

ESTABLISHED 1882

KEYSTONE DRILLER CO.

Manufacturers of Well Drills and Deep Well Pumps

MAIN OFFICE AND FACTORIES
BEAVER FALLS, PA.

NEW YORK, N. Y., 170 Broadway

BRANCH OFFICES
JOPLIN, MO.

CHICAGO, ILL., Monadnock Building

Products.

PORTABLE and TRACTION WELL DRILLING MACHINES for Water Wells, Artesian and Non-flowing; Mineral Prospecting for lead, zinc, copper, coal, fire clay, etc.; Placer Gold Testing in advance of dredging operations; Blast Hole Boring in cement and limestone quarries and heavy excavations; Deep Wells for petroleum or natural gas.

"Downie" DEEP WELL PUMPS.

For Excavators, see page 57.

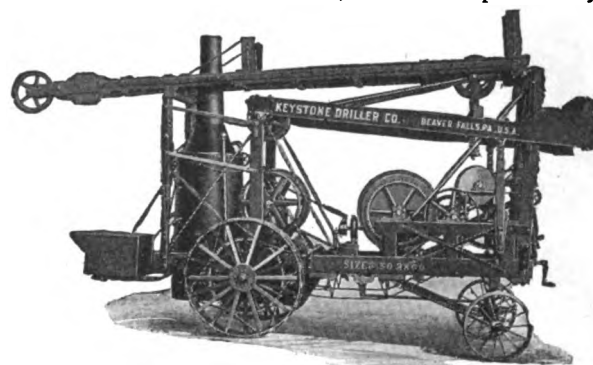


if required. Sills, beams, derrick are of seasoned fir. Boilers, A.S.M.E. code. Non-tractions, to be hauled with horses, made in sizes No. 1 to 5½. These machines are of the double beam type and excel in "spudding" or shallow drilling.

Portable oil rigs, with improved friction tool hoist, sizes No. 27 and No. 32, are offered for deep wells. Have steel sills, babbitted bearings, mounted oil country (locomotive type) boilers on separate truck. Strongest and most efficient construction, maximum portability.

Keystone Drills.

The Keystone traction, self-moving, well drills are made in sizes No. 3 to No. 5½. They are complete, self-contained with motive power on one truck; generally furnished with vertical fire tube boiler and steam engine, but can be equipped with gas or electric motor

PORTABLE DEEP WELL RIG
Sizes No. 27, No. 32 and No. 35TRACTION STEAM WELL DRILL
Sizes No. 1 to No. 5½**PRINCIPAL SIZES AND STYLES OF KEYSTONE WELL DRILLS**

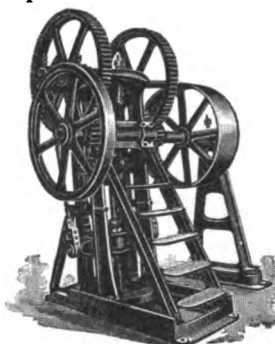
Size, No.	Style	Tool hoist	Power	Size boiler	H. p. of motor or engine	Depth capacity, ft.
1	Non-traction	Friction	Steam	30"x 60"	6	250
3	Non-traction	Cog.	Steam	34"x 66"	8	500
3	Traction	Cog.	Steam	34"x 66"	11	500
3	Traction	Friction	Steam	34"x 66"	11	350
3½	Non-traction	Cog.	Gas motor	34"x 66"	12	400
3½	Traction	Cog.	Steam	34"x 66"	11	400
3½	Traction	Cog.	Electric	34"x 66"	15	400
4	Non-traction	Cog.	Steam	34"x 66"	11	800
4	Traction	Cog.	Steam	34"x 66"	11	800
4½	Traction	Cog.	Gas motor	40"x 72"	18	800
5	Non-traction	Cog.	Steam	40"x 72"	14	1000
5	Non-traction	Cog.	Gas motor	40"x 72"	18	1000
5	Traction	Cog.	Steam	40"x 72"	14	1000
5½	Traction	Comb	Steam	40"x 72"	14	1000
27	Non-traction	Friction	Steam	25 h.p.	30	2500
32	Non-traction	Friction	Steam	25 h.p.	30	3000
35	Non-traction	Friction	Steam	30 h.p.	45	3500

PRINCIPAL SIZES AND STYLES OF KEYSTONE WELL DRILLS
(Continued)

Size, No.	Shipping weight with tools, lbs.	Principal uses
1	9000	Shallow water wells, test holes
3	11000	Water wells, test and blast holes
3	14000	Water wells, test holes, blast holes
3	14000	Placer gold testing, water wells, blast holes
3½	11000	Blast holes, water wells, test holes
3½	14000	Blast holes, water wells, test holes
3½	12000	Blast holes, water wells, test holes
4	12000	Water wells, shallow oil wells, test holes
4	15000	Water wells, shallow oil wells, test holes
4½	14000	Water wells, test holes, blast holes
5	16000	Water wells
5	15000	Water wells
5	18000	Water wells, shallow oil wells
5½	18000	Special water wells, mineral test holes
27	26000	Oil wells, separate boiler
32	28000	Oil wells, separate boiler
35	32000	Oil wells, separate boiler

"Downie" Deep Well Pumps.

These pumps are offered for heavy, continuous service in deep water wells, to pump against total head of 50 to 600 ft.; direct steam driven or geared from power; single or double stroke heads and barrels. The type most commonly used is double stroke geared head, direct connected to electric motor with D.S. working barrel and "Downie" conical valves. Efficiency of 85% and maximum capacity with this type. Usable in wells 4½ to 10 in. in diameter with working barrels 2¾ to 8 in. diameter. A 6-in. well will admit a 4-in. double stroke barrel, producing 68 gals. per minute at 35 r.p.m. Catalogue No. 6 in English or Spanish.

DOUBLE STROKE GEARED
PUMP HEADDOUBLE STROKE
STEAM PUMP
HEAD

CHICAGO PNEUMATIC TOOL COMPANY

1002 Chicago Pneumatic Building
NEW YORK, N. Y.

For Sales and Service Branches See Page 850.

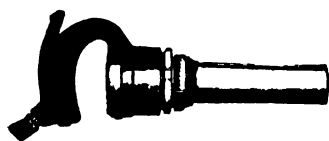
Products.

PNEUMATIC TOOLS, including CHIPPING, CALKING and RIVETING HAMMERS, AIR DRILLS, WOOD BORERS, and "CLOSE QUARTERS" DRILLS, SAND RAMMERS, SELF-ROTATING HAMMER DRILLS, ROCK DRILLS, ELECTRIC DRILLS and GRINDERS.

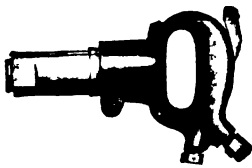
PNEUMATIC GEARED HOISTS and WINCHES.
For Semi-Diesel Oil Engines, see page 850; for Air Compressors, see pages 48-49.

Boyer and Keller Chipping and Calking Hammers.

A complete line for every chipping, calking, scaling and beading operation.



BOYER CHIPPING AND CALKING HAMMER



KELLER CHIPPING AND CALKING HAMMER

DATA, CHIPPING, CALKING, AND SCALING HAMMERS

Size and style	Piston diam., in.	Length stroke, in.	Service for which adapted	Weight, lbs.		Code	
				Net	Shpg.	Round	Hexagon
*†BOYER "BK" CHIPPING AND CALKING HAMMERS							
1	1 1/8	1	Light chipping	11 1/2	14	Abhume	Abhurl
1-x	1 1/8	1 1/2	Medium chipping	12 1/2	16	Abiabic	Abiaction
2	1 1/8	2	General chipping	13	16	Abiadum	Abiding
3	1 1/8	3	Heavy chipping	14 1/2	18	Abigail	Ability
4	1 1/8	4	Extra heavy chipping	15 1/2	21	Abiology	Abiolus

*BOYER CHIPPING, CALKING AND SCALING HAMMERS							
F	1 1/8	1 1/2	Scaling hammer	6 1/2	10	Abjection	Abjectness
BB	1 1/8	1 1/2	Flue beading	9	13	Abdomen	Abdominal
B	1 1/8	2	Light chipping	12	16	Abdiquer	Abditory

*KELLER CHIPPING, CALKING AND SCALING HAMMERS							
0	3/4	1 1/8	Scaling hammer	6	10	Abed	Abelle
1	1 1/8	1 1/2	Scaling hammer	8	12	Abelric	Abelric
1	1 1/8	1	Light chipping	12	15	Abensur	Abervine
1-x	1 1/8	1 1/2	Medium chipping	13	16	Aberrance	Aberrant
2	1 1/8	2	General chipping	13 1/2	17	Aberration	Aberring
3	1 1/8	3	Heavy chipping	15	19	Abettment	Abettment
4	1 1/8	4	Extra heavy chipping	16	22	Abeyantly	Abhor

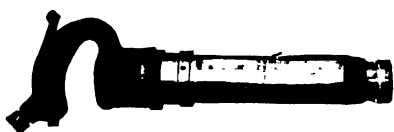
*When ordering specify "round" or "hexagon" bushings. Chisels furnished at extra charge.

†In ordering, specify whether heavy or light type handle is desired. The heavy type is standard.

‡Valveless.

Boyer Riveting Hammers.

The world's standard wherever rivets are driven.



BOYER LONG STROKE RIVETING HAMMER

Patented 3-unit construction secures unusual accessibility, ruggedness and giant driving power.

DATA, BOYER RIVETING HAMMERS

Type	Size No.	Piston diam., in.	Length stroke, in.	Capacity rivets, in.	Blows per min.	Shipping weight, lbs.
Type H.....	H-3	1 1/8	3	3/8	1542	15 1/2
	H-4	1 1/8	4	1/2	1272	16
	50	1 1/8	5	5/8	1000	24
	60	1 1/8	6	3/4	760	29
Standard....	80	1 1/8	8	1 1/8	700	32
	90	1 1/8	9	1 1/4	620	33
	80-X	1 1/8	8	1 1/4	800	32

May be equipped with safety device for preventing accidental shooting out of piston or rivet set.

SWEET'S CATALOGUE

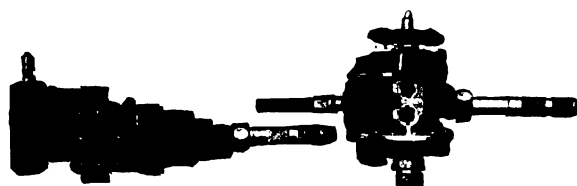


TRADE-MARK

Little Giant Air Drills.

Balanced piston type. Four single acting cylinders arranged in pairs, each pair of pistons connected to opposite wrists of a double crank shaft. Pistons of each pair travel in opposite directions at all parts of stroke, insuring smooth operation.

All Little Giant drills are of standard design, varying only in size and construction to adapt them to particular uses. Reversible and non-reversible types. Range in drilling from 1/4 to 3 in. in steel.



LITTLE GIANT CLOSE QUARTERS DRILL

LITTLE GIANT AIR DRILL

Little Giant Close Quarters Air Drills—Useful for tapping, flue rolling, etc., in close quarters. A compact train of gears provides smooth, uninterrupted rotation of spindle, overcoming the objectionable intermittent action of ratchet levers in the so-called ratchet types.

DATA, LITTLE GIANT AIR DRILLS

|| ‡ § Size No.	Speed light, r.p.m.	Air used, † per min. cu. ft.	* inches 2	Capacity*			Weight net, lbs.
				Drill in.	Ream	Tap	
LITTLE GIANT AIR DRILLS							
10 F	2200	11	00	1/4	—	—	8
10 S	1000	7	0	5/8	—	—	8 1/2
3 S (1)	1800	15	0	1/2	—	—	11 1/2
3 RS (1)	1200	15	0	1/2	—	—	14 1/2
3 A (2)	800	15	1	1/8	—	—	12
4 (2)	800	20	2	7/8	1/2	5/8	22
4R (2)	360	18	2	7/8	1/2	5/8	24
4T	370	18	2	7/8	1/2	5/8	24
4C (2)	240	20	3	1 1/4	1 1/4	1 1/4	28
4RC (2)	125	18	3	1 1/4	1 1/4	1 1/4	30
4TC	130	18	3	1 1/4	1 1/4	1 1/4	30
2 (2)	480	25	3	1 1/4	1	1	40
2R (2)	325	20	3	1 1/4	1	1	42
12	325	20	3	1 1/4	1	1	44
2C (2)	155	25	4	2	1 1/2	1 1/2	52
2RC (2)	120	20	4	2	1 1/2	1 1/2	54
12C	120	20	4	—	1 1/2	1 1/2	56
1 (2)	400	35	4	2	2	2	58
1R (2)	230	30	4	2	2	2	60
11	230	30	4	—	2	2	60
15 (2)	260	35	4	2	2 1/2	2 1/2	65
15R (2)	180	30	4	2	2 1/2	2 1/2	68
15T	180	30	4	—	2 1/2	2 1/2	68
1C (2)	110	35	5	3	2 1/2	2 1/2	75
1RC (2)	65	30	5	3	2 1/2	2 1/2	78
11C	58	30	5	3	2 1/2	2 1/2	78
15C (2)	80	35	5	3	3	3	83
15RC (2)†	52	30	5	3	3	3	97
15TC	50	30	5	—	3	3	97

LITTLE GIANT CLOSE QUARTERS DRILLS

81 (3)	310	25	3 1/4	1 1/4	—	34
91 (3)	180	35	4 2	1 1/4	—	38
81R (3)	240	25	3 1/4	1 1/4	—	36
91R (3)	120	35	4 2	1 1/4	—	40
3	400	20	2 1/2	1 1/4	—	20

LITTLE GIANT WOOD BORING MACHINES

10S (4)	1000	7	3/4	—	—	8
3RS (4)	1200	15	1	—	—	14 1/2
3RS (4)	600	15	1	—	—	14 1/2
5 (5)	650	18	2	—	—	24
5S (5)	370	18	2 1/2	—	—	24
14 (5)	700	20	4	—	—	32
14S (5)	325	20	4 1/2	—	—	32

*Nos. 00 and 0 indicate chuck sizes; other numbers indicate Morse taper sockets.

†Nos. in parentheses indicate the following regular equipment: (1) Breast plate and No. 0 chuck. (2) Feed screw. (3) Ratchet wrench for feed screw. (4) Grip handle and wood bit chuck. (5) Wood bit chuck. ‡Adapted for special extra heavy reaming and tapping.

§Letter "R" indicates reversible type drills; letter "C" indicates compound geared drills; letter "T" indicates drills fitted with grip handles and especially adapted for tapping flue rolling or reaming. *Drilling capacities are for drilling in metal — except wood boring machines, for which capacity in soft dry pine is given.

¶Nos. 10-F to 3-A inclusive, and No. 3 have 3/4-in. hose connections; Nos. 4 to 91-R inclusive have 1/2-in. hose connections. †A 80-lb. pressure.

Continued on next page

Little Giant Geared Air Hoists.LITTLE GIANT
GEARED AIR HOIST

Great hoisting power; unusually rugged steel construction; economy of air; absolute safety. Simple, valveless air motor operates equally well in either direction and has repeatedly demonstrated its power and air economy advantages. Automatic air brake makes slippage impossible. "Limit" stop device supplies infallible protection against jam-ups from over-hoisting. All gears cut from solid stock, accurately machined and case hardened. Lubrication of the "splash" type. Ask for bulletin.

DATA, LITTLE GIANT PORTABLE GEARED AIR HOISTS

Size	Capacity, tons	Height of lift, ft.	Lifting speed per min.	Distance between hooks, in.	Consumption per ft. lift, cu. ft.	Net weight, lbs.	Code
10	1	9	28	39	3	355	Accrescent
11	2	9	16	39	4	360	Accretion
12	3	11	10	45	8	465	Accroach
13	5	12	7	53½	15	820	Accroire
14	10	12	4	61½	27	1080	Accrue

Note: When desired, Little Giant portable geared hoists can be supplied in any of the above sizes, except size 10, equipped with either a plain trolley, geared single track trolley, or a geared double track trolley. When ordering, always state size and weight of channels on which trolley must operate.

Little Giant Electric Drills.LITTLE GIANT
PORTABLE
ELECTRIC DRILL

These well-known wood and metal drills may be operated wherever there are current outlets of the proper electrical characteristics. Provided with improved ventilating system for windings; splendid provision for lubrication; ball bearings, stub-tooth gears; built in a complete line for light and heavy duty, and in direct current and alternating current types; also "Universal" types for operation interchangeably on direct current or alternating current.

LITTLE GIANT ELECTRIC DRILLS—DRILLING CAPACITIES IN METAL

Size	*Universal for 110 and 220 volts, in.	D.C. for 120 and 240 volts, in.	**A.C. for 2-phase and 3-phase, in.	D.C. for street railway work, 600 volts, in.
000	1/4	...	...	...
000x	1/4	...	...	...
00-B	1/4	...	...	...
0-B	3/8	3/8	3/8	...
1B	1/2	1/2	1/2	1/2
1½-B	3/4	3/4	3/4	3/4
2B	7/8	7/8	7/8	7/8
3B	1 1/8	1 1/8	1 1/8	1 1/8
4B	...	2	2	1 1/2

*For connection to ordinary lamp socket. D.C. or A.C. of 60 cycles or less, single phase interchangeably.

**Furnished in side spindle style only. Standard windings are for 60 cycles, 120 or 240 volts. Nos. 2, 3 and 4 can be wound for 380 or 440 volts.

Note: In ordering specify Size No.; also whether D.C., A. C. or "Universal" type is desired. (If A.C., specify phase.)

Little Giant Electric Hammer Drills.LITTLE GIANT
ELECTRIC
HAMMER DRILL

For drilling concrete and soft stone, for light chipping of metals or wherever an electrically operated percussive drill is necessary for effective work. Ask for Bulletin E-62.

DATA, LITTLE GIANT ELECTRIC HAMMER DRILLS

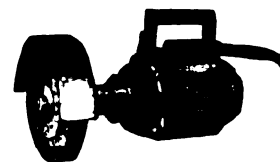
Maximum capacity in soft stone or concrete	1 in.
Weight, net	21 lbs.
Length over all	17½ in.

Wound for 110 or 220 volts (Universal type to operate on either D.C. or single-phase A.C.)

Little Giant Portable Electric Grinders.

Similar in construction to Little Giant electric drills. Widely used in foundries, machineshops, structural shops, and for grinding rails on street railways.

The line of Little Giant electric grinders also includes: precision, tool-post and surface types. Bulletin on request.

LITTLE GIANT PORTABLE
ELECTRIC GRINDER

DATA, LITTLE GIANT PORTABLE ELECTRIC GRINDERS

Size	SPEED		Size wheel, in.	Weight, lbs.
	120-240-600 volts D. C.	120-240-440 volts A.C. 2- and 3-phase, 60 cycles		
5-BP	4000 r.p.m.	3600 r.p.m.	5x 1½x1½	15
8-BP	2400 r.p.m.	1800 r.p.m.	6x1½x¾	28

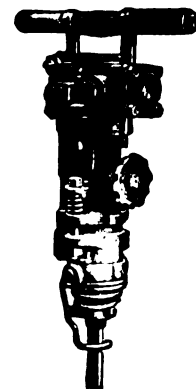
Hummer Self-rotating Hammer Drill.

For general use in the industrial, contracting, mining and quarrying fields for a wide variety of purposes, displacing to a large extent the heavier, more cumbersome and expensive mounted rock drills.

Simplicity, sturdiness in construction, ease of operation, independent motor rotation, low cost of upkeep, fast drilling and hard hitting power are the leading features. Furnished for wet or dry work.

GENERAL SPECIFICATIONS HUMMER
DRILL WITH INDEPENDENT
MECHANICAL ROTATION

Designating symbol	A-86
Diam. cylinder, in.	2 1/4
Length stroke, in.	3 1/4
Weight, lbs.	45
Length over all, in.	18 3/4
Size hose to use, in.	3/4
Size steel (hollow hex.), in.	3/8
Code word	Rezaba

A-86 HUMMER
SELF-ROTATING
HAMMER DRILL**Chicago Gatling and Slogger Rock Drills.**

Gatling Drill—A one-man drill; weighs 145 lbs. and easily drills up to 8 ft. It strikes a very rapid blow—800 per minute on the long stroke—which accounts for its quick drilling capacity. Write for Bulletin 505.

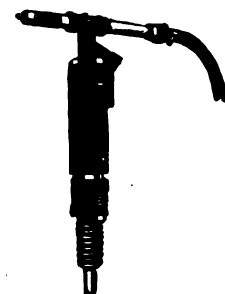
Slogger Drill—Strikes a hard, rapid blow. Made in 4 sizes. Distinctive features are improved valve motion, adjustable shell, positive lubrication, release rotation, bushed front head with taper sleeve and chuck for taking unshanked steels.

C-22 IMPROVED TYPE
GATLING DRILL

With patented cushion device, mounted on column. A powerful, "one-man" drill

Demolition Hammer Drill, Type BQ-46.

Useful in industrial plants and construction work for demolition purposes such as tearing out concrete, removing slag from ladles and slag pockets, glass from furnaces, etc. Uses either shanked or unshanked 1-in. hexagon steel, with peg-point or standard bits.

BQ-46 HAMMER
DRILL FOR
DEMOLITION WORK

SULLIVAN MACHINERY COMPANY

Manufacturers of Rock Drills and Air Compressors

ESTABLISHED 1850

86 East Adams Street
CHICAGO, ILL.

SALES OFFICES

BIRMINGHAM CLEVELAND DULUTH JUNEAU PITTSBURGH SAN FRANCISCO
BOSTON DALLAS EL PASO KNOXVILLE ST. LOUIS SPOKANE
BUTTE DENVER JOPLIN NEW YORK SALT LAKE CITY TORONTO
LONDON, ENGLAND PARIS, FRANCE SANTIAGO, CHILE SYDNEY, AUSTRALIA VANCOUVER, B. C.
MEXICO CITY, MEXICO

WORKS: CLAREMONT, N. H., CHICAGO, ILL.

Products and Services.

ROCK DRILLS and HAMMER DRILLS of many types for use in mines, quarries and on engineering construction; AIR COMPRESSORS.

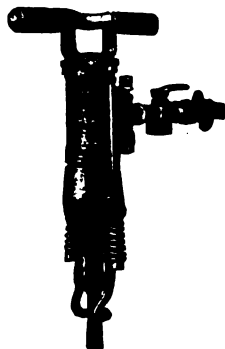
Also manufacturers of Drill Bit Sharpening Machines; "Air Lift" Well Pumps; Diamond Core Drills for mineral prospecting and test borings, Coal Mining Machines, Forge Hammers, Drill Steel Furnaces, Stone Channeling Machines and Quarrying Machinery.

Contractors for Engineers' Test Borings with Sullivan Diamond Drills, and for Mineral Land Prospecting.

Rock Drills and Hammer Drills.

Sullivan rock drills are available in numerous types for any demand of rock removal. Types include:

Rotator Hammer Drills—Bulletin 1670-J. "DX-61" Water Jet Drifters—Bulletin 1670-I. "Dry" and "Wet" Simple and Self Rotating Air Feed Stoppers—Bulletin 1670-M. "Plug" and "Foot-Hole" Granite Tools—Bulletin 1670-K. Hyspeed and Lightweight Reciprocating Rock Drills—Bulletin 1670-D. Submarine Rock Drills—Bulletin 1670-E.



SULLIVAN ROTATOR HAMMER DRILL

Rotators—6 types; 29 to 38 lbs.

The hollow piston and air tube rotators are particularly adapted for shaft or open cut drilling, having a capacity of 12- to 15-ft. holes. (They have drilled to 36 ft.) Water tube and "Pneufed" rotators are rapid mine drifters and adaptable for light tunneling. Two types of mounting available. A steam rotator can also be had. All are "one-man" drills, powerful and rapid.

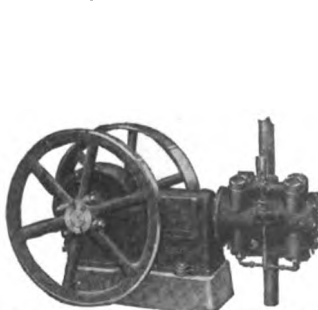
Types of Sullivan Compressors.

"WB-3," Simple Steam—Two-stage air cylinders, straight line, capacities 250 to 950 ft. Bulletin 1675-E.

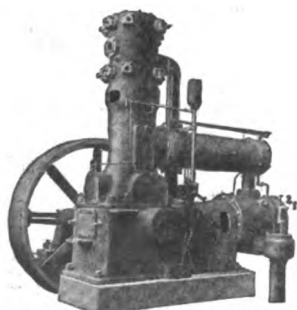
"WA-6," Simple Steam—Simple air cylinders, straight line, capacities 100 to 400 ft. Bulletin 1675-P.

"WJ-3," "WN-3," Angle Compound—Belt or direct motor drive; capacities 400 to 1300 ft. Bulletin 1677-B.

"WJ-4," "WN-4," Twin Angle Compound—For direct



SULLIVAN "WG-6" SINGLE STAGE BELT DRIVEN COMPRESSOR



SULLIVAN "WJ-3" ANGLE COMPOUND COMPRESSOR

synchronous motor drive or belt pulley; capacities 900 to 2800 ft. Bulletin 1677-B.

"WH-6," Belted—Two-stage, enclosed frame; capacity 300 ft. Bulletin 1675-R.

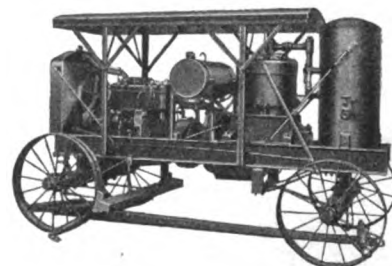
"WG-6," Belted—Single-stage, enclosed frame; capacities 50 to 350 ft. Bulletin 1675-R.

"WK-26," Direct Motor Driven—Portable mine car type, single-stage; capacities 100 to 250 ft. Bulletin 1677-A.

"WK-31," Direct Gas Engine Driven—Portable horse truck type, single-stage, for road work, etc.; capacity 150 ft. Bulletin 1675-T.

Sullivan "WK-31" Air Compressors.

Mounted on all-steel trucks, with canopy top for protection. For operating drills for street or highway rock removal. Capacity, 150 cu. ft.; 32 h.p.; weight, 5000 lbs.



SULLIVAN "WK-31" GASOLINE ENGINE DRIVEN COMPRESSOR

Two-cylinder vertical compressor operated by gear and pinion from four-cylinder, four-cycle, tractor type gasoline engine, complete with receiver, gasoline tank and radiator, on steel wagon truck.

"WJ-3" AIR COMPRESSORS, ANGLE COMPOUND, BELT DRIVEN

Cylinder sizes		Displacement		R.p.m.	I.h.p. at 100 lbs. pressure	Over all dimensions			Belt pulley		Piping
Diam. in.	Stroke, in.	Displacement, cu. ft. per min.				Length, ft.-in.	Width, ft.-in.	Height above bottom of bed plate, ft.-in.	Diam., ft.-in.	Face, in.	
14	8 1/2	10	442	250	71	8-10	4-0	7-1 1/2	5-10	10	3
16	9 1/2	12	625	225	100	9-11 1/2	5-11 1/2	7-11 1/2	6-4	15	3 1/2
17	9 1/2	12	706	225	111	9-11 1/2	5-11 1/2	7-11 1/2	6-4	15	3 1/2
18	11	14	920	225	156	11-2 1/2	7-6 1/2	7-7 1/2	6-8	19	3 1/2
20	12	14	1138	225	180	11-4 1/2	7-10 1/2	9-9	6-8	23	4
22	13	14	1377	225	225	11-7	8-1	9-9	7-2	24	4 1/2

SULLIVAN POWER DRIVEN AIR COMPRESSORS, CLASS "WG-6," BELT DRIVEN

Size cylinder		Displacement, cu. ft. per min.	R.p.m.	Maximum working pressure	H.p. at maximum pressure	Over all dimensions			Flywheels	
Diam., in.	Stroke, in.					Length, ft.-in.	Width, ft.-in.	Height above bottom of bed plate, ft.-in.	Diam., in.	Width pulley face, in.
7	6	80	300	100	10.7	5-0	1-10 1/2	2-0	30	4 1/2
8	6	104	300	50	10.7	5-5 1/2	1-10 1/2	2-0	30	4 1/2
8	8	121	260	120	20.5	6-3 1/2	2-4 1/2	2-8	40	7 1/2
9	8	152	260	100	22	6-4	2-4 1/2	2-8	40	7
10	8	188	260	50	22	6-4	2-4 1/2	2-8	40	7
10	10	213	235	120	39	7-5	3-0	3-4	50	10 1/2
11	10	258	235	100	42	7-6	3-0	3-4	50	10 1/2
12	10	307	235	100	47.5	7-7	3-0	3-4	50	10 1/2
14	10	388	235	50	50.5	7-7	3-0	3-4	50	10 1/2
12	12	345	220	120	65	8-10	3-11	3-10 1/2	60	14 1/2
14	12	470	220	90	76.5	8-10	3-11	3-10 1/2	60	14 1/2
16	12	558	220	50	75.8	8-11	3-11	3-10 1/2	60	14 1/2

INGERSOLL-RAND COMPANY

Manufacturers of Compressors and Drilling Equipment

GENERAL OFFICES

11 Broadway
NEW YORK, N. Y.

BRANCHES THE WORLD OVER

OFFICES IN UNITED STATES

ATLANTA	CHICAGO	DETROIT	JUNEAU	PHILADELPHIA	SAN FRANCISCO
BIRMINGHAM	CLEVELAND	DULUTH	KNOXVILLE	PITTSBURGH	SCRANTON
BOSTON	DALLAS	EL PASO	LOS ANGELES	ST. LOUIS	SEATTLE
BUTTE	DENVER	HOUGHTON	NEW ORLEANS	SALT LAKE CITY	WASHINGTON

FOREIGN OFFICES

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HONOLULU, T. H.	MILAN, ITALY	SECONDEE, AFRICA	WINNIPEG, MAN., CANADA

Products.

AIR COMPRESSORS; STEAM CONDENSING PLANTS; ROCK DRILLS; PNEUMATIC TOOLS; RIVETING HAMMERS; PORTABLE HOISTS.

Also manufacturers of Vacuum Pumps, Water Pumps, Air Lift Pumping Systems, Drill Sharpeners, Oil and Steam Engines, Turbo Blowers and Compressors.

For Cameron Pumps, see page 878.

Air Compressors—"Ingersoll-Rand" and "Imperial" Types.

Each type of air compressor that this company builds is designed to meet the requirements of some particular application. Each size is constructed with the ultimate object of supplying some one demand more efficiently and economically than could be done by any other manufacturer.

Each detail of every compressor receives the benefit of the best engineering skill, while the materials entering into the construction of every Ingersoll-Rand compressor are selected with particular reference to the functions they are called upon to play in conjunction with the machine's entire operation.

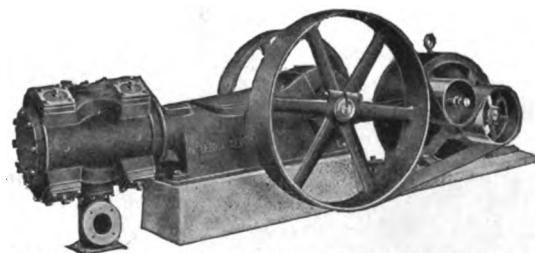
Each machine's workmanship is typical of all Ingersoll-Rand workmanship, the very best obtainable.

Such attention to design, materials and workmanship means that compressed air can be produced at bedrock prices, because more air is produced with a similar item of attendance, with a lower power input and a lower maintenance cost.

All compressors are of wholly enclosed construction with automatic splash and flood lubrication of the reciprocating parts. This makes for cleanliness, the exclusion of dirt and grit from wearing surfaces, economy of lubricant and lessened need of attendance.

Classes "ER" and "FR" Compressors.

Horizontal, double acting, single-stage machines with belt wheel, short belt drive complete with motor, or direct connected, piston valve steam engine, the latter with automatic cut-off control.

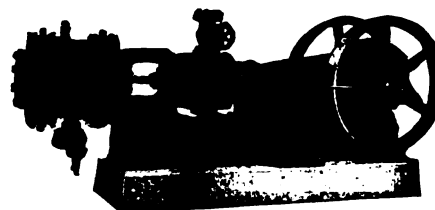


"INGERSOLL-RAND" CLASS "ER" COMPRESSOR

DATA, BELT DRIVE

Piston displac., cu. ft. per min.	Pressure, lbs. per sq. in.	Speed, r. p. m.	B. h. p. inc. belt loss	Floor space
28	100-150	500	4 -4.3	4' 7" x 1' 6"
44	20-100	500	3.8-6.5	4' 10" x 1' 6"
44	100-150	400	6.5-7	6' 2" x 1' 9 1/2"
64	45-100	400	7.3-9.3	6' 6" x 1' 9 1/2"
67	100-140	350	10-10	6' 6" x 1' 11"
92	45-100	350	11-13	6' 7" x 1' 11"
113	100-130	250	19-21	7' 11" x 2' 6 1/2"
145	65-100	250	21-24	8' 1" x 2' 6 1/2"
223	100-120	250	39-42	9' 9" x 3' 2 1/2"
324	50-100	250	43-57	9' 5" x 3' 2 1/2"
340	100-115	220	60-62	11' 0" x 4' 1 1/2"
464	40-100	220	53-74	11' 3" x 4' 1 1/2"

Data on standard machines for low pressures on request.



"INGERSOLL-RAND" CLASS "FR" COMPRESSOR

DATA, STEAM DRIVE

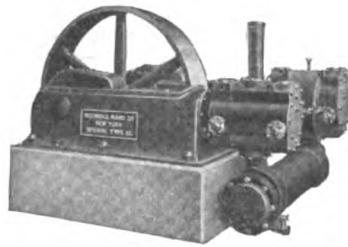
Air pressures to 125 lbs. Steam pressures, 80 to 175 lbs.

Piston displac., cu. ft. per min.	Pressure, lbs. per sq. in.	Speed, r. p. m.	I. h. p. in steam cyl.	Floor space
67	80-125	350	9-10	8' 2" x 2' 3"
92	55-100	350	11-13	8' 3" x 2' 3"
136	80-125	300	21-25	10' 2" x 2' 8"
173	65-100	300	24-29	10' 3" x 2' 8"
245	80-125	275	39-46	12' 0" x 3' 2"
355	60-100	275	51-62	11' 10" x 3' 2"
386	28-125	250	61-70	13' 8" x 4' 1"
528	45-100	250	66-88	13' 9" x 4' 1"

Data on standard machines for low pressures on request.

"Imperial" Type "XB" Compressors.

Single-stage and two-stage belt driven machines of duplex type. May also be had as complete units with electric motor and short belt drive.



"IMPERIAL" TYPE "XB" COMPRESSOR

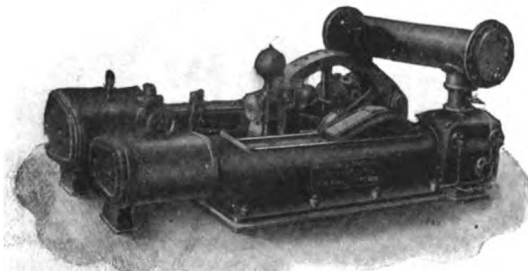
DATA, "IMPERIAL XB-2" COMPRESSORS
Air pressures, 80 to 100 lbs.

Piston displac., cu. ft. per min.	Speed, r. p. m.	B. h. p., at 100 lbs.	Belt wheel	Floor space
203	225	36	54" x 8½"	7' 8" x 5' 3"
327	210	37	60" x 10½"	8' 4" x 5' 7"
446	210	76	72" x 12½"	9' 9" x 6' 1"
599	185	104	84" x 16½"	11' 0" x 7' 8"
888	170	152	96" x 20½"	12' 6" x 8' 9"
1190	170	206	96" x 28½"	13' 0" x 9' 2"
1482	155	254	108" x 31½"	15' 1" x 9' 11"

Data on standard machines for low pressures on request.

"Imperial" Types "X" and "XPV" Compressors.

Single-stage and two-stage steam driven machines of duplex type. Simple and cross compound steam cylinders. The Type "X" has plain D steam valves on small sizes and Meyer adjustable cut-off type on larger units. The Type "XPV" has balanced piston steam valves and is suitable for high steam pressures and superheat.



"IMPERIAL" TYPE "XPV" COMPRESSOR

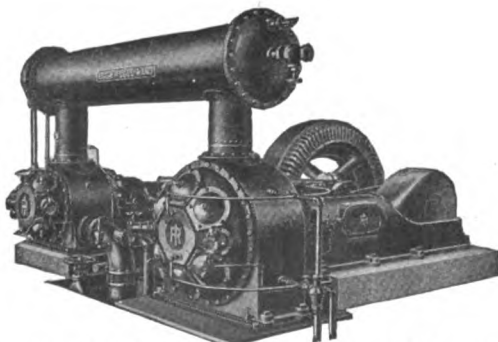
DATA, STEAM DRIVE
Air pressures 80 to 110 lbs. Steam pressures 80 to 150 lbs.

Piston displac., cu. ft. per min.	Speed, r. p. m.	I. h. p. in steam cyl.		Floor space
		80 lbs.	110 lbs.	
648	200	102	120	12' 0" x 7' 8"
940	180	148	174	13' 6" x 8' 9"
1260	180	200	235	14' 0" x 9' 2"
1531	160	242	284	17' 4" x 10' 3"
1955	160	306	360	17' 10" x 11' 0"
3030	155	463	544	22' 3" x 13' 6"
4145	125	627	736	27' 7" x 17' 3"

Data on standard machines for altitudes on request.

Class "PRE" Compressors.

Duplex, single-stage and two-stage, direct connected, electrically connected units of capacities to 7500 cu. ft. per minute, pressures to 115 lbs. per sq. in. Regularly fitted with automatic clearance control.



"INGERSOLL-RAND" CLASS "PRE" COMPRESSOR

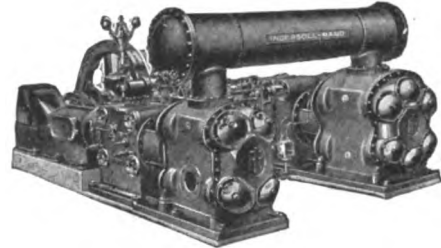
DATA, CLASS "PRE" COMPRESSOR—ELECTRIC DRIVE
Air pressure 50 to 115 lbs.

Piston displacement, cu. ft. per min.	Motor b. h. p. at air pressures given		Floor space
	90 lbs.	100 lbs.	
1302	201	210	12' 9" x 11' 9"
1574	251	264	14' 3" x 13' 0"
2033	309	324	15' 6" x 15' 6"
2678	417	438	17' 6" x 17' 9"
3633	567	596	19' 9" x 18' 0"
5011	752	787	21' 6" x 19' 0"
5967	972	1020	29' 3" x 20' 0"
7440	1120	1179	32' 0" x 24' 6"

Data on standard machines for altitudes on request.

Class "ORC" Compressors.

Duplex steam driven compressors with single-stage or two-stage air cylinders and simple or cross compound Corliss valve steam cylinders. Capacities from 2550 to 8000 cu. ft. per minute, pressures to 115 lbs. per sq. in.

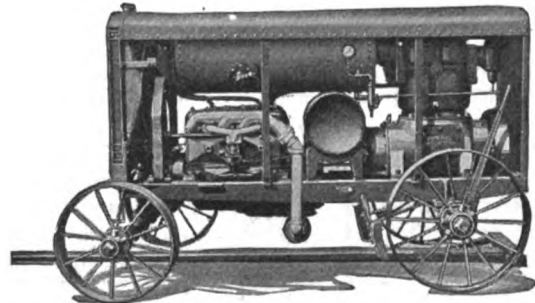


"INGERSOLL-RAND" CLASS "ORC" COMPRESSOR
DATA, STEAM DRIVE

Air pressure 90 to 125 lbs. Steam pressure 90 to 180 lbs.

Piston displacement, cu. ft. per min.	I. h. p. in steam cylinders at air pressure given		Floor space
	90 lbs.	100 lbs.	
2550	419	439	26' 5" x 15' 6"
3242	516	540	28' 11" x 17' 0"
4384	670	702	31' 2" x 19' 0"
5715	941	987	36' 5" x 19' 0"
7310	1151	1207	42' 10" x 21' 8"

Data on standard machines for altitudes on request.



"IMPERIAL FOURTEEN" PORTABLE AIR COMPRESSOR

Piston displac., cu. ft. per min.	Air pressure, lbs.	Driving motor	Drive	Weight, com- plete, lbs.
45	90	Single-cyl.-2-cycle	Gas motor	1500
118	100	Twenty-five h. p.	Electric motor	4450
118	100	Four- cyl.-4-cycle	Gas motor	4000
210	100	Four- cyl.-4-cycle	Gas motor	6000

Data on steam driven outfits and skidded units, on request.

Steam Condensing Plants.

Ingersoll-Rand barometric plants consist of counter-current barometric condenser, Ingersoll-Rand or "Imperial" dry vacuum pumps and Cameron water pumps. They are of distinct advantage in permitting the continuous use of dirty, gritty or acid mine water for cooling. The condenser design is such that stoppage cannot occur, nor is frequent cleaning necessary.

They maintain a high average vacuum under varying service conditions. Less cooling water required than in other types, pumpage costs are low, auxiliaries efficient and inexpensive to operate. Plant operation is marked by great stability and high average efficiency. Independent regulation of auxiliaries secures flexibility. Condenser design assures against possible flooding and injury of prime mover or vacuum pump.

Ingersoll-Rand low level multi-jet condensers are the simplest type of low level jet condensers. Standard equipment calls for the condenser head and a single injection water pump. This pump is a standard Cameron centrifugal type.

The Company furnishes surface condensing plants.

"Jackhammer" Rock Drills.

These tools are universally used for rock cutting, tearing up concrete, ditch digging, road construction, mining, quarrying and general work.

All these drills are of all-steel construction, automatically lubricating and self-rotating. Although primarily designed for use with compressed air, certain types will operate satisfactorily on steam.

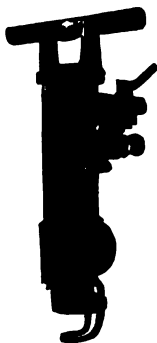
"Jackhammers" weigh considerably less than the older piston drills, and require only one man to operate.

DATA, "JACKHAMMER" ROCK DRILLS

Type	Weight, lbs.	Depth of hole	Described in Bulletin No.
BAR-33	21½	5 ft. (soft rock)	4043
BBR-13	35	8 ft.	4131
BCR-430	41	9-12 ft.	4321*†
DCR-13	55	9-12 ft.	4048*†
DDR-13	70	18-20 ft.	4142*†

*Furnished in wet and dry patterns.

†Furnished with mounting if desired



"JACKHAMMER" ROCK DRILL



"SERGEANT" TRIPOD DRILL

"Sergeant" Tripod Drills.

For deep hole work, and for large diameter drill holes, the "Sergeant" drill is offered. It is sturdy in design, and can be relied on for uninterrupted high duty service. Bulletin No. 4302.

"Little Tugger" Portable Hoists.

There are many places for this little hoist in all sorts of work. It can be clamped or bolted to any handy support and operated in any position. Either compressed air or steam furnishes power.

The load limit is a half ton and the drum capacity 450 ft. of ⅝-in. wire rope.

It finds application in handling everything, placing machinery on foundation, skidding heavy crates, hauling cars, hoisting ash buckets, erecting scaffolding, pulling scrapers and backfillers, handling pipe in trenches and a host of kindred jobs. Bulletin No. 4333 for full description.



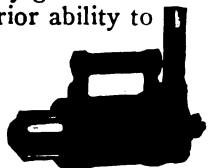
"LITTLE TUGGER" PORTABLE HOIST

"Little David" Riveting Hammers.

Sturdy, hard hitting tools for every grade of work.

Distinctive in design and of superior ability to resist abuse. Can be taken down or assembled in the field—a simple wrench is all that is needed. Built in 5 sizes, with inside and outside triggers, and with or without safety rivet set retainers.

Under equal test conditions, "Little David" riveters will exceed the work of any other hammers of like size. Air consumption is low for the results obtained. Spend more time on the work and less time in the repair shop than any other make of riveters.



NO. 1 "LITTLE DAVID" JAM RIVETER



NO. 60 "LITTLE DAVID" OPEN HANDLE RIVETER

DATA, "LITTLE DAVID" RIVETING HAMMERS

Size No.	Piston stroke, in.	Piston diam., in.	Length exclusive of set, in.	Standard piston, in.	Weight without set, lbs.	Size hose recommended, in.
5	4	1½	14½	3	14	½
40	4	1½	14½	2½	14½	½
50	5	1½	16½	2½	18	½
60	6	1½	17½	3	20	½
80	8	1½	19½	3	22	½
90	8	1½	19½	3½	24½	½

"LITTLE DAVID" JAM RIVETER

0	4	1½	11½	2½	31	½
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"LITTLE DAVID" HOLDERS-ON

2	3	3½	7½		13½	½
4	4½	3½	12½		26	½
5	4½	3½	12½		25	½

"LITTLE DAVID" SCALING AND CHIPPING HAMMERS

Size No.	Piston stroke, in.	Length over all, in.	Weight, lbs.	Size hose recommended, in.
NO	1½	10½	6½	½
NI	1½	10½	7	½
1S	1	11½	11½	½
2S	2	12½	12½	½
2SS	2	12½	12½	½
3S	3	13½	13	½
4S	4	14½	13½	½
5	4	14½	14½	½

"Little David" Drills and Wood Borers.

Simple, pneumatic tools for drilling, reaming, tapping in metal, running down lag screws, tightening bolts and boring in wood. Built in 29 sizes and gearing combinations—a tool for every grade of work.



NO. 2S "LITTLE DAVID" DRILL



NO. 9 "LITTLE DAVID" CLOSE QUARTER DRILL

DATA, "LITTLE DAVID" NON-REVERSIBLE DRILLS

Size No.	Average free speed 90 lbs. pressure, r. p. m.	Weight, lbs.	Length of feed, in.	Reaming, in.	Standard twist drill will drive	Length over all, in.	Morse taper socket	Hose, in.
1B	275	55	5½	2	2½	16	4	¾
1C	225	55	5½	2½	3	16	4	¾
1SE	100	68	5½	Extra heavy drilling, reaming and tapping		19½	5	¾
2	475	42	4¾	1	1½	14½	3	¾
2S	475	43	4¾	1	1½	15	4	¾
2SC	325	43	4¾	1½	1½	15	4	¾
3	700	25	4¾	¾	¾	11½	2	¾
3S	700	25	4¾	¾	¾	12½	3	¾
3SB	325	26	4¾	1	1½	12½	3	¾
3SC	200	27	4¾	1	1½	13½	3	¾
3AA	900	25	4¾	¾	¾	11½	2	¾
3SAA	900	26	4¾	¾	¾	12½	3	¾
5	900	15	2½			14½	1	¾
5A	1500	15	2½			14½	1	¾
44	1400-3000	9			¼ chuck	14½		¾
6	2000	9			¾	13½	1	¾
600	2000	11½			¾	15	1	¾

"LITTLE DAVID" CLOSE QUARTER DRILL

9	170	39	3¾	2	3	9	4	¾
8	250	32	2¾	1½	1½	8	3	¾

"LITTLE DAVID" REVERSIBLE DRILLS

11B	240	60	5½	2	2½	16	4	¾
11C	210	60	5½	2½	3	16	4	¾
11SE	100	73	5½	Extra heavy drilling, reaming and tapping		19½	5	¾
22	450	42	4¾	1	1½	14½	3	¾
22S	450	45	4¾	1	1½	15	4	¾
22SC	310	45	4¾	1½	1½	15	4	¾
33	725	25	4¾	¾	¾	11½	2	¾
33S	725	26	4¾	¾	¾	12½	3	¾
33SB	325	28	4¾	1	1½	12½	3	¾
33SC	225	28	4¾	1	1½	13½	3	¾

"LITTLE DAVID" GRINDERS

			Diam. of wheel end of crank shaft	
7	3000	22	¾"	20½
601	4200	14	1"	18½
602	4200	14	1½"	19½

CHICAGO PNEUMATIC TOOL COMPANY

Air Compressors

1002 Chicago Pneumatic Building
NEW YORK, N. Y.,

For Sales and Service Branches See Page 850.

Products.

AIR COMPRESSORS: Steam, Belt, Short-belt Electric Motor, Oil, Gas and Gasoline Engine, and Direct Motor Drive.

For Pneumatic Tools, Electric Tools, Rock Drills, and Geared Hoists, see pages 42-43; for Semi-Diesel Oil, Gas and Gasoline Engines, see page 850.

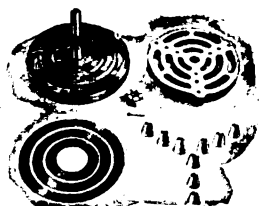
Air Compressors for All Requirements.

This company's line of air compressors is particularly complete, and embraces over 500 sizes and types for all possible requirements and conditions of service, up to capacities of 5000 cu. ft. per minute. Standard sizes for steam, belt, electric and oil, gas and gasoline engine drive can be shipped promptly (frequently from Branch stocks).

Special types built to meet requirements.

The Compressor With the Simplate Flat Disc Valve.

Simplat flat disc valves are used exclusively in Chicago Pneumatic air compressors and represent the highest development yet attained in air valve design.



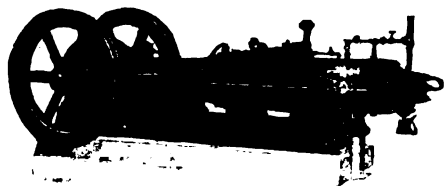
SIMPLATE DISCHARGE VALVE DISASSEMBLED

Their chief advantages are: simplicity; practically indestructible; no lubrication required; noiseless operation; plates independent in action, one of another; each plate has its individual springs; tension on inlet and discharge valves differs according to air handled; applicable to all positions and conditions.

Class N-SO₂ Fuel Oil Driven Air Compressors.

Will operate on any petroleum distillate containing not more than 1% of sulphur or 25% asphaltum, and ranging from 28° Baumé scale up to and including kerosene. Also operate on many oils below 28° Baumé, depending on the character of the oil.

Absolute simplicity, compactness and high operating economy make these units an ideal air power plant



CLASS N-SO₂ FUEL OIL DRIVEN SIMPLATE VALVE AIR COMPRESSOR*

Piston & displacement	R. p. m.	Maximum h. p.	Floor space ft.-in.	Code
144	325	21	11-9 x 3-5	†Avaraccio
212	325	29	13-6 x 3-8	†Avaran
309	300	47	15-4 x 4-7	Avare
370	250	57	18-3 x 5-7	Avaretto
507	250	77	21-6 x 6-0	Avargor
658	230	102	21-10 x 6-0	Azadones

* Compressors listed are for pressures up to 100 lbs. Information concerning machines for air pressures up to 50 lbs. furnished on application.

† Available in tank mounted type if desired.

‡ Free air per minute.



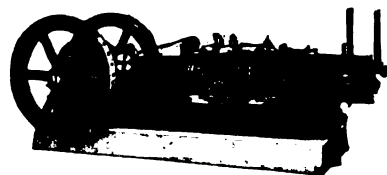
TRADE-MARK

wherever fuel oil is available. Simplicity of operation makes skilled attendants unnecessary.

Class N-SG and N-SGL Air Compressors (Gas and Gasoline Driven).

Similar in design to the Class N-SO₂ machines. Well suited to rough, heavy duty. In operation require very little attention.

Class N-SG—Made in capacities up to 658 cu. ft. free air per minute. Will operate satisfactorily on any natural or artificial gas containing 600 B.t.u. or over per cu. ft. Equipped with Simplate valves.



CLASS N-SG GAS DRIVEN SIMPLATE VALVE AIR COMPRESSOR*

Piston & displacement	R. p. m.	Maximum h. p.	Floor space ft.-in.	Code
175	300	25	11-9 x 3-5	†Axberg
250	300	35	13-6 x 3-8	†Axbidder
401	300	62	15-4 x 4-7	†Axboma
492	250	77	18-3 x 5-7	†Axbolla
658	230	102	21-6 x 6-0	†Axbugle

* Compressors are listed for pressures up to 100 lbs. Information concerning machines for air pressures up to 50 lbs. furnished on application.

† Available in tank mounted type if desired.

‡ Free air per minute.

Class N-SGL—Specially designed to meet the requirements of a gasoline driven portable machine. Similar to portable type oil driven unit described on following page. Equipped with Simplate valves and guaranteed to run satisfactorily on commercial grades of gasoline.

DATA. CLASS N-SGL GAS DRIVEN SIMPLATE VALVE AIR COMPRESSORS*

Piston & displacement	R. p. m.	Maximum h. p.	Floor space ft.-in.	Code
144	325	21	11-9 x 3-5	†Avenimos
212	325	29	13-6 x 3-8	†Avenisteis

* Compressors are listed for pressures up to 100 lbs. Information concerning machines for air pressures up to 50 lbs. furnished on application.

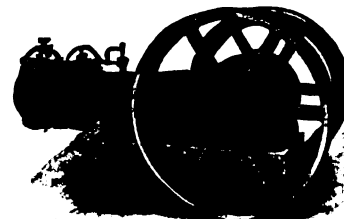
† Available in tank mounted type if desired.

‡ Free air per minute.

Class N Stationary Compressors.

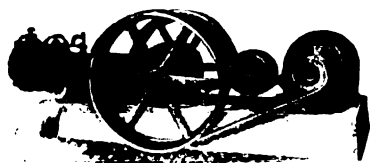
N-SB and N-SBE (belt driven) and N-SS (steam driven) air compressors are rugged, self-contained machines designed for hard service and require minimum care and attention.

Equipped with Simplate flat disc inlet and discharge valves.

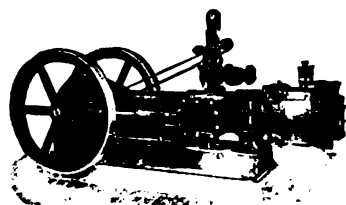


CLASS N-SB SINGLE-STAGE BELT DRIVEN COMPRESSOR
Built also in duplex and multistage types

Class N-SBE—Short-belt, motor driven machines adapted for use where space is limited and where motor driven units are desired. This type of drive is flexible, allows a maximum belt contact, relieves initial belt tension and has proved itself far preferable to gear or silent chain drives.



CLASS N-SBE SHORT-BELT MOTOR DRIVEN SIMPLATE VALVE AIR COMPRESSOR



CLASS N-SS SINGLE-STAGE STEAM DRIVEN COMPRESSOR

DATA, SINGLE-STAGE CLASS N-SB BELT DRIVEN AND CLASS N-SS STEAM DRIVEN COMPRESSORS**

Air cylinder		R.	Piston displacement, cu. ft.	Air pressure, lb.	H. p.* required	Code	
Diam., in.	Stroke, in.					Steam driven type†	Belted type
6	6	350	69	80-125	9-11	Nasbrel	Nababsom
7 1/2	6	350	107	50-100	13-17	Nasdict	Nabacrid
8	8	300	139	80-125	21-26	Nasenna	Nabadora
9	8	300	176	70-100	24-30	Nesceptor	Nabaegger
10	8	300	218	40-70	24-31	Nesfento	Nebaffling
12	8	300	314	15-40	20-34	Nesgrip	Nebaggot
10	10	275	250	80-125	39-48	Neshole	Nebahia
12	10	275	360	50-100	45-62	Nisimule	Nibajirn
15	10	275	562	30-50	53-79	Niskine	Nibajos
17	10	275	723	15-30	45-68	Nislake	Nibaklet
12	12	250	392	80-125	63-78	Nismurk	Nibalena
14	12	250	534	50-100	70-94	Nosnacco	Nobampo
17	12	250	788	30-50	76-103	Nosomula	Nobandis
20	12	250	1092	15-30	65-107	Nosostis	Nobaola
14	14	220	549	80-125	96-123	Nosparry	Nobaptist
17	14	220	809	40-80	100-141	Nosquan	Nobaqua
20	14	220	1120	15-40	75-135	Nusraid	Nubaron

**Note: Class N compressors in the capacities listed can also be supplied with short belt electric motor drive, either in stationary, truck or skid mounted portable types.

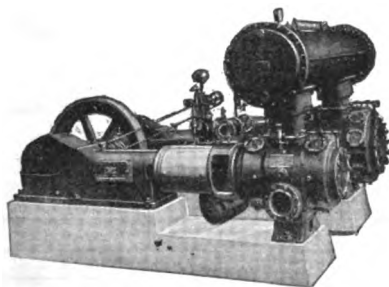
*For belt driven compressors, this includes belt loss; for steam driven compressors, the figures stated are the indicated horsepower in the steam cylinder.

†6, 8 and 10-in. stroke compressors have plain D-slide valve; 12- and 14-in. stroke have double ported balanced slide valves.

Class O-CSC 2-stage Steam Driven Air Compressors.

Enclosed construction, rugged design and high rotative speeds, simplified steam valve gear and unexcelled system of automatic lubrication.

Equipped with Simplate valves.



CLASS O-CSC 2-STAGE STEAM DRIVEN AIR COMPRESSOR

DATA, CLASS O-CSC 2-STAGE CHICAGO PNEUMATIC SIMPLATE VALVE COMPOUND STEAM DRIVEN COMPRESSORS

Cylinders					Displ. per min.	R. p. m.	H. p.	Approx. floor space		Code
High pres.	Low pres.	Low pres.	High pres.	Stroke, in.				Length, ft. in.	Width, ft. in.	
10	16	15	9	10	511	250	90	10 10	7 1 1/2	Oroncio
12	19	17	10	12	741	235	130	12 3	8 2	Oropoles
14	22	20	12	14	1145	225	201	14 0	9 6	Oropion
16	26	23	13	16	1730	225	304	17 3	9 6	Orottere
16	26	24	14	18	1884	200	331	18 2	9 8	Orphaney
16	26	26	15	18	2212	200	390	18 6	9 8	Orpet*

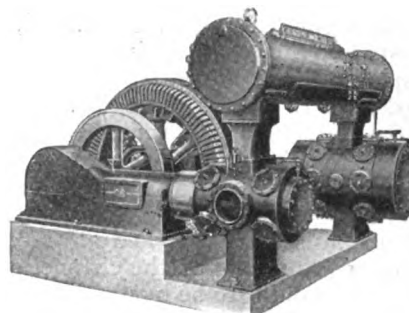
* Suitable only for 150 lbs. steam pressure

Class O-CE Electric Motor Driven Air Compressors.

Highly efficient and compact.

A variable volume of air delivered at constant speed and with minimum power consumption is an important operating characteristic. Built in single-stage and 2-stage, and in both duplex and duplex-tandem types, for either belted or direct connected motor drive. Capacities from 500 to 5000 cu. ft. of air per minute.

Equipped with Simplate valves.



CLASS O-CE 2-STAGE CHICAGO PNEUMATIC SIMPLATE VALVE MOTOR DRIVEN COMPRESSOR

Cylinders			Displ. per min.	R. p. m.	H. p.	Floor space		Code
Low press.	High press.	Stroke, in.				Length, ft. in.	Width, ft. in.	
17	10	12	810	257	140	10 9	10 6	Overhigh
20	12	14	1308	257	225	12 0	12 0	Orlero
23	13	16	1730	225	301	14 5	11 3	Ormille
24	14	18	1884	200	327	13 8	12 8	Overig
26	15	18	2212	200	383	17 6	14 8	Ovalis
26	15	21	2424	188	417	18 6	15 3	Ornasti

Portable Air Compressors, Oil, Gas and Gasoline Engine Driven.

Complete portable outfits available for contractors, sand blast cleaners, cement gun workers, prospectors, etc.

Outfits comprise standard N-SG, N-SGL, N-SO2 or N-SBE compressors (previously described) with complete motor, receiver and cooling system, all compactly tank-mounted on substantial truck. As shown, engine and compressor are arranged tandem on same piston rod, thereby eliminating all gearing or other power consuming transmissions. Completely descriptive bulletins on request.



CHICAGO PNEUMATIC SIMPLATE VALVE TANK MOUNTED PORTABLE COMPRESSOR

Can be operated on oil, gas or gasoline; also built for electric motor drive

NOVO ENGINE COMPANY

C. E. BEMENT, VICE-PRESIDENT AND GENERAL MANAGER

Air Compressor Outfits and Saw Rigs

NEW YORK OFFICE
1617-19 Woolworth Building

10 Porter Street
LANSING, MICH.

CHICAGO OFFICE
800 Old Colony Building

Products.

NOVO AIR COMPRESSOR OUTFITS and
NOVO-BEACH SAW RIG.

For Novo Hoisting Outfits, see page 75;
for Novo Engines and Pumping Outfits, see
pages 912-13.

Novo Air Compressor Outfits.

Novo Air Compressor Outfit No. 174, illustrated below, consists of a 6 by 6-in. duplex compressor having a piston displacement of 80 cu. ft. of free air per minute, operated by a 15-h.p. Novo engine. It is mounted on a truck, the frame of which is made of channel steel, securely riveted together. The bases of both the engine and compressor are machine finished and bolted securely to the framework and bed plate. Accurate and permanent alignment is assured. The air receiver is installed vertically at the end of the channel steel frame, thus permitting the outfit to be mounted on a low wheel truck, keeping the center of gravity low and enabling the operator to start the engine from the ground.

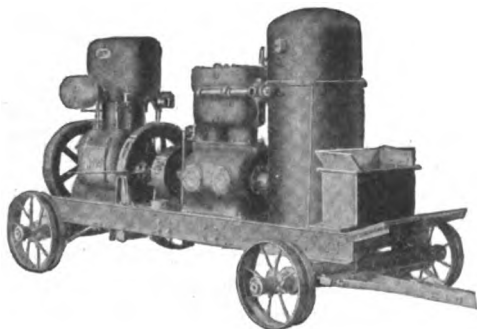


FIG. 413. NOVO AIR COMPRESSOR OUTFIT MOUNTED ON TRUCK

SPECIFICATION DATA, NOVO AIR COMPRESSOR OUTFITS

Outfit No.	Engine h.p.	Com- pressor		Displacement, cu. ft. per minute	Pressure, lbs. per sq. in.	Receiver		Bare weight, lbs.	Shipping weight, lbs.	Code word, truck mounted
		Bore	Stroke			Diam., in.	Lgth., in.			
NOVO IMPERIAL AIR COMPRESSORS, MOUNTED ON HAND TRUCK										
158	1½	2½	3	5	100	14	26	765	965	Ima
159	4	3½	4	10.5	100	14	48	1275	1700	Imes
160	6	4½	5	21	100	14	48	1665	1900	Imic
NOVO IMPERIAL AIR COMPRESSORS, MOUNTED ON TEAM TRUCK—FIG. 413										
161	8	6	6	42	75	24	60	3625	3625	Imur
162	10	6	6	40	100	24	60	4200	4200	Imix
163	15	8	6	70	100	24	60	4800	4800	Imle
NOVO TYPE H DUPLEX AIR COMPRESSOR OUTFITS, MOUNTED ON TEAM TRUCKS										
178	10	4½	4½	38	100	24	60	4200	4200	Unth
174	15	6	6	80	100	24	60	4500	4500	Unur

NOTE—The above outfits are water cooled of the reservoir type, with the exception of Type H compressors, which are water cooled by circulating pumps. Outfits are equipped with 2-cylinder 15 h.p. engine and are similar in design to Fig. 413.

SWEET'S CATALOGUE



TRADE-MARK

The engine and compressor are connected by means of a specially designed friction clutch coupling, permitting the engine to be started without load and the compressor to be thrown in after the engine has attained full speed.

Novo air compressors are furnished with piston displacements ranging from 5 to 80 cu. ft., and are designed for portable and stationary work.

Novo-Beach Saw Rig.

The Novo-Beach Saw Rig possesses many important advantages not incorporated in any other contractor's saw rig on the market. Chief among these are the *frictionless roller table* and the *double arbor*.

The frictionless roller table consists of a movable table carried on grooved rollers. When cutting-off, the material is fed to the saw on the rolling table, the momentum of which forces the material being worked against the cutting edge of the saw. When ripping is to be done the table is securely locked to the frame.

In the double arbor feature a rip saw is carried on one arbor and a cut-off saw on the other. One turn of the crank effects the change from a rip saw to cut-off saw without stopping saw. Height of saw above table is adjustable. The arbor raises and lowers on an arc giving perfect belt adjustment without use of belt tighteners. The weight of the arbor frame is counterbalanced by heavy springs so that it is easy to raise and lower.

Outfits are furnished complete including rip saw and cut-off saw, main drive belt, one ripping gauge, one bevel gauge and miter gauge, one cut-off gauge. Write for Bulletin No. 122.



NOVO-BEACH SAW RIG

SPECIFICATIONS

Outfit No.	Engine h.p.	Size saw, in.	Maximum thickness stock to be cut, in.	Code word
4B	4	14	4	Bebon
6B	6	16	5	Becim

ACCESSORY CODE WORDS

Jointer—Bedel	Boring attachment—Beguk	Table extension—Belid
---------------	-------------------------	-----------------------

The code words above cover the accessory only. If wanted in combination with the saw rig give all code words; for example, if Outfit 4B with jointer, boring attachment and table extension is desired, order should specify: 1 Outfit Bebon with Bedel, Beguk and Belid.

E. I. DU PONT DE NEMOURS & CO., INC.

Explosives and Blasting Accessories

GENERAL OFFICES
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PITTSBURGH, PA.
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SCRANTON, PA.
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SEATTLE, WASH.
SPOKANE, WASH.
SPRINGFIELD, ILL.

Products.

EXPLOSIVES and BLASTING ACCESSORIES, which include:

Red Cross Extra, Gelatin and Straight Dynamites.

Du Pont Extra, Gelatin and Straight Dynamites; Du Pont Blasting Gelatin; Repauno Gelatin; Low Explosives; Blasting Powders.

BLASTING ACCESSORIES for detonation or deflagration of explosives: Electric Blasting Caps, Blasting Caps, Galvanometers, Rheostats, Thawing Kettles, Blasting Machines, Fuse, Cap Crimpers, Connecting Wire, Leading Wire, Tamping Bags.

For Paints and Varnishes, see pages 186-87.

Quality.

Since 1802, the Du Pont Company has been engaged in the making of explosives. In this century of activity, the company has introduced many new explosives and improved its methods of manufacture. Today its products are recognized as the standard by which other explosives are rated.

The extensive manufacturing, storage and shipping facilities of the Du Pont Company insure ample production and prompt shipments.

The specifying of Du Pont explosives insures highest efficiency and the accomplishment of maximum results with a minimum expenditure for material, time and labor.

Red Cross Straight Dynamite.

This is a quick acting, powerful, water resisting, low freezing explosive especially recommended for open work in hard, tough material where a shattering action is desired, such as breaking boulders and general construction work.



RED CROSS STRAIGHT DYNAMITE

Red Cross Extra Dynamite.

The "extra" dynamites are not so quick nor shattering as "straight" dynamite, but have a more heaving and lifting effect.

Red Cross Extra is suited to soft rock; also hard rock where shattering is unnecessary; and excavating clay, earth and shale. It is a low freezing, all-year-round explosive. The cartridge wrappers should not be slit nor should the charge remain in water very long.



RED CROSS EXTRA DYNAMITE



Du Pont Gelatin.

This brand is a dense, plastic, highly water resisting, low freezing explosive. It is especially recommended for very wet work, under water, and in close work where ventilation is deficient. Du Pont Gelatin gives best results when thoroughly confined, but is not suitable for mudcapping.

Blasting Accessories.

As the largest manufacturers of explosives and with an extensive experience the Du Pont Company is competent to devise and introduce detonation apparatus especially suited to explosives. Insist upon the use of these Du Pont dependable detonating supplies to insure complete detonation.

Blasting Machines.

Several sizes of blasting machines are made having capacities of 1 to 150 No. 6 electric blasting caps fitted with copper wires. The most popular sizes are the pocket size and Nos. 2 and 3.

The pocket size fires from 1 to 3 electric blasting caps. It has a removable handle to prevent firing the charges by anybody other than the shot-firer.

Blasting machines Nos. 2 and 3 fire 10 to 30 copper wire electric blasting caps, and weigh 15 and 25 lbs., respectively. They are thoroughly made and can be relied upon to generate current to fire the number of charges specified. The machines are compact in form, easy to operate and portable.



DU PONT BLASTING MACHINE

Du Pont Electric Blasting Caps.

Nos. 6 and 8 electric blasting caps are made according to specifications determined by long connection with the manufacture and use of explosives. The selection of materials, manufacturing, assembling and inspecting of parts receives the most careful attention to insure a blasting cap capable of causing complete detonation.

Special Information Available for Users of Explosives.

A century of experience as explosives makers has enabled this company to acquire a practical knowledge of explosives.

This company has a series of books and folders containing valuable data concerning the selection of explosives and the best methods to adopt to insure the most satisfactory results. State what is required of explosives and necessary information will be forwarded.

ATLAS POWDER CO.

Manufacturers of High Explosives, Blasting Powder and Blasting Supplies

WILMINGTON, DEL.

ALLENTOWN, PA.	BIRMINGHAM, ALA.	BOSTON, MASS.	CHICAGO, ILL.	DES MOINES, IOWA
HOUGHTON, MICH.	JOPLIN, MO.	KANSAS CITY, MO.	KNOXVILLE, TENN.	McALESTER, OKLA.
MEMPHIS, TENN.	NASHVILLE, TENN.	NEW ORLEANS, LA.	NEW YORK, N. Y.	PHILADELPHIA, PA.
PITTSBURG, KANS.	PITTSBURGH, PA.	POTTSVILLE, PA.	ST. LOUIS, MO.	WILKES-BARRE, PA.

Products.

ATLAS BLASTING SUPPLIES and EXPLOSIVES, which include: Chemicals, Blasting Caps, Electric Blasting Caps, Blasting Batteries, Galvanometers, Rheostats, Leading and Connecting Wire, Thawing Kettles, Carrying Cases for blasting caps, etc.



TRADE-MARK

Dynamite.

Atlas Nitroglycerine Dynamite, Strengths 20% to 60%—A high explosive similar to the original dynamite. Exceedingly quick in action, it develops a great disruptive and shattering force, and should be used only where such an effect is desired. It is low freezing and may be used in open work in cold weather without thawing, if charges are fired promptly. Recommended for mud-capping rock, blasting ditches in wet ground, breaking old machinery and castings, etc. An Atlas No. 6 blasting cap or electric blasting cap should be used to detonate this explosive.



ATLAS POWDER

Atlas Extra Dynamite, Strengths 15% to 75%—For general blasting in mining, quarrying, railroad construction, road building, Atlas Extra is superior to Atlas nitroglycerine dynamite. Particularly suited to underground work as its fumes are not as objectionable as those given off by nitroglycerine dynamite. It exerts more of a heaving and lifting force, than a rending and shattering one. Atlas Extra is not recommended for very wet work, but is used to best advantage in comparatively dry operations where the material to be blasted is not unusually hard. It is low freezing and will not require thawing except in very severe weather.



ATLAS EXTRA

Atlas Low Freezing Gelatin Dynamite, Strengths 25% to 90%—Has all the advantages of ordinary gelatin dynamite, such as being waterproof, absence of objectionable fumes, etc.,



ATLAS GELATIN

and, in addition, does not freeze and become insensitive above 10° Fahr. Unequalled for blasting in mines and tunnels where the temperature is low and ventilation poor. Nothing weaker than a No. 6 blasting cap or electric blasting cap will properly explode it.

Atlas Low Powder, Strengths 5% to 20%—This is a low grade, granular high explosive which may be said to rank between blasting powder and dynamite. It is made in four grades: RRP, F, FF and FFF. RRP is the lowest grade and is usually put up in paraffined paper bags and packed in wood cases. Will run freely into bore holes and crevices. Other grades packed in cartridges like dynamite. Of great value in open work, such as quarries, railroad cuts, mine strippings, etc., when material to be blasted is comparatively soft and no great amount of water is present. Also used in blasting large stumps. Should be detonated with a primer of nitroglycerine dynamite of not less than 40% strength.



ATLAS RRP

Atlas Permissible Explosives.

Permissible explosives should be used in all gassy or dusty mines. When used according to Bureau of Mines' regulations they will not ignite coal dust or gas mixture. To meet the various conditions of coal mining, Atlas permissible explosives are made in nine grades under the name of "Coalite." They have all passed the tests demanded by the United States Government Bureau of Mines.

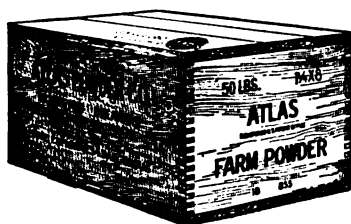
"Coalite"—Nine Grades: A, B, C, D, E, F, G, H and I. All "Coalites" are low freezing, resist water to considerable extent, thus being particularly effective in wet mines, and do not give off dangerous or objectionable fumes. Among these grades are explosives strong or weak, dense or bulky. "Coalites" E, F, H and I are best suited for use in soft, bituminous coal mines; "Coalites" A, C, D, and G are particularly adapted to mining anthracite and the harder bituminous coal; while "Coalite" B ranks between the two groups. All "Coalites" are put up in cartridge form in white paper shells.



COALITE (PERMISSIBLE EXPLOSIVE)

Atlas Farm Powder.

Especially adapted to agricultural blasting. It is a low freezing dynamite of moderate strength, intended for stump blasting, subsoiling, tree planting and ditching. Practically never requires thawing in weather in which a farmer would ordinarily use it. Requires a No. 6 or stronger detonator.



ATLAS FARM POWDER

Atlas Blasting Gelatin.

This gelatin is the most powerful explosive of Atlas manufacture. Comparing it with other explosives it may be said to be 100% in strength.

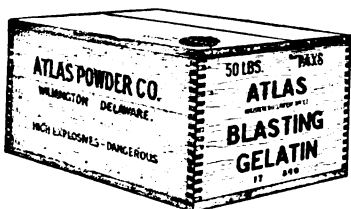
Like gelatin dynamite, it is water resisting and may remain under water for hours without losing its effectiveness.

It is used in bottoms of "cut holes" in tunnels, and in the bottoms of quarry holes where the rock is exceptionally hard, and in submarine blasting.

Atlas blasting gelatin should be used sparingly at first. Use a minimum rather than a maximum charge.

It is so much stronger than all other blasting explosives in common use that an overcharge may do considerable damage.

Blasting gelatin is packed in standard size cartridges and shipped in 50-lb. cases.



ATLAS BLASTING GELATIN

Atlas Blasting Powder.

Blasting powder is a slow acting, granular explosive, composed of charcoal, sulphur, sodium nitrate or potassium nitrate (saltpetre).

Two grades are manufactured: "B" blasting powder and "A" blasting powder. "B" blasting powder is usually used in coal mining and for blasting shale, earth and dimension stone. "B" blasting powder is manufactured in 7 granulations: FFFF, the finest, to CCC, the coarsest. The finer granulations are quicker in their action and exert a greater breaking and shattering effect on the material blasted; while the slower granulations have a tendency to lift and heave it out in large lumps. A mixed granulation consisting of FF, FFF and FFFF is used in railroad construction work.

Blasting powder does not freeze, but must be kept dry. It is useless when wet and when damp it loses its efficiency. Damp powder when exploded gives off much more smoke than dry powder. Blasting powder is packed and shipped in sheet steel kegs containing 25 lbs.



BLACK BLASTING POWDER

Atlas Blasting Machines.

Generate electric current for firing electric blasting caps. Made in five sizes:

No. 2 for stump and boulder blasting, quarrying and mining where it is not necessary to fire more than 10 charges at any one time.

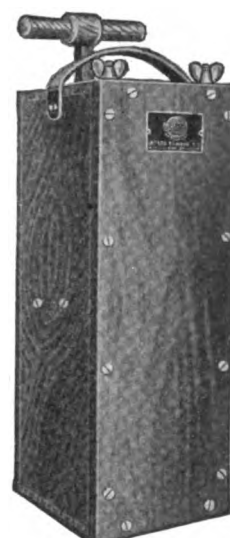
No. 3 will fire 30 electric blasting caps simultaneously. For quarrying, mining and blasting ditches.

No. 4 for use in quarrying and mining. Capacity, 50 copper wire electric blasting caps.

No. 5 for quarry and contracting work where a large number of charges are to be fired at once. Capacity, 100 copper wire electric blasting caps.

No. 6, extra powerful. Will fire 150 copper wire electric blasting caps.

Complete information about blasting machines sent on request.



BLASTING MACHINE

Davis No. 1 Blaster.

A light weight machine especially made for coal mining and other operations where it is not necessary to fire

more than one or two charges at a time. It has a capacity of 5 copper wire electric blasting caps and

weighs 3¼ lbs. It is operated by a removable key or handle which when kept in the possession of the blaster prevents the operation of the machine by any other person. This is an important safety feature.



DAVIS No. 1 BLASTER

Atlas Electric Blasting Caps.

Detonators containing electric wires embedded in the explosive charge and connected by a platinum bridge of high resistance. When an electric current is passed through one of these the charge is exploded.

They are made in two strengths, No. 6 and No. 8 and furnished with insulated copper wires of the following lengths: 4, 6, 8, 10, 12, 14, 16 ft. Longer lengths to order. The No. 6 electric blasting cap contains 1 gram of explosive charge and the No. 8 contains 2 grams.

All Atlas electric blasting caps are packed in pasteboard cartons, enclosed in heavy wood cases. Cartons contain either 25 or 50 depending on the length of wires. Waterproof electric blasting caps for submarine blasting are furnished in all lengths.



ELECTRIC BLASTING CAP

Atlas Blasting Cap Carrying Case—An absolutely moistureproof device, the first and only thing of its kind that enables the miner to take proper care of his day's supply of blasting caps. It holds 7 No. 6 or No. 8 blasting caps and is a means of carrying them conveniently and protecting them from moisture. It also prevents the lodging of foreign matter in the caps. Proper care of blasting caps maintains the efficiency of Atlas explosives.



BLASTING CAP CARRYING CASE

HERCULES POWDER CO.

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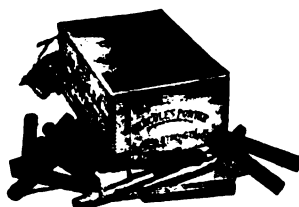
Products.

EXPLOSIVES of all kinds and **BLASTING SUPPLIES** which include: Blasting Machines, Galvanometers, Rheostats, Blasting Caps, Squibs, Victor Delay Electric Igniters, Leading Wire, Connecting Wire, Fuse, Cap Crimpers, Storage Magazines, Thawing Kettles, Blasting Paper, Tamping Bags, etc.

Explosives and Blasting Powders.

NITROGLYCERIN DYNAMITE—Hercules nitroglycerin dynamite is manufactured on both the regular and low freezing formulas in strengths from 15% to 60%.

This dynamite is suitable for work requiring strength and quickness, and gives the best results where a shattering effect is desired. Packed in standard cartridges, 50 lbs. to the case.



NITROGLYCERIN
DYNAMITE

EXTRA (AMMONIA) DYNAMITE—Hercules extra dynamite is made on both the regular and low freezing formulas in strengths from 15% to 60%. The extra grades may be considered as the explosive best adapted for general all around work.

Extra dynamite has the same strength, grade for grade, as nitroglycerin dynamite. It is, however, less expensive, and gives a more heaving than shattering action. It is recommended for mining, quarrying, digging wells, road and railroad construction, clay blasting, mudcapping, and most agricultural work. Packed in standard cartridges, 50 lbs. to the case.

HERCULES GELATIN DYNAMITE—Hercules gelatin dynamite is distinguished by plasticity, high density, imperviousness to water, and freedom from noxious fumes. It is made on the regular formula in strengths from 35% to 75% and the low freezing formula in strengths from 30% to 75%. Hercules gelatin is good for wet work. Its plasticity enables it to be loaded easily and effectively in holes having an upward slant, and the density and plasticity make it extremely well adapted for tight blasting in hard rock. It is packed in standard cartridges, 50 lbs. to the case.



HERCULES GELATIN
DYNAMITE

BLASTING GELATIN—Hercules blasting gelatin is the strongest, quickest, most waterproof and fumeless explosive manufactured for commercial purposes, having a strength of 100%. It is especially adapted for



use in cut holes, hard rock tunnel rounds and submarine blasts in hard rock. Packed in standard cartridges, 50 lbs. to the case.

RED H—Red H Permissible explosives belong to the ammonia nitrate class. The weight for weight strength of Red H powders approximates very closely that of 60% dynamite. On account of their bulkiness, they average about one-third more cartridges of a given size to the case than is found in a similar case of regular dynamite having the same sized cartridges; but each cartridge is equal to a cartridge of 35% dynamite. This makes Red H a very good substitute for the low grades of ammonia and nitroglycerin dynamite.

Red H Nos. 1 and 6 are the quickest in their action; Nos. 2 and 4 are of the intermediate quickness. Nos. 3 and 5 are the slowest and usually best adapted for blasting coal down in good lump form. Nos. 1, 2, 3, and 7 are high freezing; Nos. 4, 5 and 6 are low freezing. Nos. 1 and 2 can be used in a frozen condition, providing the cartridge receiving the blasting cap is loosened up by rolling before it is inserted. Red H is packed in standard cartridges, 50 lbs. to the case.



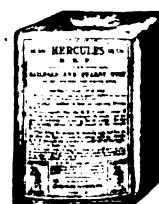
RED H

XPDITE—Xpdite belongs to the nitroglycerin class of permissibles. While the fumes given off are not always as good as those from Red H, this dynamite will stand water better and is recommended for wet work. Nos. 1 and 2 are the strongest, quickest and best adapted for blasting coal that is desired in a well-broken condition. Nos. 3 and 6 are weakest and the latter is low freezing and gives the best results in blasting thin coal that has been undercut. Packed in standard cartridges, 50 lbs. to the case.



XPDITE

R. R. P.—Hercules R. R. P. belongs to the class known as granular dynamite, often called Judson. R. R. P. is best adapted for use in soft, seamy material, tunnel blasts in hard rock, and heavy blasts where it is necessary to fire them in fairly hard material. Packed in paraffined paper bags containing 12½ lbs. The standard case holds 4 of these bags, making a net weight of 50 lbs.



R. R. P.

"F" POWDERS—The Hercules "F" powders are similar to R. R. P., but contain a small amount of nitroglycerin, which is as follows: F, 10%; FF, 15%; FFF, 20%. (Do not confuse these powders with blasting powder having the "F" granulation markings.) "F" powders are packed in cartridges like ordinary dynamite, 50 lbs. to a case.



"F" POWDERS

BLASTING POWDERS—The HERCULES POWDER CO. manufactures two high grade blasting powders: "A" blasting (or saltpetre powder), and "B" blasting (or soda powder).

"A" blasting powder is for use in dimension stone, slate and granite quarries.

"B" blasting powder is for use in non-gaseous coal mines, coal stripping, quarry, and construction work. It is manufactured in all sizes of grains, glazed and unglazed. From FFFF, about $\frac{1}{8}$ in. diameter, to CCC, about $\frac{1}{2}$ in. diameter. A special granulation called R. R. is made for large blasts. Packed in kegs containing 25 lbs. net.



BLASTING POWDERS

Hercules Blasting Machines.

An apparatus for generating electric current used in firing electric blasting caps, squibs and igniters; made in 6 sizes with capacity for detonating from 3 to 150 shots in series, as follows:

Size	Capacity, Electric Blasting Caps Copper Wires
Midget	3
No. 2	10
No. 3	30
No. 4	50
No. 5	100
No. 6	150



HERCULES BLASTING MACHINES

Electric Blasting Caps.

These are used to detonate charges of high explosives by means of electricity. They are made in two strengths, No. 6 and No. 8. These are connected with insulated copper wires from 4 to 30 ft., or with iron wires from 2 to 8 ft. Packed 25 or 50 to the carton, 10 cartons to the case.



ELECTRIC BLASTING CAP

Electric Squibs.

Hercules electric squibs are similar in appearance to electric blasting caps, except that a paper shell is used instead of copper, and are used to fire charges of blasting powders. The advantages of electric squibs are that more than one shot may be fired at one time, resulting in a saving of both powder and time. Electric squibs are made with 4- to 8-ft. iron wires and 4- to 30-ft. copper wires. Packed 25 and 50 to the carton, 10 cartons to the case.

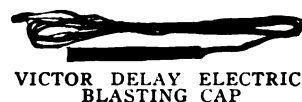


ELECTRIC SQUIBS

Victor Delay Electric Blasting Caps.

These are made in two delays. Three different periods can be obtained by using regular electric blasting caps in the same circuit. Delay electric blasting

caps are made with copper wires 4 to 30 ft. Packed 25 and 50 to the carton, 10 cartons to the case.



VICTOR DELAY ELECTRIC BLASTING CAP

Leading Wire.

Hercules leading wire is an insulated copper wire (No. 14 B. & S. gage) used for connecting electric blasting cap circuits to the blasting machine. It is furnished in coils from 200 to 500 ft.



LEADING WIRE

Connecting Wire.

Hercules connecting wire is used to join the wires of electric blasting caps. It is a high grade insulated copper wire (No. 20 or No. 21 B. & S. gage), and is put up in 1- and 2-lb. spools.

Blasting Caps.

Blasting caps are used to detonate charges of high explosives. As the efficiency of any high explosive depends on the initial shot, this company does not recommend caps smaller than Hercules No. 6. Standard sizes Nos. 6 and 8. Packed 100 in a box, 5 to 100 boxes in a case.



BLASTING CAPS

Miner's Squibs.

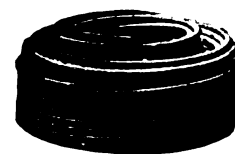
Squibs are used for firing charges of blasting powder. "Artificial Straw" and "Rocket" squibs burn with a flame. "Chinese" or "Gas" squibs burn with an ember, no flame. Packed 100 to the box, 100 boxes in a case.



MINER'S SQUIBS

Safety Fuse.

The HERCULES POWDER CO. carries all standard brands of fuse. All brands have definite burning speeds, and are packed in coils of 100 ft. Cases contain from 5 to 60 coils.



SAFETY FUSE

Storage Magazines.

The HERCULES POWDER CO. carries a complete line of sidewalk and steel storage magazines.



STORAGE MAGAZINES

Further Information.

The HERCULES POWDER CO. publishes literature dealing with various kinds of work in which explosives are used. Copies may be had on request. The Hercules Service Division is always glad to answer in detail any request for information on the subject of explosives and their uses.

EQUIPMENT CORPORATION OF AMERICA

Construction, Industrial and Material Handling Equipment

1480 Lumber Exchange Building

CHICAGO, ILL.

TELEPHONE:
RANDOLPH 6586

BRANCH OFFICES

PHILADELPHIA, PA., 680 Land Title Building—Telephone, SPRUCE 5498
PITTSBURGH, PA., 880 Empire Building—Telephone, COURT 2424

Products.

CONSTRUCTION, INDUSTRIAL and MATERIAL HANDLING EQUIPMENT as follows:

Trench Backfillers; Bar Benders; Locomotive Fire Box Boilers; Buckets: Clamshell, Scraper or Dragline; Cars: Dump, Industrial; Concrete Cars and Carts; Coal and Ash Handling Machinery; Portable Compressors: Air or Gas; Cranes: Locomotive, Traction; Crushers: Gyratory, Jaw; Derricks: Guy, Stiff Leg; Dragline Excavators; Hammers: Pile, Steam; Hoists: Contractors, Electric, Gasoline, Steam; Locomotives: Industrial or Mine; Mixers: Concrete, Mortar; Sheet Steel Piling; Portable Pumping Sets, Gasoline Driven; Pumping Sets: Steam, Gasoline or Motor Driven; Pumps: Centrifugal, Diaphragm, Power; Industrial Railways; Road Rollers; Steam Shovels; Switches: Track, Industrial Railway; Track: Industrial; Steel; Tractors: Industrial, Gasoline.

A large stock is carried at all times of the following: Air Compressors, Clamshell Buckets, Cars (24-in., 36-in. and standard gage), Concrete Mixers, Cranes (Locomotive and Traction), Derricks, Hoists, Locomotives, Pumps, Road Rollers, Steam Shovels and Industrial Track.

Slogan.

"We Buy—Rebuild—Sell—or Rent."

Rebuilding Facilities.

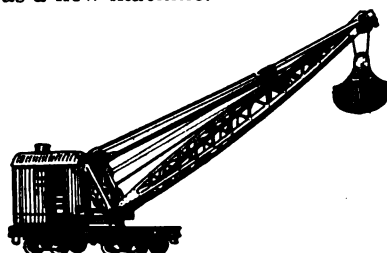
We have three rebuilding plants located in Chicago, Pittsburgh and Philadelphia, fully equipped with all the facilities necessary to honestly rebuild used equipment so that we can safely and conscientiously guarantee to replace any defective parts in any piece of equipment we sell.

Every machine that carries our warranty certificate has been torn down to the main frame, all parts dipped in a hot acid to remove dirt, grease and paint, so that each part can be minutely inspected for wear and defects. It is then rebuilt by a corps of well trained mechanics under the supervision of experts.

Every bearing is rebabbitted, every gear or pinion which shows excessive wear is replaced with new, and the completed machine not only looks like new but will really perform as well as a new machine.

Cranes.

Locomotive, both 4- and 8-wheel. Also cranes on traction wheels.

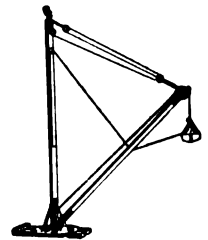


LOCOMOTIVE CRANE



Derricks.

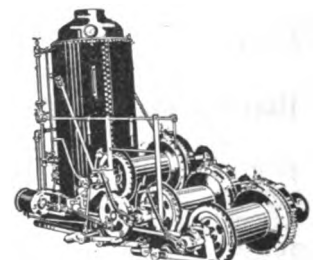
Both stiff leg and guy derricks, arranged for clamshell bucket operation or hook work. Furnished with buckets if desired.



GUY DERRICK

Hoists.

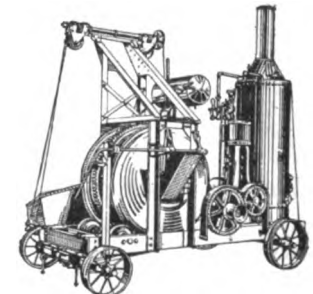
Steam, gasoline or electric hoists; single, double or triple drum.



STEAM HOIST

Concrete Mixers.

All sizes with steam, electric or gas power. Equipped with elevating side loaders, batch hoppers or low charging platforms.

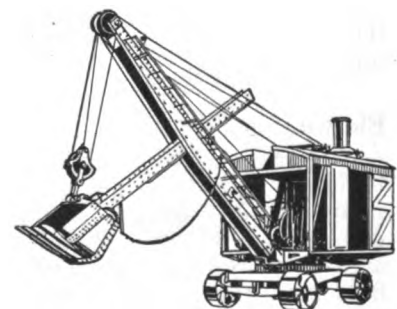


CONCRETE MIXER

Steam Shovels.

Mounted on traction wheels, railroad trucks, or caterpillar traction.

All sizes from 3/4-yd. to 4-yd. dipers.



STEAM SHOVEL

Service.

We rent or sell complete plant for construction work including steam shovels, cranes, concrete mixers, and hoisting engines. This organization has had 15 years' experience in building and rebuilding construction and industrial equipment. Our sales force includes engineers capable of figuring on equipment needs, and making recommendations that will oftentimes save money.

ESTABLISHED 1882

KEYSTONE DRILLER CO.

Manufacturers of Traction Excavators

BEAVER FALLS, PA.

For Branch Offices, see Page 41

Products.

TRACTION EXCAVATORS.
For Drills and Pumps,
see page 41.

**Keystone Excavators.**

The Keystone excavator is a light, traction steam shovel for contractors' general use.

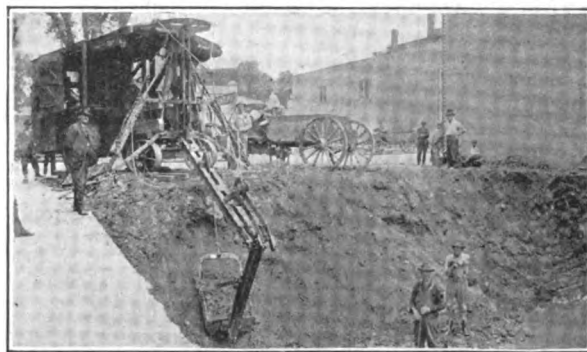
Model 4 weighs 14 tons. It has a long wheel base, about 10 ft. Two traction speeds, $1\frac{1}{2}$ and 3 miles per hour. Equipped with 3 readily interchangeable buckets—skimmer, drag-ditcher and clamshell, it can be used on a wide variety of work—road grading, stripping, ditching, back-filling, cellar digging and unloading cars. Has long horizontal crowd—14 ft. and powerful thrust. Will lift old macadam, etc., without rooting. Used most for road work and ditching, with skimmer and drag-ditcher.

Model 4 is constructed entirely of steel, has an 18-ft. boom and operates regularly a $\frac{1}{2}$ -yd. scoop. Has double engine and hydraulic side jacks. Boom swings through half circle. Clamshell attachment gives boom length of 26 ft.; 18-ft. radius; bucket clears 13 ft. above

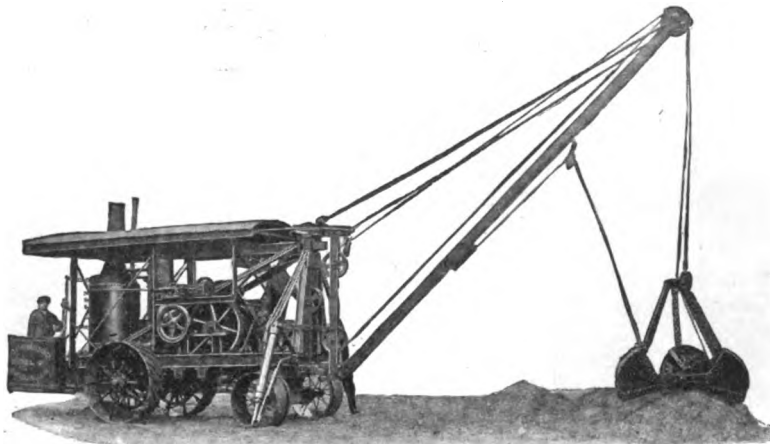
ground. With drag-ditcher attachment bucket reach is 26 ft.

SPECIFICATIONS MODEL 4

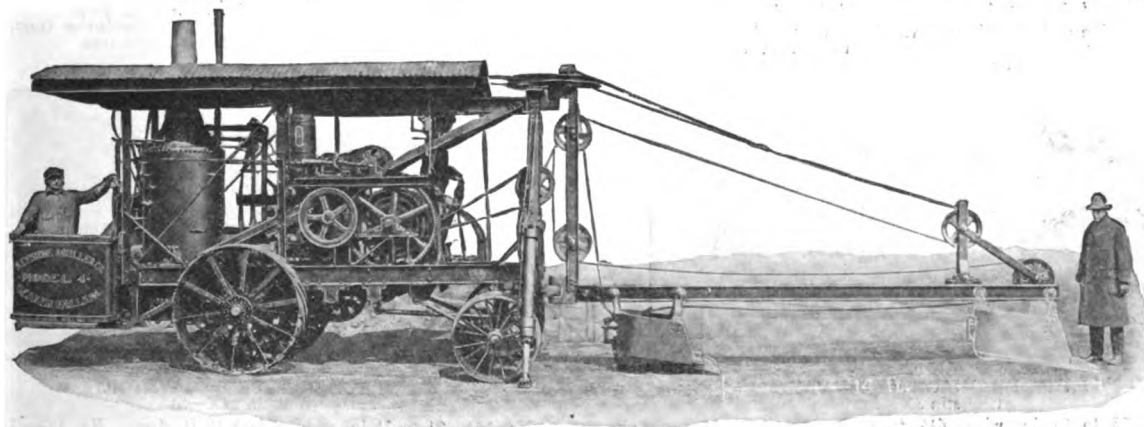
Weight, 14 tons.	Length of boom, 18 ft.
Construction, all-steel	Horizontal crowd, 14 ft.
Engine:	Skimmer, $\frac{1}{2}$ yd.
Two-cylinder	Dipper, $\frac{1}{2}$ yd.
32 h. p.	Clamshell, $\frac{1}{2}$ yd.
Boiler, 40 by 72 in.	Width of ditches, 12 to 36 in.
Depth of ditching, 16 ft.	



DRAG-DITCHER SCOOP, USED IN DITCHING, BACKFILLING AND CELLAR DIGGING, (MODEL 3)



CLAMSHELL, FOR UNLOADING CARS, DEEP DITCHING, ETC. (MODEL 4)



SKIMMER SCOOP, FOR ROAD GRADING AND GENERAL EXCAVATION (MODEL 4)

PAWLING & HARNISCHFEGER CO.

Manufacturers of Excavators and Backfillers

MILWAUKEE, WIS.

BRANCH OFFICES

PHILADELPHIA, PA., WALTER PRICE, Stephen Girard Building	NEW ORLEANS, LA., T. W. WADDELL, Whitney Central Building
NEW YORK, N. Y., WALTER PRICE, 50 Church Street	SEATTLE, WASH., S. W. SELFRIDGE, L. C. Smith Building
PITTSBURGH, PA., GEO. L. MEAD, Fidelity Building	SAN FRANCISCO, CAL., R. M. TAYLOR, Monadnock Block
CHICAGO, ILL., R. A. S. JOHNSON, Monadnock Building	LOS ANGELES, CAL., ROY S. YOUNGLOVE, Central Building
PORTLAND, ORE., S. W. SELFRIDGE, Yeon Building	

SALES REPRESENTATIVES

SALT LAKE CITY, UTAH, LANDES & Co., INC., Corner 2nd West & South Temple	MINNEAPOLIS, MINN., Wm. H. ZIEGLER Co., 423 South Fifth Street
KANSAS CITY, MO., VICTOR L. PHILLIPS, 7th and Delaware Streets	HARTFORD, CONN., K. B. NOBLE Co., 249 Pearl Street
CHICAGO, ILL., W. B. LOUER Co., Old Colony Building	PHILADELPHIA, PA., EDELEN & Co., 235 Commercial Trust Building
DALLAS, TEX., S. A. ELLSBERY, 501 Deere Building	ATLANTA, GA., W. E. AUSTIN MACHINERY Co., 2 Spring Street
DENVER, COLO., LANDES & Co., Boston Building	PITTSBURGH, PA., BECKWITH MACHINERY Co.

Products.

EXCAVATORS; BACKFILLERS.

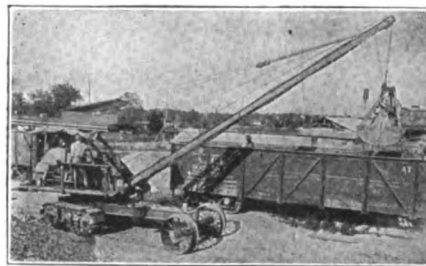
Also manufacturers of Grab Buckets, Drilling and Boring Machines.

For Traveling Cranes and Hoists, see pages 658-59.

Service.

P & H service is as vital and valuable to the man who uses P & H machinery as is the superior construction and design that are a part of every machine made by PAWLING & HARNISCHFEGER CO.

Wearing parts are easy to get at, and a complete stock of repair parts for every P & H machine is always on hand, ready to be shipped; these are important factors to be considered in the purchase of a machine.



EXCAVATOR CRANE
(Bulletin 5X-S)

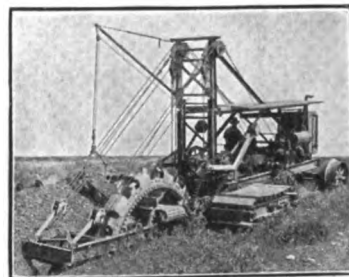
No. 205—30-ft. boom, $\frac{1}{2}$ -cu. yd. capacity bucket. 4-cylinder, 5 by 6 $\frac{1}{4}$ -in., 40-h.p. Waukesha engine, using either gasoline or distillate. A combination machine capable of a variety of applications such as excavating, backfilling and material handling



DRAGLINE EXCAVATOR
(Bulletin on request)

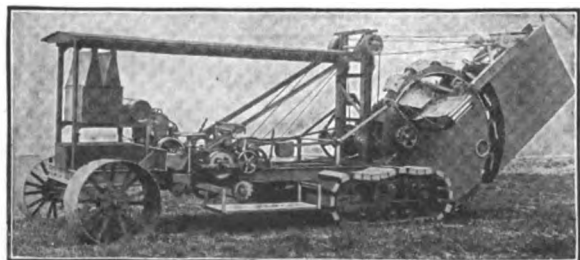
No. 205—30-ft. boom, $\frac{1}{2}$ -cu. yd. capacity. No. 210—48-ft. boom, 1-cu. yd. capacity; 55-ft. boom, $\frac{3}{4}$ -cu. yd. capacity.

Gasoline and electric power. Corduroy traction. Also adapted for backfilling and may be used with clamshell. An excellent general purpose outfit



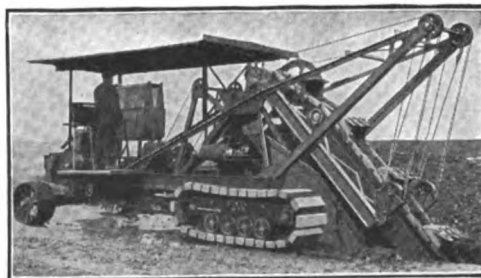
PIPE LINE EXCAVATOR
(Bulletin 1X-S)

Built for various trench dimensions.
No. 122—15 to 21 in. by 6 $\frac{1}{2}$ ft. deep.
No. 123—20 to 24 in. by 6 $\frac{1}{2}$ ft. deep.
No. 125—20, 24 and 28 in. by 7 $\frac{1}{2}$ ft. deep.
4-cylinder gas-kerosene motor. Corduroy traction.
Adapted to pipe line and conduit construction



FARM DRAINAGE EXCAVATOR
(Bulletin 3X-S)

No. 102—15 to 21 in. wide, 6 $\frac{1}{2}$ ft. deep. No. 103—15 to 21 in. wide, 6 $\frac{1}{2}$ ft. deep. No. 105—20 to 24 in. wide, 7 $\frac{1}{2}$ ft. deep. 4-cylinder gas-kerosene motors. Corduroy traction only



LADDER TYPE EXCAVATOR
(Bulletin 24X-S)

No. 151—21 to 31 in. wide, 8 and 10 ft. deep. No. 152—27 to 39 in. wide, 10 and 12 ft. deep. No. 153—27 to 42 in. wide, 12 and 15 ft. deep. 4-cylinder gas-kerosene motor. Corduroy traction only

SAUERMAN BROS.

Cableway Excavators, Power Scrapers and Fittings

1145 Monadnock Block

CHICAGO, ILL.

Products.

Manufacturers of CABLEWAY EXCAVATORS, POWER SCRAPERS (Patented).

Also Cableway Fittings.

Sauerman Dragline Cableway Excavators.

Uses—The following is a partial list of the classes of work for which Sauerman dragline cableway excavators have been installed: excavating sand and gravel from under water and from dry pits; loading ballast to cars; backfilling retaining walls; reclaiming coal from stock piles and storage pits; deepening river beds; building levees and dams; handling road material; stripping clay beds and removing overburden; removing sand bars, islands and earth dams from rivers; reservoir construction and cleaning.

Description—The Sauerman dragline cableway excavator consists primarily of a bucket and carrier mounted on a slack track cable. This track cable is supported at the power end by a mast or tower, and at out-board end is anchored to the ground or suitable support, so as to form a proper incline for gravity return of the bucket. The track cable is not directly attached to the mast, but to a set of fall blocks at top of the mast, controlled by a light-cable known as the

tension line. The tension line is controlled by rear drum of double drum friction hoist. By letting out or taking in this line, the track cable is lowered or raised. The loading, conveying and dumping of the bucket is accomplished by load line attached to front of bucket and leading through sheave block at top of mast to front drum of hoist.

Advantages—Sauerman dragline cableway excavators will dig, elevate, convey the material over a span of 700 ft. or more and will dump the material at any point. These excavators are operated entirely by one man and dig equally as well under water as in dry material.

Bottomless Power Scrapers.

Uses—The "Excavator Type" Sauerman bottomless power scraper is used for excavating gravel from hillsides, stripping overburden and general excavation work. The "Type C" Sauerman bottomless power scraper is used for rehandling loose materials, storing and reclaiming coal, etc.

Operation—Operated by a double drum friction hoist which pulls the scraper back and forth over the material. Being bottomless, the scraper deposits its load automatically when the operator puts the pull-back cable in operation.



CABLEWAY DIGGING GRAVEL FROM WET PIT



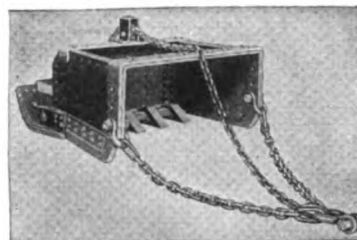
CABLEWAY INSTALLED FOR GENERAL EXCAVATION WORK



"TYPE C" SCRAPER RECLAIMING COAL FROM GROUND STORAGE



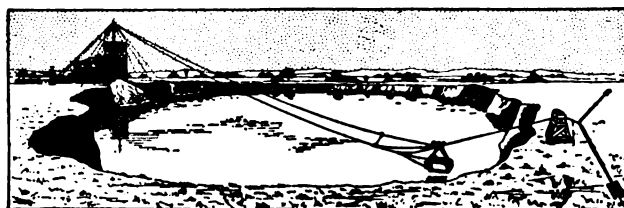
CABLEWAY BUCKET CONVEYING COAL FROM STORAGE PIT



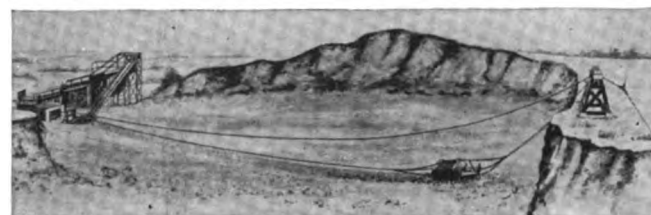
FRONT VIEW OF "EXCAVATOR TYPE" POWER SCRAPER



DELIVERING COAL TO HOPPER AT POWER PLANT



TYPICAL CABLEWAY INSTALLATION FOR GRAVEL PLANT



"EXCAVATOR TYPE" SCRAPER DIGGING AND CONVEYING GRAVEL



RECLAIMING COAL FROM PIT WITH "TYPE C" SCRAPER

FOUNDED 1880

THE BROWN HOISTING MACHINERY CO.

Manufacturers of Locomotive Cranes

CLEVELAND, OHIO

BRANCH OFFICES

NEW YORK, N. Y., 50 Church Street

PITTSBURGH, PA., Oliver Building

CHICAGO, ILL., 208 South La Salle Street

SAN FRANCISCO, CAL., Monadnock Building

EUROPEAN REPRESENTATIVE, H. E. HAYES, 12 Rue de Phalsbourg, PARIS, FRANCE

Products.**BROWNHOIST LOCOMOTIVE CRANES.**

Also manufacturers of Bridge Tramways; Fast Plants; Cantilever Cranes, Overhead Traveling Cranes, Work Car Cranes, Jib Cranes, Pillar Cranes, Bridge Cranes; Electric Hoists; Tramrail Systems; Trolleys; Crabs; Winches; Tubs; Furnace Hoists; Pig Iron Breakers, and Coal and Ore Dumping Machines; Transfer Cars; Floating, Gantry and Portal Cranes; Dragline Excavators; Monorail Hoists; Grab Bucket Trolleys; Car Loaders and Unloaders.

For Grab Buckets, see pages 96-97; for Coal and Ash Handling Machinery, see page 702.

Brownhoist Locomotive Cranes.

Types—These cranes are made in the following sizes: Nos. 2, 3, 4 and 6, and there are several types of each size. They can be operated by steam, electricity or gas engine. The No. 2 and No. 3 sizes are equipped with 4 wheels and the larger sizes are mounted on two M. C. B. standard 4-wheel trucks. Various lengths of booms can be used on the various types.

Uses—The cranes can be used for practically all kinds of hoisting work and for handling materials. Some of the uses are handling coal, ore, coke, cinders, gravel, crushed stone, etc., with grab bucket; excavating with dragline or orange peel buckets; driving piles;

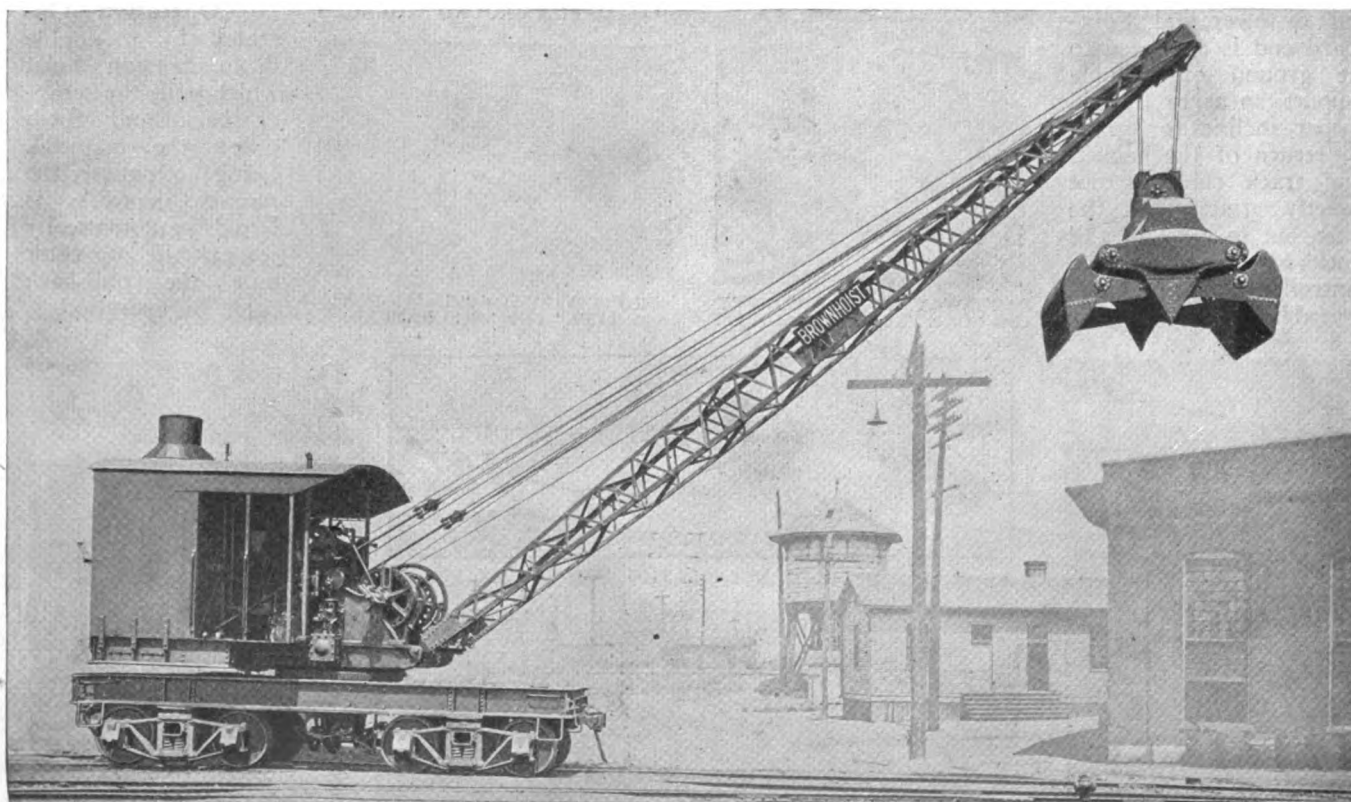
BROWNHOIST

TRADE-MARK

pulling piling; handling materials with lifting magnet; and with bottom block for handling tubs and miscellaneous loads; and switching cars.

Speeds—The cranes are equipped with a pair of high speed engines of large diameter and short stroke. Locomotive crane service requires almost constant starting and stopping of the engines, and the engines on Brownhoist cranes develop full power much quicker than the small diameter engines with longer stroke. Under working conditions the engine speeds run from 100 to 700 r.p.m. On a No. 4 steam crane with fully loaded bucket, the hoisting speed is approximately 200 f.p.m. Hoisting or lowering empty hook on one part line on this crane is about 500 f.p.m. Maximum rotating speed with full load is about 3 to 4 r.p.m. Travel speed with full load on straight level track is approximately 600 f.p.m. Speeds under various conditions will be given on request.

Capacities—Capacities vary for the different types, and in the table on opposite page are given capacities at various radii for one type of crane of each size. Larger and smaller capacities are obtained with different type cranes and different length booms. The cranes can be overloaded anywhere from 15% to 60% of the figures given before the crane will tip. With outriggers the overload is a still greater percentage of the rated capacity given.



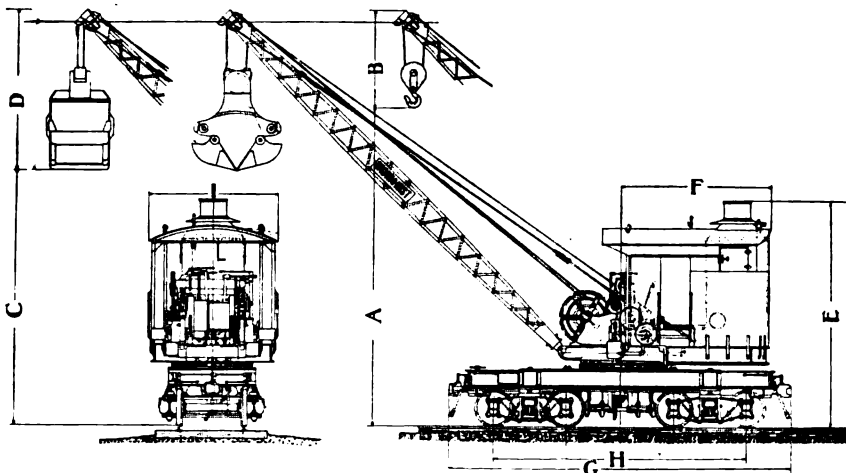
BROWNHOIST STANDARD NO. 4 STEAM LOCOMOTIVE CRANE WITH BROWNHOIST 54-CU. FT. LINK-TYPE COAL GRAB BUCKET
No. 4 and No. 6 Cranes are mounted on two M.C.B. standard 4-wheel trucks

CLEARANCE TABLE

With same lengths of boom as given in table on this page—booms at 45° angle.

	No. 2	No. 3	No. 4	No. 4	No. 6
A	22'- 0"	24'	29'	29'	31'
B	6'- 0"	7'	7'	7'	9'
C	20'- 0"	22'	27'	27'	29'
D	8'- 0"	9'	9'	9'	11'
E	15'- 2"	16'	17'- 2"	17'- 2"	17'- 3"
F	10'- 6"	9'-10"	9'-10"	9'-10"	12'- 6"
G	10'- 1"	12'	26'	26'	28'
H	7'- 0"	8'	19'- 2"	19'	20'
I	8'-10"	10'	8'- 8"	8'- 8"	10'

For bucket dimensions, see page 97.



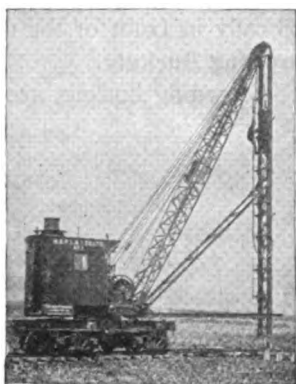
CLEARANCE DIAGRAM OF BROWNHIST CRANES

Traveling Mechanism—The 4-wheel cranes are supplied with a traveling shaft connected to both axles. On 8-wheel cranes the traveling shaft is connected to one axle on each truck. The shaft is jointed with universal couplings which insure a good mesh of the gears when the crane is traveling on a curve.

The cranes will operate on 60° curves, and also up grades.

Boilers—The steam cranes are supplied with vertical tube boilers having quick steaming qualities. Each boiler is made to comply with the strictest state boiler laws. The size depends upon the size of crane. Boilers are supplied for coal, coke, wood or oil firing.

Operation—All cranes are operated and fired by one man. A platform is provided for the operator where he can easily reach all levers and brakes necessary for operation. The platform is elevated so that the operator can have a full view of the work at all times.



NO. 4 CRANE EQUIPPED WITH LEADS AND STEAM HAMMER FOR DRIVING PILES

CAPACITIES, WEIGHTS AND WHEEL LOADS

Crane	Radius, ft.	Capacities, lbs.		Total weight of crane, lbs.		Max. wheel loads, boom at right angle to tracks, lbs.	
		Without out-riggers	With out-riggers	With block and full load	With bucket and full load	With block and full load	With bucket and full load
No. 2 Type B 25-ft. boom	15 20 25	11100 7600 5700	..... ..... .....	55100	57600	27000	20000
No. 3 Type G 35-ft. boom	12 20 30 39	28000 16300 9600 6700	..... ..... ..... .....	122000	101500	58000*	48500*
No. 4 Type J 40-ft. boom	13 20 30 40 44	39300 23000 13800 9500 8300	40000 27300 17300 12300 8800	160500	136500	38000	32500
No. 4 Type A 40-ft. boom	13 20 30 40 44	42000 24400 14400 9700 8000	44600 27800 17300 12100 8000	170500	138500	40500	33000
No. 6 45-ft. boom	12 15 20 30 40 49	60000 46000 32000 18000 12000 10000	90000 77000 56000 36000 25000 19000	231000	181000	50000	40000

*Max. wheel loads with boom over one wheel and all wheels supported.

No. 2—29000 lbs. with block—20000 lbs. with bucket.

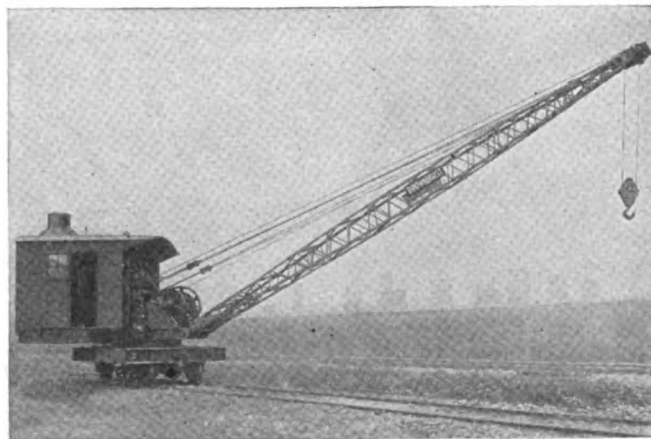
No. 3—66000 lbs. with block—55000 lbs. with bucket.

Prices.

Prices will be given on the type of crane necessary to fulfil required conditions.



BROWNHIST NO. 6 STEAM LOCOMOTIVE CRANE FEEDING MATERIAL TO CENTRAL MIXING PLANT



BROWNHIST NO. 3 LOCOMOTIVE CRANE EQUIPPED WITH HOOK AND BLOCK

No. 2 crane is also mounted on 4 wheels or may be equipped with traction wheels or Brownhoist creeper trucks

THE BROWNING COMPANY

Builders of Locomotive Cranes

CLEVELAND, OHIO

SALES OFFICES

NEW YORK, N. Y.
SAN FRANCISCO, CAL.

LOS ANGELES, CAL.
PORTLAND, ORE.
CHICAGO, ILL.

SEATTLE, WASH.
SALT LAKE CITY, UTAH
PHILADELPHIA, PA.

BIRMINGHAM, ALA.
MONTREAL, CAN.

Products.

Manufacturers of LOCOMOTIVE and PORTAL CRANES and their ACCESSORIES, such as Buckets, Pile Driver Leads and Steam Shovel Attachments.

Browning Crane.

The Browning locomotive crane is made in various sizes and with either 4 or 8 wheels. It is self-propelling, carries any length of boom and revolves in a full circle.

Independent Rotating Engine—The Browning crane is equipped with an independent swinging engine, thereby eliminating the double rotating clutches. This arrangement increases the speed and ease of operation, and permits of variable speeds in rotating, without in any way changing the speed of the hoist or travel when the crane is rotating, hoisting, and traveling at the same time.

Engines—The engines are of the vertical slide valve type, reversible by means of Stevenson links. The cylinders and crosshead guide are cast and bored in one piece, which insures absolute alignment.

Clutches—All clutches except the hoist are of the positive, or jaw-clutch type. The hoist clutch is the Browning patent all-steel type. This clutch consists of 5 parts, the grip being accomplished by expanding a square helical spring against the inner side of a clutch ring. All parts are case hardened.

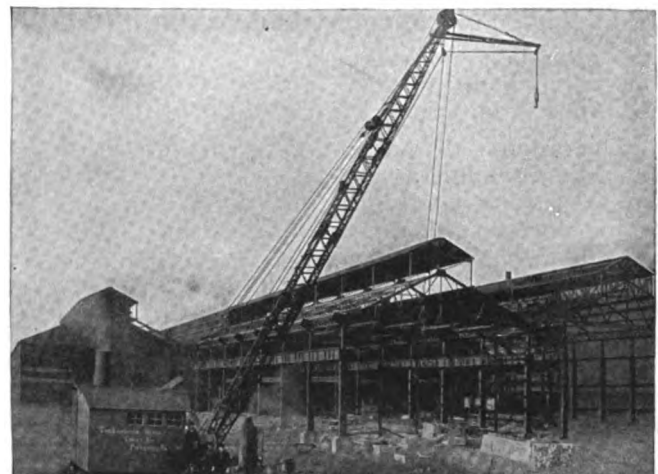
Operation—The operator stands on a raised platform so that he has an unobstructed view of the work ahead at all times. The levers and controls are arranged vertically in front of the operator.

Browning Buckets.

Browning buckets are especially designed by engi-



FORD MOTOR CO. CRANES EQUIPPED WITH CLAMSHELL BUCKETS



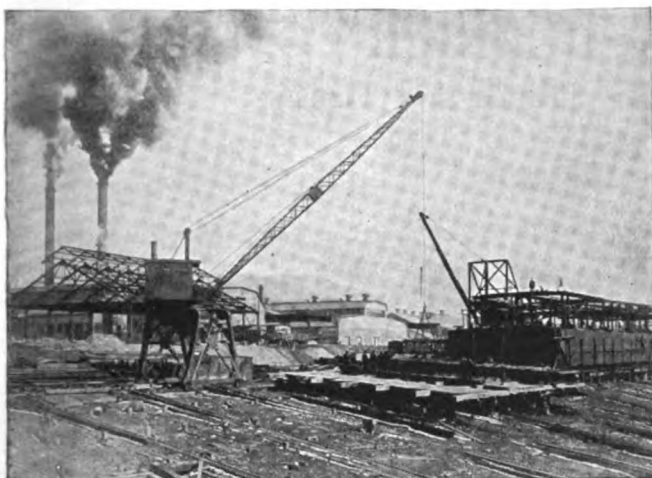
LAWRENCE STEEL CONSTRUCTION CO. CRANE EQUIPPED WITH SPECIAL BOOM EXTENSION FOR ERECTION WORK



LOCOMOTIVE CRANE EQUIPPED WITH GENERATOR AND MAGNET



BROWNING LOCOMOTIVE CRANE WITH STEAM SHOVEL ATTACHMENT DOING THE WORK OF A STEAM SHOVEL



PORTAL CRANE
Can be equipped for either steam or electricity

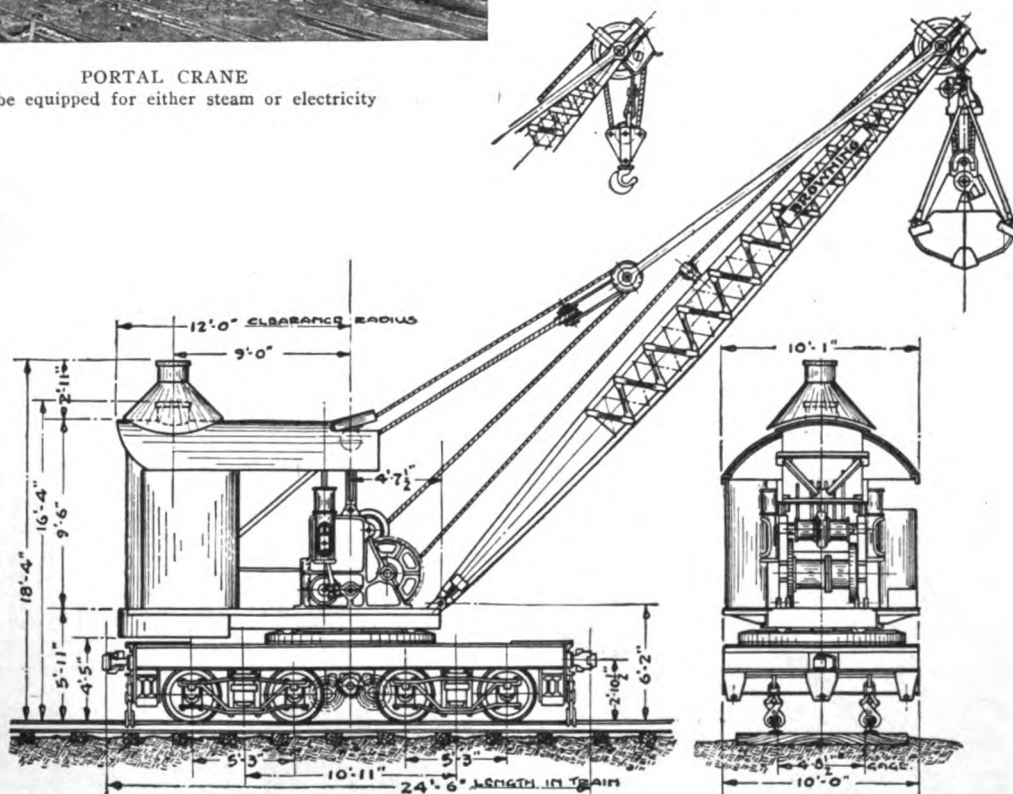
neers of combined crane and bucket experience for the particular line of work they are to perform, and insure satisfactory performance under the most difficult working conditions. All wearing parts are bronze bushed and carry individual grease cups.

Co-operative Service.

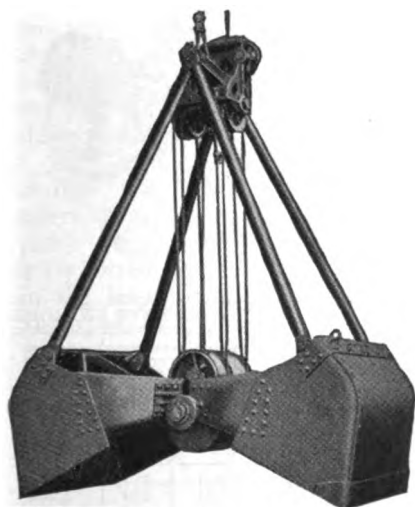
THE BROWNING COMPANY invite correspondence and questions on any type of work requiring machinery of this nature, and will furnish without charge complete information accompanied by photographs when possible.

Catalogues.

New catalogues of the Browning cranes and buckets which will show their wide adaptability and explain their economical operation, will be sent free on request.



CLEARANCE DIAGRAM AND DETAILS OF BROWNING LOCOMOTIVE CRANE



Reeved Type
A powerful digger recommended for work in very hard and lumpy materials



Flat Chain Type
A good bucket for handling coal and ashes; well built, and serviceable



Wood Grapple
For handling pulp wood and logs rapidly and economically. Correctly built to hold the largest load possible

THREE TYPES OF BROWNING BUCKETS

BUFFALO HOIST & DERRICK CO.

Manufacturers of Locomotive Cranes and Hoists

129 Erie Street
BUFFALO, N. Y.

NEW YORK OFFICE, 30 Church Street

Products.

LOCOMOTIVE CRANES, STEAM and ELECTRIC HOISTS.

Gasoline Hoists, Derricks, Tractocranes, Horse and Hand Power Hoisting Machinery, Boom Swingers, Sheave Blocks, Bull Wheels, Sheaves, Derrick Fittings.

For Clamshell Buckets, see page 95.

Locomotive Cranes.

10-ton, 4-wheel U. S. gauge or 15-in. face tractor-crane wheels.

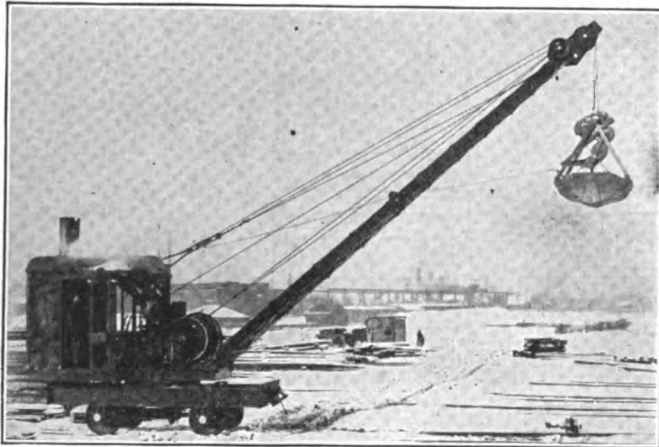
Designed for either hoisting operations (using block and hook or magnet), or for operating a 2-line clamshell bucket of the grab bucket type. It will handle a $\frac{3}{4}$ -cu. yd. bucket of this type, at a radii of 39 ft. 6 in. measured from the center of the track. This crane can also be used for shifting cars as it has ample power to push or pull a string of 3 or 4 heavily loaded freight cars.

All operations of hoisting, swinging, traveling, raising and lowering the boom or operating the grab bucket are performed by power.

The crane has bronze bushed bearings throughout.

All gears and frames are steel casting.

Further information on request.



10-TON 4-WHEEL STANDARD BUFFALO LOCOMOTIVE CRANE AND 1-CU. YD. BUFFALO STANDARD CLAMSHELL BUCKET IN USE BY A LARGE BUFFALO STEEL COMPANY

Steam Hoists.

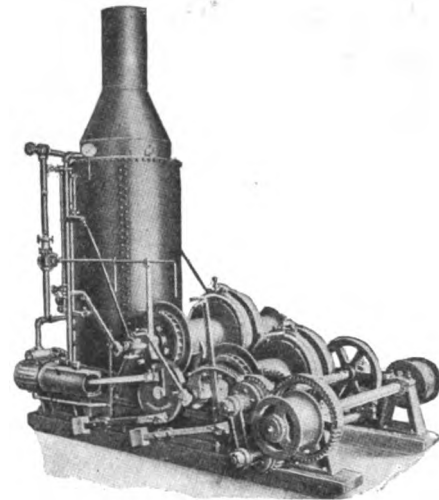
Improved type of engine for use in connection with general hoisting designed with single, double or triple drum, with or without boom swinger. Engines are the modern short stroke type with large steam and exhaust ports.

Lever are located so operator can handle both drums without changing his position; foot brakes are directly under operator.

Cylinders and guides are cast in one piece, being rigid and strong. Cylinder and crosshead guide bored at one setting, thereby insuring perfect alignment.

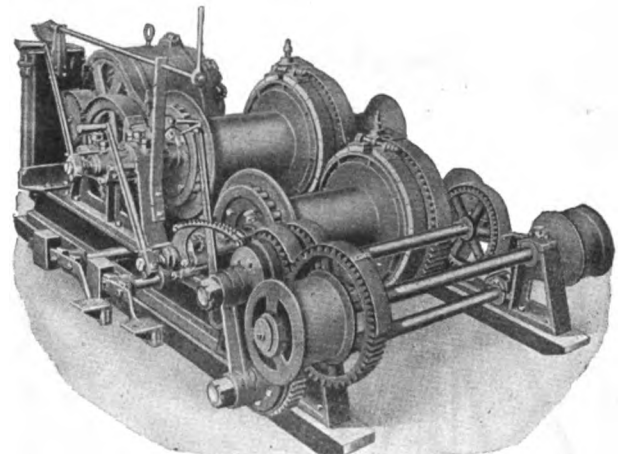
Electric Hoists.

The illustration represents the double drum electric hoist with the Buffalo latest and most improved swinger. Hoist is especially designed with single, double or triple drum and with or without swinger attached.



DOUBLE DRUM STEAM HOIST WITH SWINGER

Code word	Order No.	Nominal h.p.	Size of cylinders, bore and stroke, in.	Load hoisted, single rope, average speed	Drums		Boilers			Approx. shipping weight, lbs.
					Diam., in.	Length, in.	Diam., in.	Height, in.	No. of 2-in. tubes	
Emarate	20 $\frac{1}{2}$	10	5 $\frac{1}{2}$ x 8	3,000	12	23	36	78	68	9,000
Embalm	21 $\frac{1}{2}$	18	6 $\frac{1}{2}$ x 10 $\frac{1}{2}$	5,000	12	26	36	84	68	11,800
Emblem	22 $\frac{1}{2}$	25	7 $\frac{1}{2}$ x 10 $\frac{1}{2}$	6,000	12	26	42	87	92	12,800
Emerald	22 $\frac{3}{4}$	30	8 $\frac{1}{2}$ x 10	8,000	14	27	42	99	92	14,300
Emerge	23 $\frac{1}{2}$	35	9 x 10	9,000	16	32	48	102	128	25,000
Boom swinger drums					9 $\frac{1}{2}$	13				



DOUBLE FRICTION DRUM ELECTRIC HOIST AND BOOM SWINGER

Code word	Order No.	Motor h.p.	Drums		Hoisting capacity		Approx. shipping weight, lbs.
			Diam., in.	Length, in.	Weight hoisted single rope, lbs.	Speed in ft. per min.	
Frought	95	10	12	22	2,000	150	8,000
Frown	96	15	12	22	2,500	150	8,200
Froy	97	20	12	26	3,000	150	8,500
Fulcrum	98	25	12	26	4,000	150	9,800
Fulgert	99	30	14	26	5,000	175	10,500
Fuller	101	40	16	25	6,000	175	12,000
Fumble	102	50	16	25	8,000	175	13,500
Boom swinger drums			13	9 $\frac{1}{2}$			

THE McMYLER INTERSTATE COMPANY

Manufacturers of Locomotives Cranes

CLEVELAND, OHIO

For Branch Offices, See Page 106

WORKS:
BEDFORD, OHIO

Product.

LOCOMOTIVE CRANES.

For Clamshell Buckets, see page 106; for Material Handling Machinery, see page 692.

A Locomotive Crane for Every Purpose.

McMyler-Interstate cranes will efficiently accomplish any of the following operations:

- (1) Handle a fall block on the main hoist line.
- (2) Handle a ball and hook on the auxiliary line.
- (3) Operate a 2-line clamshell, orange peel or drag-line scraper bucket.
- (4) Operate a magnet, power for which may be furnished by generating units on the crane itself.
- (5) Drive piles by means of pendulum lead or railroad pile driver attachment.
- (6) Switch several cars.

Types of McMyler-Interstate Cranes.

This company manufactures a complete line of standard and broad gauge locomotive cranes to conform

Predominant Features.

Speedy operation; large tractive capacity; freedom from vibration; operator given a clear view of the work; exceedingly simple construction; all necessary safety requirements provided for; long life with minimum repairs; may be equipped with standard locomotive type air brakes or steam brakes, giving operator absolute control on any grade.

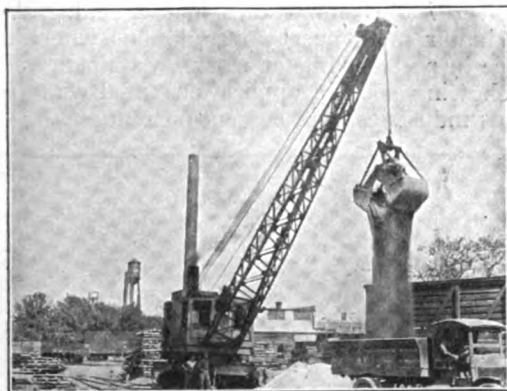
Type B Locomotive Crane.

An 8-wheel, standard gauge crane built in 15- and 20-ton capacities, for steam or electrical operation.

By virtue of its unusually rapid operation, it is primarily considered a bucket crane; however, it may be used with equal facility for accomplishing any of the operations specified elsewhere on this page.

When handling a 2-line clamshell bucket for coal or similar materials, this crane will handle up to 60 buckets per hour. Records of 13 buckets in 3 minutes with crane swinging at 90° with each trip have been made with these machines.

Write for Bulletin No. 42.



TYPE B LOCOMOTIVE CRANE OPERATING CLAMSHELL BUCKET



TYPE B LOCOMOTIVE CRANE OPERATING FALL BLOCK

to any condition. Among the more prominent of which are Types B and J described herein.

As crane specialists, the engineers of this company are particularly fitted to aid in the selection of any type of crane whatsoever. The accumulated data of 35 years of successful crane building is at the disposal of prospective purchasers when confronted with crane problems.



TYPE J LOCOMOTIVE CRANE OPERATING FALL BLOCK



TYPE J LOCOMOTIVE CRANE OPERATING CLAMSHELL BUCKET

Type J Locomotive Crane.

An 8-wheel, standard gauge crane built in 35- and 40-ton capacities, for steam or electrical operation.

This heavy duty type is distinguished by its flexibility, being readily convertible to any class of service. As a many-purpose crane, it is unsurpassed.

Write for Bulletin No. 43.

THE JOHN F. BYERS MACHINE CO.

Manufacturers of Cranes, Hoisting Machinery and Portable Derricks

270 Sycamore Street

RAVENNA, OHIO

SALES AND SERVICE OFFICES IN ALL PRINCIPAL CITIES

Products.

"AUTO-CRANES"; FULL REVOLVING CRANES; PORTABLE DERRICKS; EXCAVATORS—Derrick, Grab Bucket, Drainage, Trench; BUCKETS—Clamshell, Excavating, Grab; HOISTS—Steam, Gasoline, Electric and Belt.

Also manufacturers of Ash and Refuse handling Machinery; Backfillers; Ditching Machines; Car and Wagon Loaders and Unloaders; Pile Drivers and Steam Shovels.

Byers Cranes.

Small, compact, powerful; traveling on the ground wherever needed. Light, moderate priced, simple to operate. Built for travel on road wheels, rail trucks or crawling traction trucks. Forward and reverse propelling mechanism through spiral steel clutches, by steel roller chain and heavy differential.

Instantly handled by operator by means of conveniently placed levers. One man operates all levers.

Rail truck crane built for any gage track.

Three kinds of power: steam, gasoline (or kerosene) or electricity.

Special Features Common to Both Types of Cranes—Self-propelling; 1-man control; clamshell, orange peel or dragline bucket; hook, skip, magnet or steam shovel attachments.

Unload coal from cars to stock pile or directly to boiler room; rehandle or "stock out" coal as needed;

handle ashes or other loose materials, scrap, etc.; do excavating and steel erecting. Full revolving type does same work performed by locomotive cranes of similar capacity.

The "Auto-Crane."

A half-circle swing machine for operation by steam, electricity or gasoline (or kerosene); used with clamshell, hook, skip, grab and other attachments. See illustration and diagram below, and "performance views" on opposite page.

Full Revolving Crane.

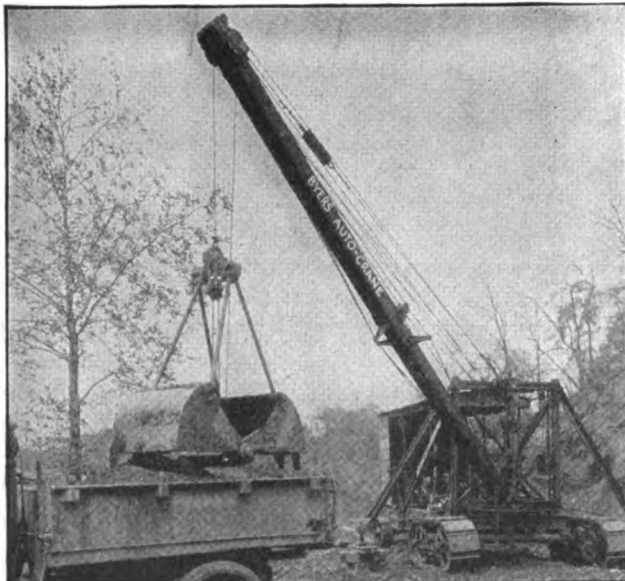
A machine of similar general construction and capacity, but of the "full-circle swing" type. See illustration and diagram below.

Shipping.

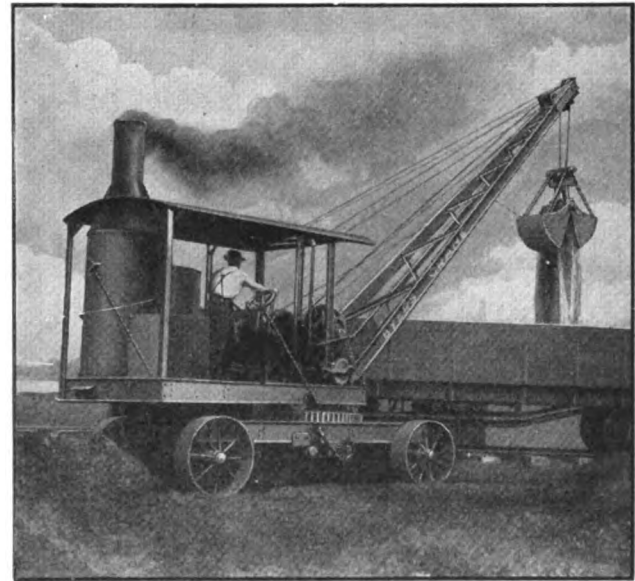
"Auto-Cranes" are shipped set up, ready to work, only boom and trucks removed. Full Revolving Cranes shipped completely set up with only boom removed. Both can be moved from job to job by rail, or will travel over streets. Their size comes within road and highway clearances.

References, Catalogues and Bulletins.

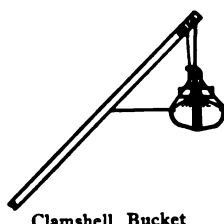
Over 700 Byers Cranes in the field. We gladly refer inquirers to nearby installations where machines may be inspected while at work. Catalogues and bulletins showing specific applications of Byers Cranes to various industries, will be sent on request.



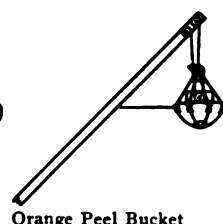
"AUTO-CRANE"—ELECTRICALLY OPERATED
(Crawling traction treads; doing general excavating)



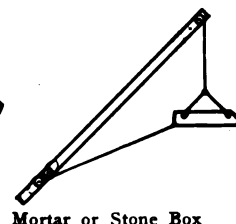
FULL REVOLVING CRANE
Does general service rendered by corresponding size locomotive cranes



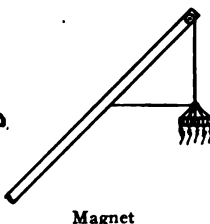
Clamshell Bucket



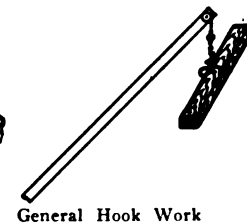
Orange Peel Bucket



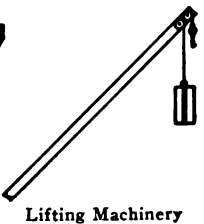
Mortar or Stone Box



Magnet

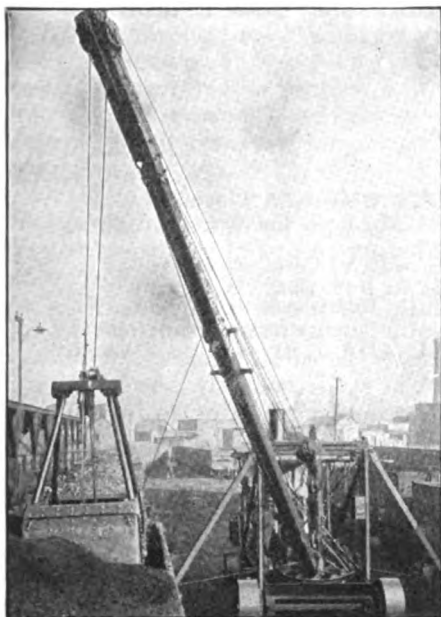


General Hook Work



Lifting Machinery

SHOWING STANDARD BOOM EQUIPMENT AVAILABLE FOR USE WITH BYERS CRANES



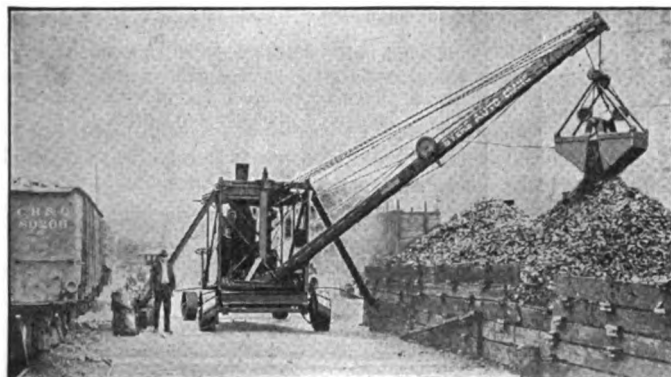
CLAMSHELL "AUTO-CRANE" UNLOADING COAL



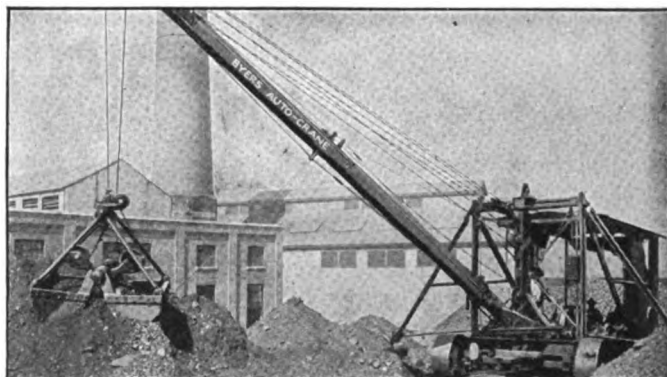
"AUTO-CRANE" STANDING ON STOCK PILE FIGHTING "HOT SPOT" IN COAL



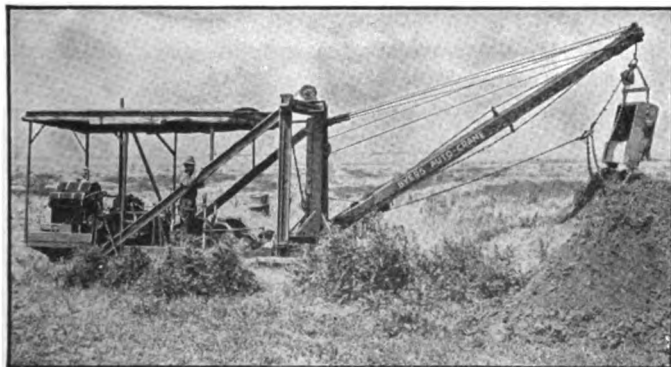
TAKING COAL FROM CAR TO STORAGE BIN IN ONE SWING



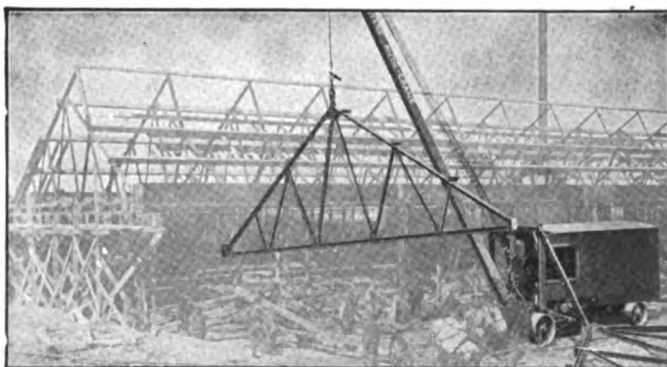
FROM CAR TO STOCK PILE AND OUT AGAIN



"AUTO-CRANES" CLIMB STOCK-PILES ON THEIR OWN POWER



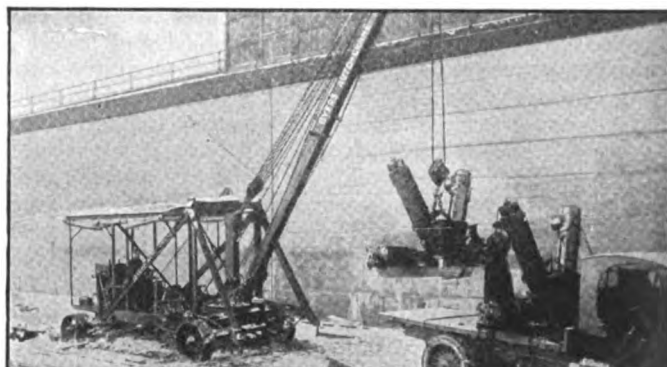
"AUTO-CRANE" OPERATED BY GASOLINE MOTOR DOING GENERAL EXCAVATING



EQUIPPED WITH HOOK, "AUTO-CRANE" DOES STEEL ERECTING



"AUTO-CRANE" WITH MAGNET ATTACHMENT UNLOADING AND REHANDLING SCRAP



ANOTHER PRACTICAL APPLICATION OF "AUTO-CRANE'S" VERSATILE LIFTING HOOK

FOUNDED 1873

INDUSTRIAL WORKS

Industrial Cranes
BAY CITY, MICH.

CABLE ADDRESS:

"INDUSWORKS, BAY CITY"

NEW YORK, N. Y., 50 Church Street
PHILADELPHIA, PA., Widener Building

BRANCH OFFICES

CHICAGO, ILL., McCormick Building
DETROIT, MICH., Book Building

CODE:

ABC, Third Edition

AGENCIES

ST. LOUIS, MO., J. G. MILLER
BIRMINGHAM, ALA., C. B. DAVIS ENGINEERING Co.
SAN FRANCISCO, CAL., N. B. LIVERMORE & Co.
DENVER, COLO., LANDES & Co.
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MINNEAPOLIS, MINN., COPELAND & KLINGEL
EL PASO, TEX., EL PASO BRIDGE & IRON Co.
PORTLAND, ORE., NORTHWESTERN EQUIPMENT Co.
SEATTLE, WASH., NORTHWESTERN EQUIPMENT Co.
MONTREAL, CANADA, F. H. HOPKINS & Co., LTD.

TORONTO, CANADA, F. H. HOPKINS & Co., LTD.

Products.

LOCOMOTIVE CRANES, WRECKING CRANES, ERECTION CRANES, GASOLINE COALING CRANES, PILLAR CRANES, TRANSFER CRANES.

Pile Drivers, Transfer Tables, Portable Rail Saws, Dragline Excavators, Steam Pile Driving Hammers, Lifting Magnets, etc.

* For Grab Buckets, see pages 102-103.

Experience and Scope.

INDUSTRIAL WORKS was founded in 1873.

Being pioneer builders of locomotive and wrecking cranes, this company has acquired a fund of practical experience that could come only from having many machines in various kinds of service. "Industrial" cranes of today are the development of this varied experience. Satisfactory service has proved that they are fundamentally correct in design, sturdy in construction, and efficient in operation. In size they range from 2-ton hand operated pillar cranes to wrecking cranes of 160 tons capacity. INDUSTRIAL WORKS has had a good deal of experience building special cranes for special work where no standard machine would fit. This organization is particularly adapted to handle such work.

Locomotive Cranes.

"Industrial" locomotive cranes, steam, gasoline or electrically operated, are made in capacities of from 5 to 60 tons, and with booms from 20 to 140 ft. long. They are mounted on 4-wheel or 8-wheel cars for standard or special gage track, or on boats and gantries.

They are largely employed in railroad operations, bridge building and construction work; in loading and unloading coal, ore, sand, and other bulk material; in handling structural material, machinery and lumber. Being self-propelling, they switch several loaded cars. As used by contractors, they handle forms and concrete material, erect structures, drive piles, and do excavating generally.

These cranes may be used with grab buckets and lifting magnets, or arranged for operating with a dragline bucket, pile driver leads, or a steam shovel dipper arm.

Mechanically, "Industrial" cranes are not excelled. Every crane is made, assembled and tested in the company's extensive shops. All parts of the crane are accessible for easy examination, a large man being able to pass through the machinery part and car to the ground. Absolute interchangeability of parts is assured by the use of jigs and templates at every possible point in the construction. Inconvenient bearings are lubricated through oil pipes. The propelling gears on 8-wheel cars are placed in or out of mesh from the outside of the car body.

The system of clutches and independent drums makes "Industrial" cranes unexcelled for clamshell bucket work. Both drums are independent, and the auxiliary take-up drum for the holding line is entirely automatic in its action, requiring no attention from the

operator. With this drum he can raise the bucket open if desired.

Data—In general all sizes of locomotive cranes do the same kind of work, the amounts being limited, of course, by their capacities.

The 60-ton capacity cranes are used chiefly for erection purposes; those from 20 to 60 tons for erection work or for handling large quantities of material with a bucket or magnet; cranes from 5 to 20 tons are general purpose machines, being used for all kinds of loading and placing of material.

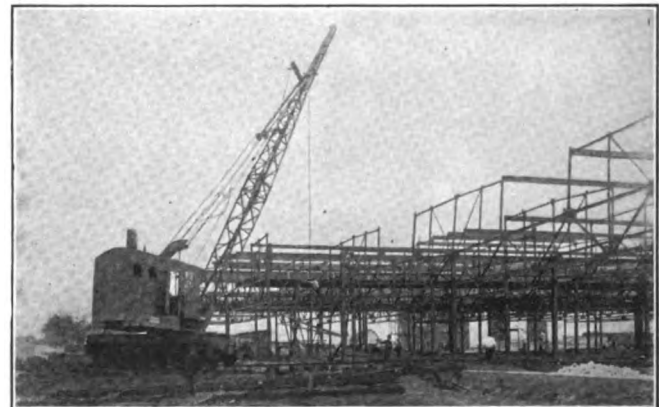
Locomotive cranes are usually rated according to their maximum capacity at the minimum radius (about 12 ft.).

The following table gives the approximate radius in feet at which various size cranes will handle clamshell buckets full of coal and sand:

	1½-YD. BUCKET				2-YD. BUCKET		
	5-ton	12-ton	15-ton	20-ton	25-ton	30-ton	40-ton
Coal.....	20	25-37	41-46	48-52	49-52	52-54	58-61
Sand.....	18	25-33	36-41	44-48	37-41	42-46	47-51

A 1½-cu. yd. bucket holds approximately 1 ton of coal.

To unload material with a grab bucket from the far end of a modern gondola car, standing on the same track as the crane, requires a 50-ft. boom. In general, the shorter the boom, the easier and faster will be the operation of the crane.



LOCOMOTIVE CRANE AT WORK ON CONSTRUCTION OF LARGE INDUSTRIAL BUILDING

Features of "Industrial" Cranes.

- (1) "Industrial" cranes are built complete in our shops.
- (2) Each crane is completely assembled and given a full working test before leaving the plant.
- (3) Absolute control of all materials used in the construction of product is had through our chemical and physical laboratories.
- (4) Heavy duty gears and shafting are heat treated.
- (5) Vanadium steel castings are used extensively.

(6) Through bolts with grip nuts, and not stud bolts, are used on all heavy duty parts. Turned bolts are used wherever there is possibility of relative motion.

(7) All gearing is of cast steel or bronze and all except slewing racks and pinions and a few slow moving gears are cut.

(8) All running bearings provided with replaceable bronze bushings. Wearing surfaces of all thrust bearings are separated by bronze washers. There is a bronze collar behind each bevel gear.

(9) Flexible arrangement of auxiliary drum on bucket cranes.

(10) Specially designed clutches, each developed particularly for the work it has to do.

(11) Rollers under the crane are adjustable for wear.

(12) Special trucks built for extra heavy crane duty.

(13) Spur gear propelling mechanism with fewest possible wearing parts.

(14) Heavy rack bolted to car body and efficient brake on rotating motion giving absolute control and obviating the danger of involuntary rotation.

Inquiries.

Inquiries for locomotive cranes should give the following information:

- (1) Steam, electric or gasoline operated.
- (2) Gage of track, and weight of rails used.
- (3) Any unusual clearance conditions.
- (4) Maximum load to be lifted.

(5) Radius at which maximum load is to be handled. (Radius is measured from center of rotation of crane to center of gravity of load.)

(6) Maximum radius crane must be capable of maximum load to be handled at that radius and height to which it must be raised.

(7) Nature of work to be done (including propelling service expected) and kind of material to be handled.

(8) Whether a grab bucket or lifting magnet is to be handled and if so, what size.

(9) If magnet is to be handled, whether generating set or plug-in system is to be used.

(10) If electrically operated, state whether current is D. C. or A. C. In either case voltage should be given and if A. C., voltage, phase and cycle.

(11) If electrically operated, whether current will be taken by trolley, plug-in or third rail.

Inquiries for wharf and shipbuilding cranes or other cranes mounted on fixed piers, traveling gantries, traveling piers of the simple raised type, or of portal or semiportal type, etc., should give the following additional information:

(12) Height of revolving crane above rails.

(13) Clearances allowable each side of supporting rails.

(14) Gage and relative levels of the supporting rails for the substructure.

(15) Any special clearances desired under substructure when of the traveling portal or semiportal pier type.

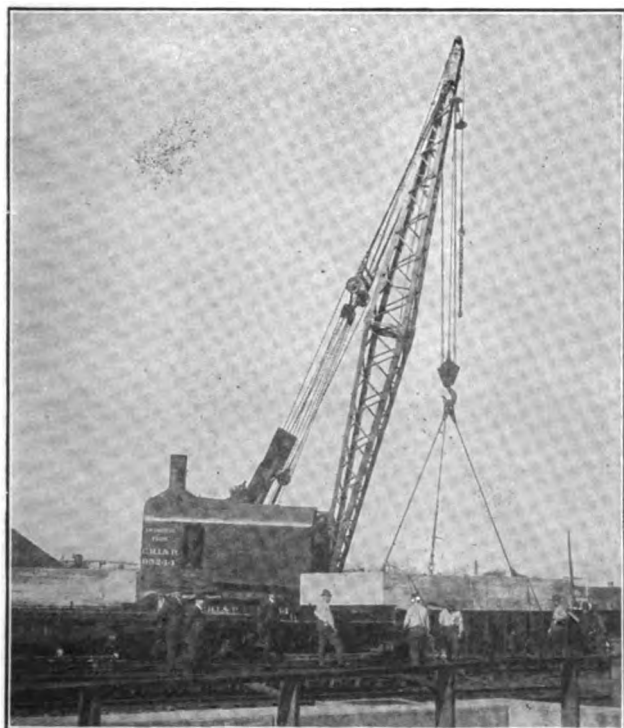
(16) Lowest and highest working positions of hook at maximum and minimum radii.

(17) Fixed or variable radius.

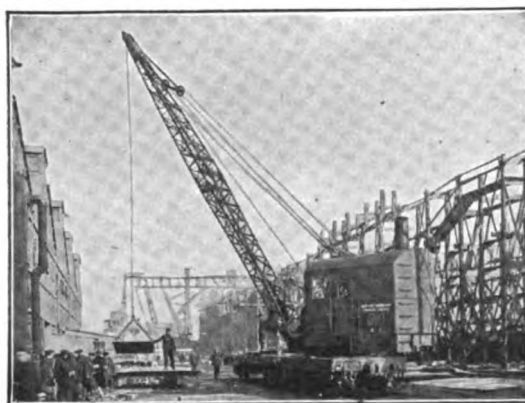
(18) If traveling gantry is desired will revolving crane be fixed upon the same or will it travel along the top?

CRANE CAPACITIES, WEIGHTS AND RADII WITH DIFFERENT LENGTH BOOMS

Type crane	Length of boom, ft.	Max. weight of crane in operating conditions, lbs.	Capacities at maximum and minimum radii without outriggers				Capacities at maximum and short radii with outriggers			
			Min. radius, ft.	Cap. at min. radius, lbs.	Max. radius, ft.	Cap. at max. radius, lbs.	Radius of max. cap., ft.	Max. cap., lbs.	Max. radius, ft.	Cap. at max. radius, lbs.
"A" (4-wheel) (8-wheel)	25	41,300	10	10,000	25	3,000				
	25	59,200	10	10,000	25	3,000				
"C A" (8-wheel)	40	93,000	12	25,000	40	5,000				
	45	94,300	12	25,000	45	3,400				
"C B" (4-wheel)	40	84,700	12	25,000	40	5,000				
	45	86,000	12	25,000	45	3,400				
"E A" (8-wheel)	40	110,900	12	30,000	40	7,500				
	45	111,300	12	30,000	45	6,100				
	50	111,700	15	24,500	50	4,950				
"E B" (4-wheel)	40	99,000	12	30,000	40	6,100				
	45	99,400	12	30,000	45	4,850				
"G" (8-wheel)	40	128,850	12	40,000	40	9,000	13	40,000	40	10,200
	45	129,300	12	40,000	45	7,200	13	40,000	45	8,600
	50	129,500	15	31,000	50	6,100	15	31,000	50	7,000
	60	130,050	20	22,000	60	4,200	20	23,500	60	5,500
"H" (8-wheel)	40	145,350	12	50,000	40	10,200	14	50,000	40	14,000
	45	145,850	12	50,000	45	8,800	14	50,000	45	11,500
	50	146,350	15	37,000	50	7,500	15	47,000	50	10,000
	60	147,300	20	25,000	55	5,100	20	35,000	60	7,000
	70	148,300	25	18,000	60	3,200	25	27,000	70	5,000
"K A" (8-wheel)	40	173,500	12	60,000	40	12,400	15	60,000	40	20,500
	45	174,050	12	60,000	45	9,900	15	60,000	45	17,000
	50	174,400	15	44,000	50	8,400	15	60,000	50	14,500
	60	175,100	20	30,000	60	5,800	20	45,000	60	11,000
	70	175,800	25	21,500	70	3,800	25	35,000	70	8,000
	80	176,500	30	16,500	80	2,400	30	28,500	80	6,000
	90	177,200	35	12,500	90	900	35	23,500	90	4,000
"L" (8-wheel)	40	189,250	12	70,000	40	15,000	16 1/4	80,000	40	25,300
	45	189,950	12	70,000	45	12,000	16 1/4	80,000	45	21,500
	50	190,450	15	51,000	50	10,000	16 1/4	80,000	50	18,500
	60	191,500	20	35,000	60	6,900	20	63,000	60	14,600
	70	192,550	25	25,500	70	4,700	25	48,000	70	11,000
	80	193,350	30	19,500	80	3,000	30	37,200	80	8,200
	90	194,250	35	15,000	90	1,500	35	29,900	90	6,000
	100	196,000	40	12,000	100	0	40	24,400	100	4,500
"N" (8-wheel)	40	177,450	16	39,200	40	10,700	16	120,000	40	37,000
	50	178,300	20	28,200	50	6,300	20	98,000	50	26,400
	60	179,400	25	19,760	60	3,360	25	74,000	60	19,300
	70	180,500	25	18,400	70	1,000	25	73,200	70	13,800
	80	182,700	25	15,500	50	2,000	25	70,000	80	9,200
	90	184,300	30	9,700	50	900	30	53,000	90	5,900
	100	185,500	35	5,500	45	1,400	35	40,000	100	3,000



LOCOMOTIVE CRANE LOADING RAILROAD CARS



LOCOMOTIVE CRANE AT WORK IN SHIPYARD

LINK-BELT COMPANY

Manufacturers of Elevating, Conveying and Power Transmission Machinery

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CHICAGO

INDIANAPOLIS

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NEW YORK, N. Y., 299 Broadway
PITTSBURGH, PA., 1501 Park Building
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ST. LOUIS, MO., Central National Bank Building

NEW ORLEANS, LA., C. O. Hinz, Carondelet Building

SEATTLE, WASH., 820 First Avenue, South
LOS ANGELES, CAL., 161 North Los Angeles Street
DENVER, COLO., LINDROOTH, SHUBART & Co., Boston Building
SAN FRANCISCO, CAL., 168 Second Street

Products.

ELEVATING and CONVEYING MACHINERY for handling all kinds of materials: Locomotive Cranes; Coal and Ashes Handling Conveyors; Portable Loaders; Belt Conveyors; Slat Conveyors; Link-Belt Roller Chain; Silent Chain Drives; Grab Buckets; Elevator Buckets; Screens; Friction Clutches; Chains and Sprockets; Bucket Carriers; Coal Crushers; Electric Hoists.

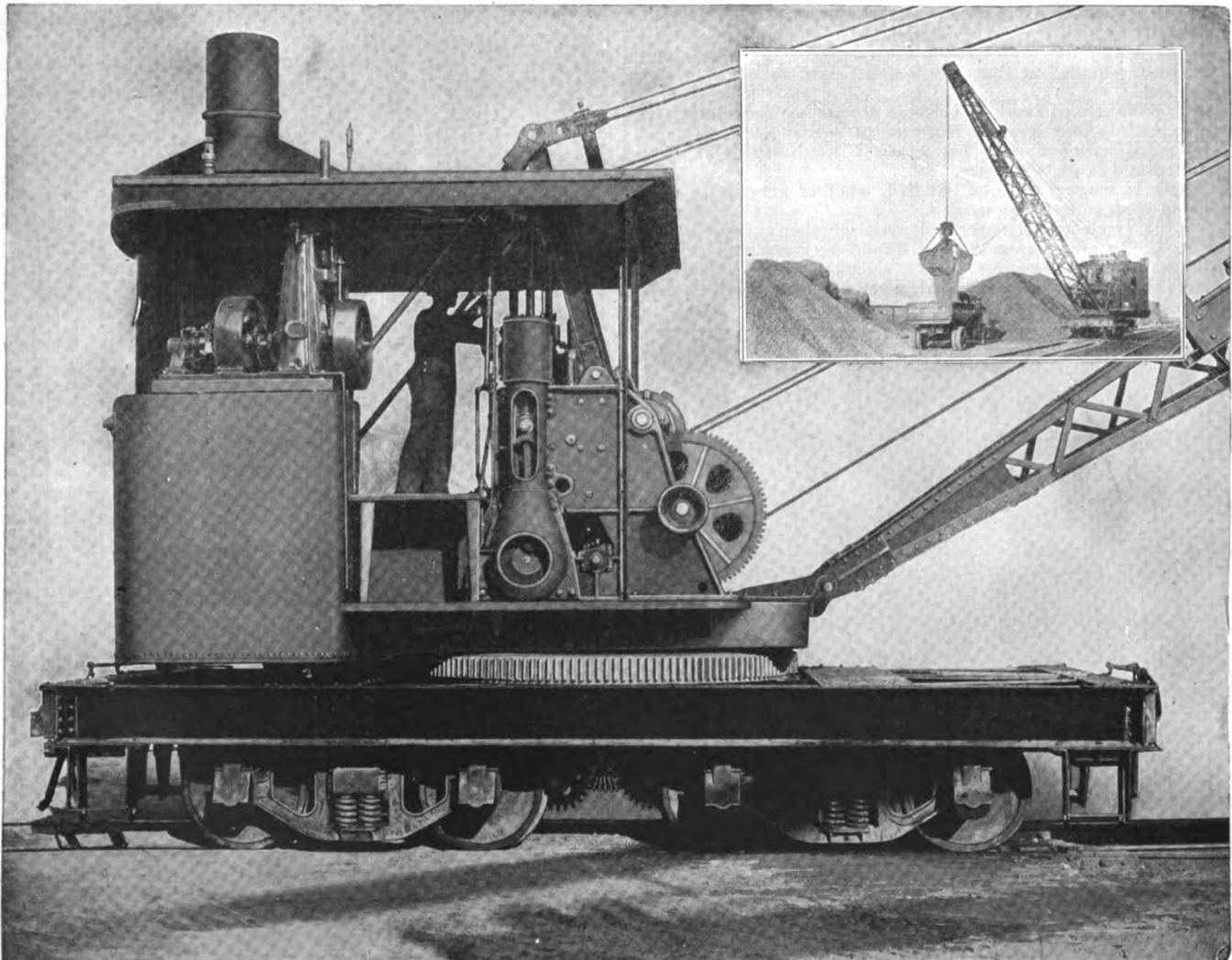
Also manufacturers of Excavating Machinery; Dragline Excavators; Coal Storage Systems for power-houses, etc.; Coal Tipples, and Coal Washeries; Freight and Package Carriers; Screw Conveyors; Gondola Car Unloaders; Power Transmission Machinery.

Link-Belt Locomotive Crane.

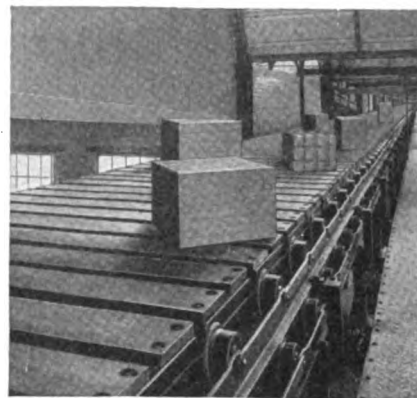
Handles anything: coal, stone, logs, pig iron and structural steel, packages, boxes, etc., weighing from 1 to 25 tons. Can be used as a switch engine capable of pulling 8 standard gondola cars on a straight track. Does the work of from 20 to 40 laborers.

Distinctive Features—Steel gears and bronze bushings throughout; one-point adjustment on clutches; few parts, every one accessible; large roomy platform for operator, everything handy; exceptionally large factor of safety used; the only crane with foolproof safety device on swinging mechanism.

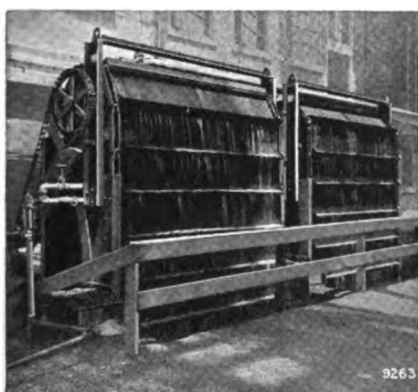
Reliability, the most desired quality in any locomotive crane, will be found in Link-Belt cranes, coupled with speed and ease of operation.



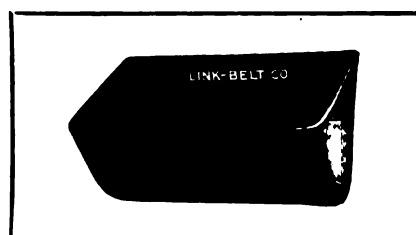
LINK-BELT LOCOMOTIVE CRANE
Note simplicity and compactness



LINK-BELT LABOR-SAVING ELEVATORS AND CONVEYORS
Increase production, save labor and promote general efficiency. Handle all materials



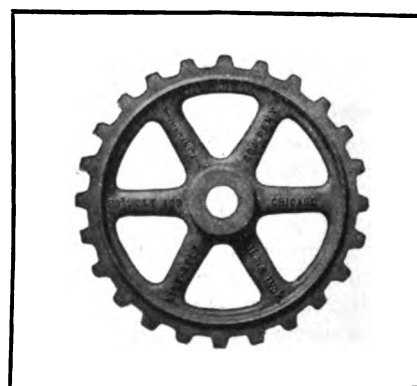
LINK-BELT WATER INTAKE SCREENS



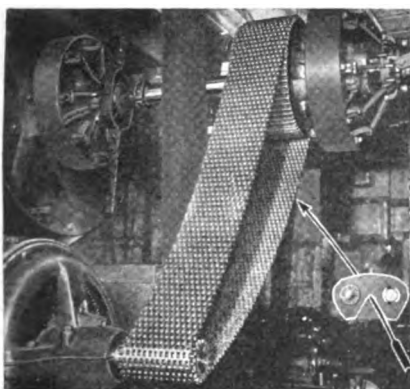
MALLEABLE IRON ELEVATOR BUCKET



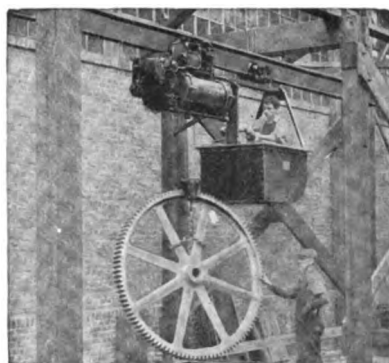
EWART DETACHABLE LINK-BELT



FLINT-RIM SPROCKET WHEEL
For durability



LINK-BELT SILENT CHAIN
For high speed power transmission



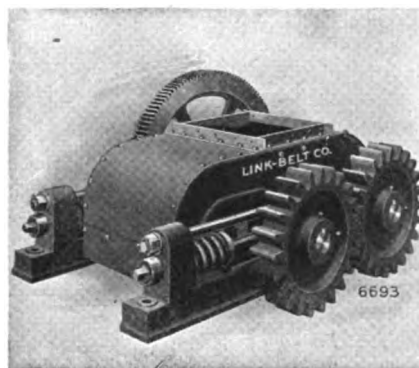
ELECTRIC HOIST WITH OPEN TRAILING OPERATOR'S CAGE



LINK-BELT BELT CONVEYOR
For handling all kinds of material



LINK-BELT PORTABLE LOADER
Loads a ton of any loose material a minute



LINK-BELT COAL CRUSHER
For reducing coal to size required for stokers. Made in many types and sizes to meet all requirements



PECK OVERLAPPING PIVOTED BUCKET CARRIER
For handling coal and ashes, stone, gravel, etc.

OHIO LOCOMOTIVE CRANE CO.

Iron Street
BUCYRUS, OHIO

Products.

LOCOMOTIVE CRANES.

Facilities.

OHIO LOCOMOTIVE CRANE CO. is the only concern in the country today devoting its time and attention exclusively to the manufacture of locomotive cranes.

The company's factory buildings and equipment are modern and its facilities for turning out locomotive cranes are unsurpassed. These cranes are completely built in the company's shops which include grey iron, steel and brass foundries and a large well equipped machinshop.

Adaptability.

Ohio locomotive cranes are constructed in such a manner that possibilities of application to various classes of work are unlimited. Cranes are made in a wide variety of types, and can be operated by steam, electricity, compressed air, oil or gasoline engines, and can be furnished in capacities ranging from 5 to 50 tons.

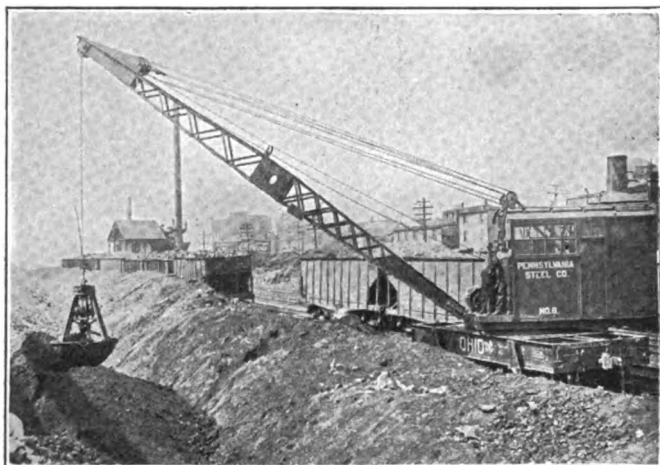
Ohio cranes are largely employed in industrial plants, railroad operations and construction work.

They can be equipped with a bucket for handling sand, gravel, crushed stone, slag, coal, sugar beets, ore, dirt, etc.; with a generating set and lifting magnet for handling scrap iron, castings, bars, etc.; with a dragline

Shafts are made of forged steel turned to proper size. The boom, sluing and hoisting clutches used are of the cone friction type. The traveling clutch is of the multiple disc friction type, requiring adjustments at very wide intervals and being a very powerful and simple design.

All gears are made of steel, excepting the worm gear on the hoist boom which is made of bronze. All gears have teeth cut from the solid with the exception of the rotating rack and the slow motion propelling gears, and all have machine cut teeth.

Of the castings employed, 90% are open hearth steel, 7% are iron and 3% are bronze.



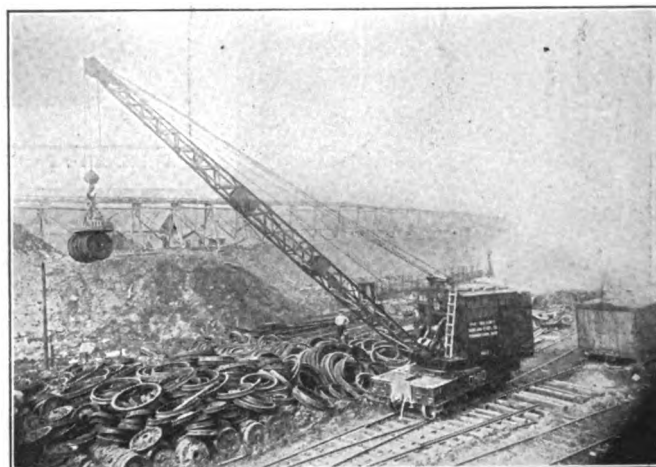
25-TON CAPACITY, 8-WHEEL CRANE, PENNSYLVANIA STEEL CO., STEELTON, PA.
Equipped with orange peel bucket

bucket for rapid excavation; with a fall block and hook for all general hoisting purposes; with pile driving attachments for driving pile, and can be used as a switching engine.

Construction.

The main base supporting most of the mechanism is one large steel casting, to the sides and rear of which are securely fastened by rivets a structural steel frame supporting the boiler, forming a rigid construction which insures against breakage.

All the bearings used are of the very best quality of bronze. The shaft-shell bearings are of the same size and therefore interchangeable. A feature incorporated in no other make of crane.

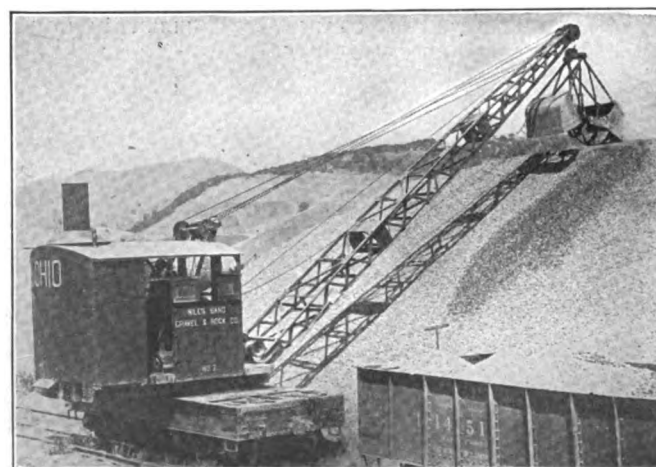


20-TON CAPACITY, 8-WHEEL CRANE, WILKOFF IRON & STEEL CO., YOUNGSTOWN, OHIO

Used for handling heavy material about their scrap yards. Equipped with magnet and generator

Catalogues.

It is impossible to give an adequate description of the construction and the scope of utility of the Ohio locomotive crane on this page. The company's own catalogues, giving full particulars, will be gladly furnished on request.



20-TON CAPACITY, 8-WHEEL CRANE, NILES SAND, GRAVEL & ROCK CO., NILES, CAL.

Equipped with oil burner and Hayward bucket for storing and loading crushed rock

A. C. TORBERT

Locomotive Cranes, Cars, Steam Shovels, Locomotives; Railway,
Industrial and Contractors' Equipment

TELEPHONES: 781-783 Continental and Commercial Bank Building
WABASH 8181, 8182 CHICAGO, ILL.

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LOCOMOTIVE CRANES, all makes, types and capacities, for all purposes.

Also the following:

Steam Shovels, all types, capacities and makes.

Locomotives, any gauge, type, make or size.

Railroad, Construction and Industrial Cars, all types, any gauge or capacity: Flat, Box, Gondola, Ore, Dump Cars, Interurban Cars, Passenger Coaches, etc.

Railway, Industrial and Contractors' Equipment.

Hoisting Engines, Drag Lines, Derricks, etc.

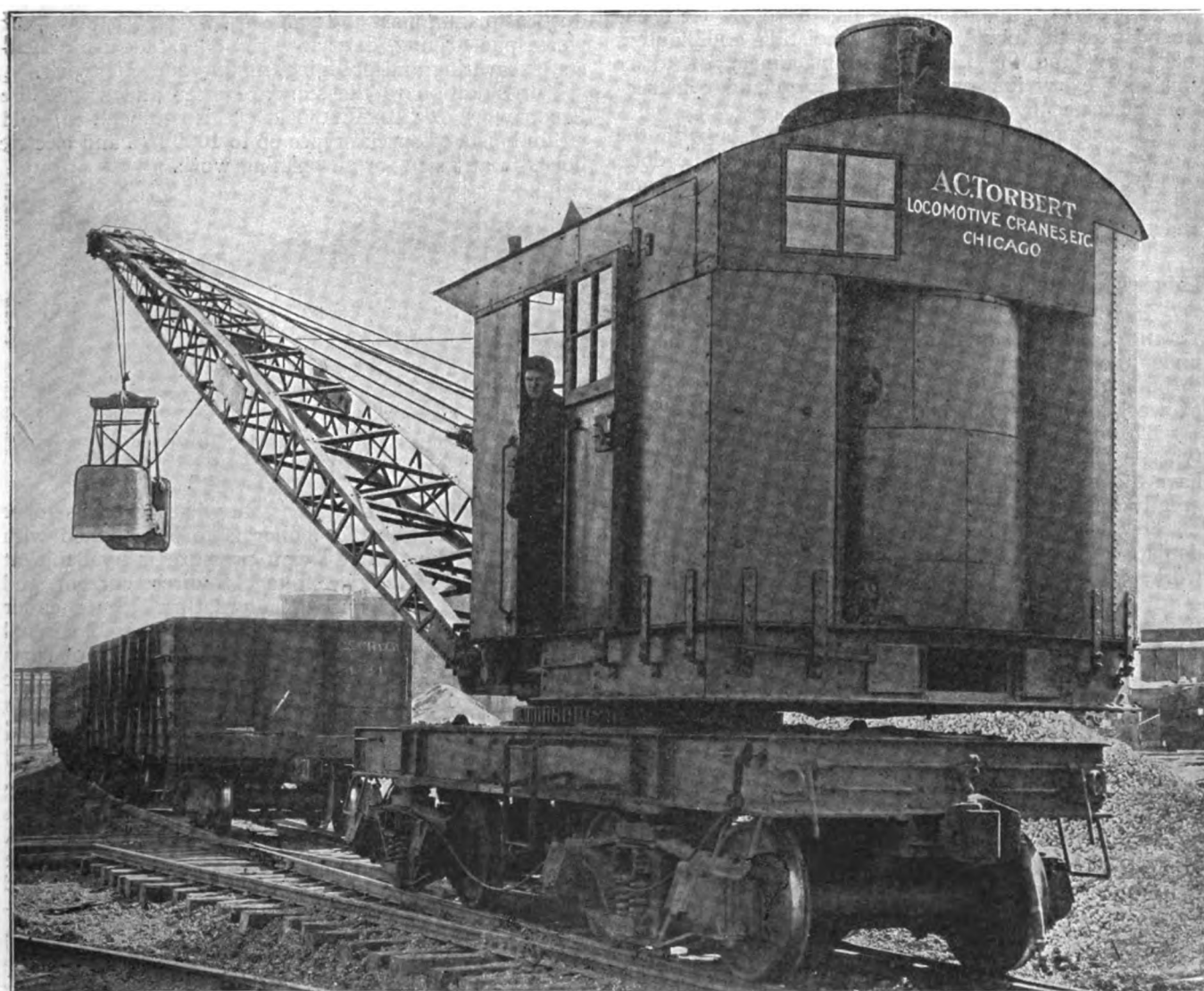
Facilities and Service.

We own outright all of our equipment, and operate our own shops and storage yards at Chicago, where we assemble new, overhaul, repair and rebuild. Leasing equipment is a specialty.

With our organization and facilities, we feel well qualified to serve the interests of the trade in a thoroughly practical manner.

We assemble new, buy, rebuild, sell and lease. We specialize in leasing equipment.

What are your requirements? Please telegraph, telephone or write us. Correspondence solicited.



ONE OF OUR LOCOMOTIVE CRANES IN OPERATION

LIDGERWOOD MANUFACTURING CO.

Hoisting and Hauling Machinery

MAIN OFFICES

Liberty and Church Streets

NEW YORK, N. Y.

BRANCH OFFICES

CHICAGO, ILL.

PITTSBURGH, PA.

PHILADELPHIA, PA.

SEATTLE, WASH.

LONDON, ENGLAND

Products.

STEAM, ELECTRIC and GASOLINE HOISTS for contractor's work, derrick work, grab bucket work, shafts, coal and freight handling, mines, quarries, dredges and excavators; CABLEWAYS and CABLEWAY EXCAVATORS.

Also, Steel and Wood Derricks and Derrick Fittings, Ballast Unloaders, Ship and Dock Winches, Steering Engines, Towing Engines, Logging Machinery.

Experience.

Since 1873 this company has devoted itself exclusively to the manufacture of hoisting and hauling machinery, and the Lidgerwood machinery of today embodies every improvement in design and construction suggested by this long experience.

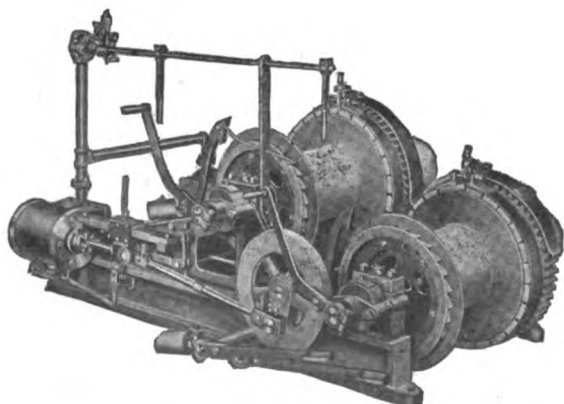
This company equips its electric hoists with the types of motor best adapted for the work to be done by the hoist, and is prepared to equip both electric and steam hoists with the latest type of automatic control and safety devices.

Lidgerwood Hoists.

It is the practice of the LIDGERWOOD MANUFACTURING Co. to design the complete machine to operate under the maximum service it is built to perform, and to build every part of the machine to meet the strain of working at its full capacity.

Drums are built of the friction, clutch and fixed types. The friction drums, both cone and band type, have the patented cork inserted friction woods, which greatly increase their holding capacity.

Two types of contractors' hoists are shown: a double drum steam hoist, without boiler for derrick work, and an electric hoist for 3-line derrick operat-

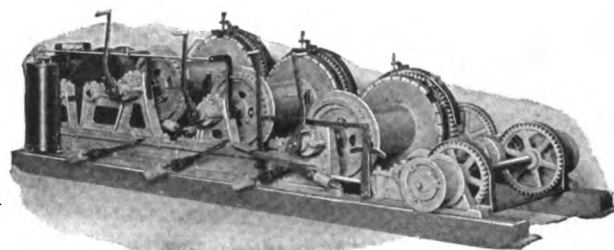


DOUBLE FRICTION DRUM, DOUBLE CYLINDER STEAM HOIST WITHOUT BOILER

ing a grab bucket, the hoist having 3 drums and the Lidgerwood patented swinging gear for operating the bull wheel that swings the derrick.

The steam, electric and gasoline hoists are built in single, double, and triple drum types—the double and triple drum hoists can be fitted with the boom swinging gear. Steam hoists are built in all styles both with and without boilers. Electric hoists are fitted with either direct or alternating current motors. The company has standard hoists built for every ordinary hoisting service required in contracting, building, industrial plants, mast and gaff rigs, warehouse and dock work, pile driving, derrick work, operating grab buckets, excavating and dredging, mining and quarrying.

In addition to the standard sizes and styles, the LIDGERWOOD MANUFACTURING Co. is equipped to build steam hoists of special types up to 1000 h.p. and electric hoists in any size for all hoisting work.



THREE-FRICTION DRUM ELECTRIC HOIST WITH BOOM SWINGING GEAR

In requesting estimate, state what power is to be used—if steam, whether boiler is to be supplied with the hoist, if not, what steam pressure is available at throttle; if electric, give voltage if direct current, and voltage, cycle and phase if alternating. State either the maximum rope pull on single line, or, if block and tackle be used, give maximum load and number of parts of rope to be used, giving a general description of the work to be done.

Lidgerwood Cableways.

Lidgerwood cableway is a hoisting and conveying machine, capable of carrying single loads up to 30 tons over spans of 2000 ft. without intervening supports. They have stationary or traveling towers. They handle loads in slings, plain or automatic dumping skips, and operate clam, orange peel, or scraper buckets for excavating.

Cableways are valuable in constructing dams, bridges, filtration beds, and for open pit mining, quarrying, and excavating over wide areas.

NOVO ENGINE COMPANY

C. E. BEMENT, VICE-PRESIDENT AND GENERAL MANAGER

Hoisting Machinery

NEW YORK OFFICE
1617-19 Woolworth Building

10 Porter Street
LANSING, MICH.

CHICAGO OFFICE
800 Old Colony Building

Products.

Novo HOISTING OUTFITS: Reversible or Non-reversible, Single or Double Drum, One or Two Speeds.

Also manufacturers of Novo Double Platform Elevators.

For Novo Gasoline Engines and Pumping Outfits, see pages 912-13; for Novo Air Compressor Outfits and Saw Rigs, see page 50.



TRADE-MARK

guards are provided throughout. Furnished with 8-, 10-, or 15-h.p. Novo engines of 1200 to 4300 lbs. capacity.

Data—Maximum width, 63 in.; diameter of drum, 12 in.; length of drum between flanges, 16 in.; diameter of drum flanges, 20 in.; drum holds 1050 ft. of 1/2-in. cable; diameter of drum shaft is 2 3/4 in. Gear face, 3 in.; gear pitch, 3 in.; brake diameter, 22 1/4 in.; brake width, 3 in.

Type DH Hoisting Outfits.



Fig. 434. NOVO TYPE DH SINGLE DRUM HOIST

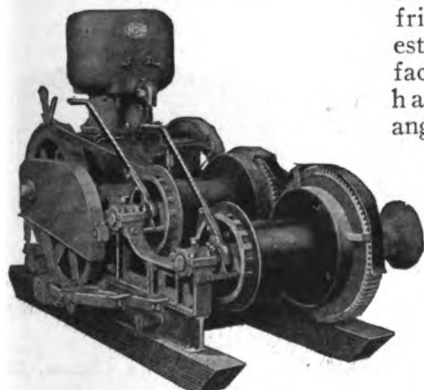


Fig. 416. NOVO TYPE DH DOUBLE DRUM HOIST

High grade single or double drum hoists can be furnished either with two speeds or single speed reversible. The base on which rest the engine and hoist is built up of I-beams and cast iron spreaders, providing a rigid and stable foundation. All gears have wide face and large teeth. Drums on both single and two-speed hoists are interchangeable. Double cone or V-type wood friction, giving greatest possible friction surface. Wide brakebands, having maximum angle of contact, are rolled from one-piece high carbon steel, insuring a positive grip and quick release. Hoists are equipped with either niggerheads or sheaves, or one of each. Gear

Single Drum Non-reversible Type OH Hoist.

This outfit is suitable for light pile driving and ordinary contractors' hoisting with gravity drop. The cable drum is loose on shaft and is engaged by strong friction clutch for hoisting and by a brake band operated by a foot lever for holding and lowering the load.

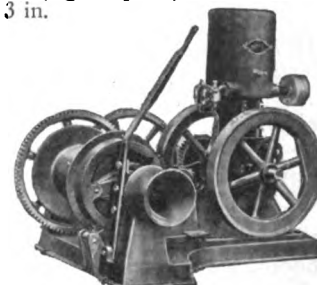


Fig. 1465. NOVO TYPE OH SINGLE DRUM NON-REVERSIBLE HOIST

Single Drum Reversible Type TN Hoists.

These outfits are suitable for double platform material elevator work and all around general hoisting. They are equipped with friction clutch and large brake controlled by foot lever to hold load when clutch is disengaged.

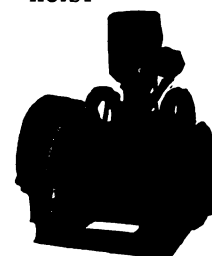


Fig. 431. NOVO TYPE TN SINGLE DRUM HOIST
Reversible and non-reversible

DATA, SINGLE DRUM HOISTS

Outfit No.	Engine h.p.	Weight, lbs.	Drum holds 1/2-in. cable	Will lift lbs.	Feet per minute	Code word
NOVO TYPE OH SINGLE DRUM NON-REVERSIBLE HOISTS, FIG. 1465						
000	3	1175	900 ft.	750	100	Nod
0	4	1300	900 ft.	750	150	Noun
00	6	1500	900 ft.	1000	150	November
NOVO TYPE TN SINGLE DRUM REVERSIBLE HOISTS, FIG. 431						
1	6	2200	700 ft.	1000 to 1500	150 to 100	Noise
5	8	2650	700 ft.	1500 to 2100	140 to 100	Nephew
4	10	3050	700 ft.	2150 to 2800	130 to 100	Noiseless

HOISTING CAPACITY AND SPEED TYPE DH HOISTING OUTFITS, FIG. 416

	SINGLE DRUM						DOUBLE DRUM			
	Single Speed Reversible Hoist No. 323 Non-reversible Hoist No. 321			Two Speed Non-reversible Hoist No. 322			Single Speed Reversible Hoist No. 327 Non-reversible Hoist No. 325		Two Speed Non-reversible Hoist No. 326	
	8 h.p.	10 h.p.	15 h.p.	8 h.p.	10 h.p.	15 h.p.	10 h.p.	15 h.p.	10 h.p.	15 h.p.
Engine size.....	63x65	63x65	63x65	63x65	63x65	63x65	63x91	63x91	63x91	63x91
Floor space, in.....	1150	1450	2100	750	950	1380	1450	2100	950	1380
Rear drum { high speed, lbs.....	1150	1450	2100	1730	2200	3240	1450	2100	2200	3240
Forward drum { low speed, lbs.....	1150	1450	2100	1730	2200	3240	1450	2100	2200	3240
*Hoisting speed, ft. per min.....	185	185	185	285	285	285	185	185	285	285
Rear drum { high speed.....	185	185	185	120	120	120	185	185	235	235
Forward drum { low speed.....	185	185	185	120	120	120	185	185	235	235
Weight with engine.....	3480	3850	4350	3480	3850	4350	4800	5300	4800	5300
Reversible, lbs.....	3100	3450	4000	3480	3850	4350	4400	4950	4800	5300
Non-reversible, lbs.....	Hexe	Hexi	Hexu	Hoda	Hode	Hodo	Hyli	Hylu	Hyri	Hyru
Code word—Reversible.....	Hexe	Hexi	Hexu	Hoda	Hode	Hodo	Hyli	Hylu	Hyri	Hyru
Code word—Non-reversible.....	Haba	Hebe	Habo	Heri	Hern	Heru	Hume	Humo	Humbe	Humbo

*On special order, the gearing on Novo hoists can be changed to give a higher speed at less capacity or a lower speed at greater capacity. Niggerhead keyed to drum shaft can be furnished in place of sheave, without extra cost.

CONTINENTAL BRIDGE CO.

Steel Derricks and Cranes

CABLE ADDRESS:
"CONBRIDGE"

Monadnock Block
CHICAGO, ILL.

Western Union and Bentley Code

PLANT, PEOTONE, ILL.

Products and Services.

All types of STEEL DERRICKS built to order, in any capacity, designed to fit your requirements.

ALL-STEEL DERRICK CARS built to order, complete, for steel erection and other purposes; STEEL DERRICK SKIPS; HAND POWER BAR CUTTERS.

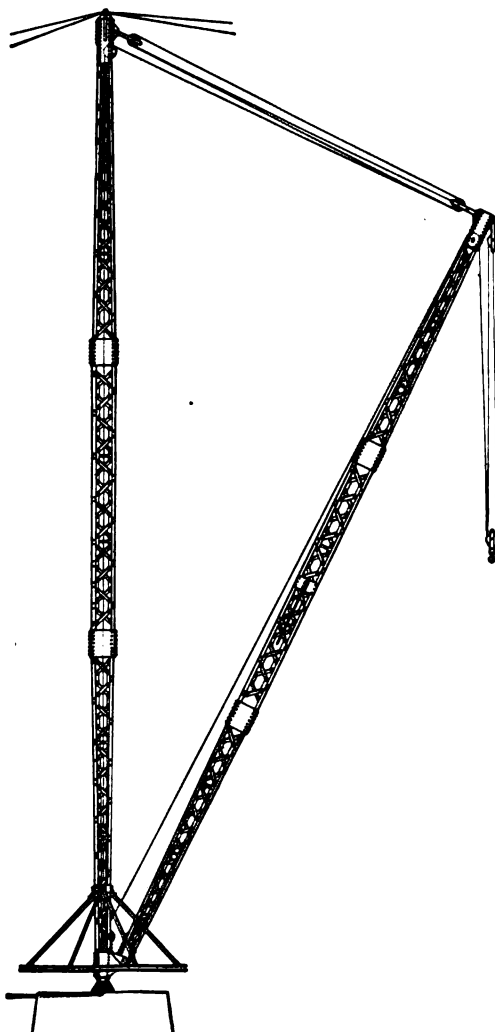
Also All-steel Industrial Cars for every purpose, Jib Cranes, Hand Power Traveling Cranes, Graves Steel Trusses.

Fabricators of Steel Buildings, Bridges, and Special Construction.

Continental Steel Derricks.

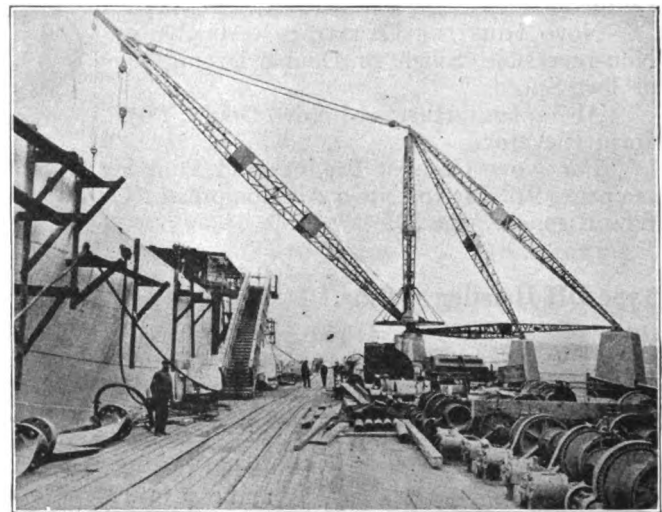
Derricks are all-steel of latticed angle construction with angle lacings. Complete derrick includes mast, boom, stiff legs, stiff leg anchor shoes, all castings, straps, sheaves, blocks, bull wheel and guide sheaves.

Sheaves are grooved for wire rope and fitted with self-lubricating bronze bushings unless otherwise ordered.



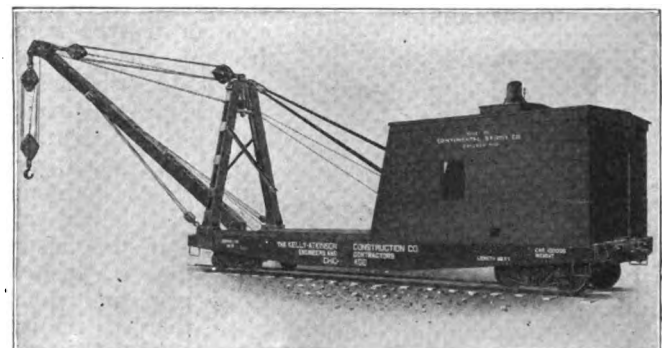
GUY DERRICK

SWEET'S CATALOGUE



STIFF LEG DERRICK

Built for Newburgh Shipyard, Inc., fitting out dock, Newburgh, N. Y.



ALL-STEEL DERRICK CAR

Built for Kelly-Atkinson Construction Co., steel erectors, Chicago, Ill.

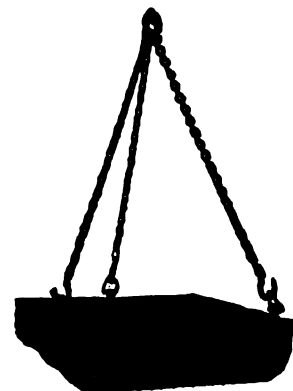


HAND POWER BAR CUTTER

Cuts deformed reinforcing bars up to 1 1/4 in.

Engineering Service.

Our Engineers are always ready to help solve derrick problems without any obligation on your part.



DERRICK SKIP

Built for U. S. Government
Muscle Shoal Dam, Florence, Ala.

INSLEY MANUFACTURING COMPANY

Steel Derricks, Industrial Cars, Buckets and Concrete Placing Equipment
INDIANAPOLIS, IND.

Products.

STEEL DERRICKS of all types and capacities for all classes of service. INDUSTRIAL CARS of all types for industrial and construction usage.

CONCRETE PLACING EQUIPMENT: Chutes, Hoist Buckets, Hoppers, Towers, Carts, Form Clamps, etc.

Also manufacturers of Buckets: Tip Over, Center Dump, Two-line and Controllable Form Types. Skips, Stone and Cableway.

Service.

The INSLEY MANUFACTURING COMPANY maintains a corps of engineers who are specialists in the design of material handling equipment, as well as in the design of concrete plant layouts. This service is at the disposal of firms interested, free for the asking.

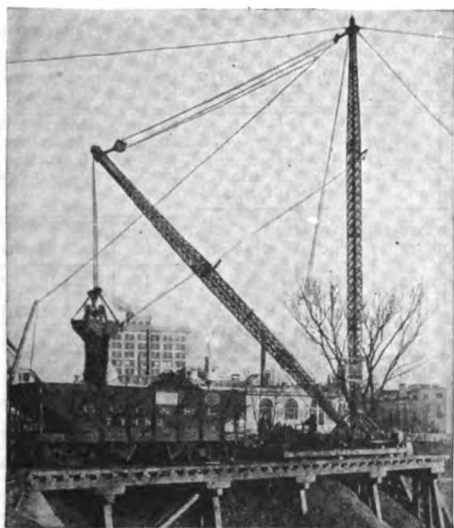
Steel Derricks.

The advantages of equipment constructed of steel over their counterparts of wood have long been recognized and in offering the Insley line of steel guy and stiff leg derricks, equipment is put at the disposal of the engineer, contractor and industrial user which can be adopted and standardized upon to a marked economic advantage.

The strength of a steel member can always be accurately determined, whereas the strength of even the soundest appearing timber is a matter of some uncertainty.

Safe and uninterrupted operation over a long period of time follows the adoption of steel equipment, and to this rule Insley steel derricks form no exception. They are designed by experienced derrick engineers in accordance with proved engineering theories, embody maximum strength and are built by mechanics skilled in derrick construction.

Write for special derrick catalogue.



INSLEY STEEL GUY DERRICK

Industrial Cars.

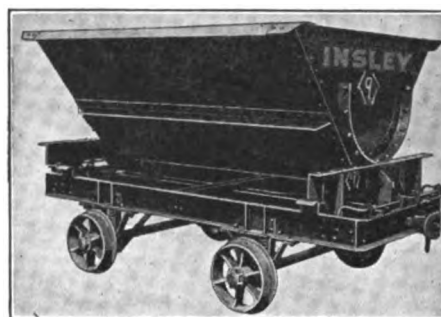
Insley cars are so designed and constructed as to result in minimum operating and maintenance costs.

Excess strength is provided to take care of the abuse to which this class of equipment is subjected; all cars are equipped with roller bearings, and wheels are made of a special car wheel mixture and have extra deep flanges.

The following types are made in standard sizes. rocker dump, rotary dump, V-body, quarry, charging, concrete, skip, paving and skeleton flat.

Special cars built to order.

Car catalogue on request.

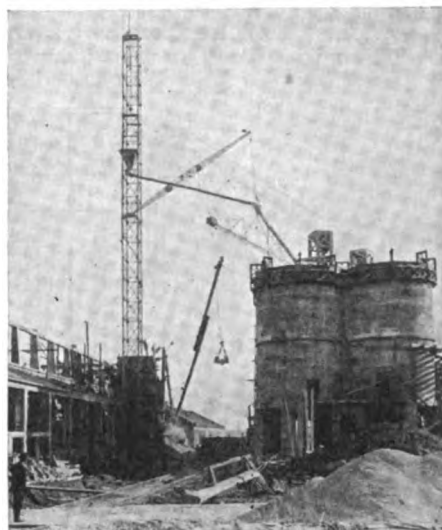


ROCKER DUMP TYPE QUARRY CAR

Concrete Placing Equipment.

The INSLEY MANUFACTURING COMPANY are the originators of modern concrete placing equipment and have special literature available which is of the utmost value to all interested in this class of work.

Plant layouts are submitted on request, each problem being treated according to the construction conditions encountered.



INSLEY STEEL TOWER, QUICK SHIFT
COUNTERWEIGHT CHUTE PLANT
FOR CONCRETE DISTRIBUTION

THE SASGEN DERRICK CO.

CANADIAN BRANCH
TORONTO, No. 1 Wabash Avenue

3101-3119 Grand Avenue
CHICAGO, ILL.

NEW YORK OFFICE
Grand Central Terminal

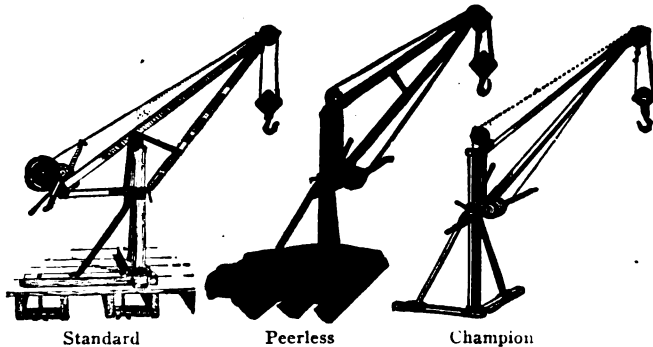
Products.

Manufacturers of PORTABLE CIRCLE SWING BUILDERS' DERRICKS for Hand, Horse or Power; CIRCLE SWING DERRICKS with DOUBLE DRUM WINCH for handling Orange Peel Buckets; STIFF LEGGED DERRICKS, 1 to 10 tons; "A" FRAME, TRIPOD, POLE, TOP POINT and REGULAR SETTER DERRICKS; TRUCK DERRICKS; HORSE and POWER MATERIAL ELEVATORS; WINCHES, CRABS, BLOCKS, and TOWER BOOMS.

Also manufacturers of Stone and Timber Tongs, Stone Hooks, Lewises, Rope and Cable.

Advantages.

This company's motto is "Satisfaction or no Sale." Derricks shipped on trial to reliable contractors. These derricks are built of best malleable and steel fittings, which make them light, strong and durable.



Standard Peerless Champion

SASGEN CIRCLE SWING DERRICKS

STANDARD—Equipped with best crucible steel and malleable fittings, including geared winch. Boom can be detached from mast. Operated by hand or power. Drum holds 275 ft. of $\frac{1}{4}$ -in. cable. Capacity 2500 lbs.; weight 350 lbs.; height 8 ft. Boom reach 5 ft. Equipped with 150 ft. steel cable and block.

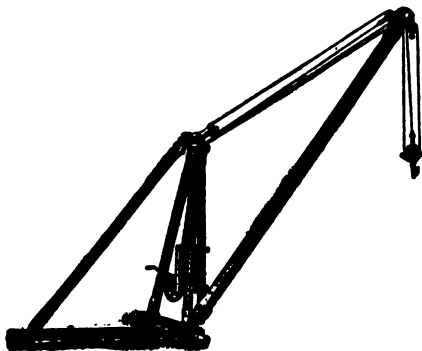
Price, hand power..... \$88.00
Price, hand and power..... 92.00

PEERLESS—Self-lubricating bushings, load and boom brake; used by hand, horse or power. Boom instantly removed by loosening one nut. Weight 275 lbs.; capacity 1800 lbs.; height 8 ft. Boom reach 5 ft. Equipped with 125 ft. crucible steel cable and block.

Price, hand power..... \$67.00
Price, hand and power..... 69.00

CHAMPION—Used by hand, horse or power. Folds in two parts and can be transported in touring car. Has self-lubricating bushings, also boom and load brake. Weight 200 lbs.; capacity 1000 lbs.; height 7 ft. 6 in. Boom extends 5 ft. Equipped with 110 ft. steel cable and block.

Price, hand power..... \$58.00
Price, hand and power..... 59.50



SASGEN STIFF LEGGED DERRICK

DATA ON SASGEN ONE, TWO, THREE, AND FOUR-TON STIFF LEGGED DERRICKS

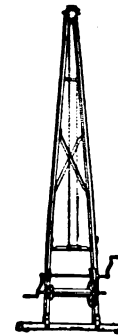
No.	Length boom, ft.	Price equipped for power	Price, with drum winch for hand	No.	Length boom, ft.	Price, equipped for power	Price, with drum winch for hand
ONE-TON CAPACITY				TWO-TON CAPACITY			
40	12	\$126.00	\$158.00	200	18	\$218.00	\$268.00
41	14	130.00	162.00	201	20	228.00	278.00
42	16	134.00	166.00	202	22	238.00	288.00
43	18	140.00	172.00	203	24	250.00	300.00
44	20	146.00	178.00	204	26	262.00	312.00
45	22	152.00	184.00	205	28	274.00	324.00
46	24	158.00	190.00	206	30	286.00	336.00
THREE-TON CAPACITY				FOUR-TON CAPACITY			
220	20	\$296.00	\$352.00	240	30	\$484.00	\$582.00
221	22	306.00	362.00	241	32	498.00	596.00
222	24	318.00	374.00	242	34	512.00	610.00
223	26	330.00	386.00	243	36	528.00	626.00
224	28	342.00	398.00	244	38	544.00	642.00
225	30	366.00	422.00	245	40	560.00	658.00
226	32	380.00	436.00	246	42	578.00	676.00
227	34	394.00	450.00	247	44	596.00	694.00
228	36	410.00	466.00	248	46	614.00	712.00
229	38	426.00	482.00	249	48	634.00	732.00
230	40	442.00	498.00	250	50	654.00	752.00

For stiff legged derricks from 5 to 10 tons write for prices. Give length of boom and capacity wanted.



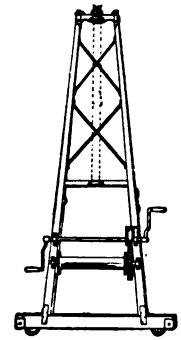
SASGEN POLE DERRICK
Equipped with winch not geared, 100-ft. cable, hoisting block. Very handy for light work

Cap., lbs.	Length, ft.	Price
1400	16	\$47.00
	18	48.00
	20	49.00



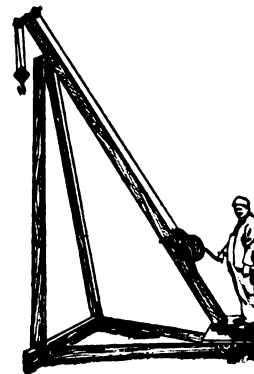
TOP POINT SETTER DERRICK
Equipped with all malleable and steel fittings, including gears. Has sheave frame at top and clamps for fastening extension pole

Cap., lbs.	Length, ft.	Price
3000	18	\$74.00
3000	20	76.00
3000	22	78.00



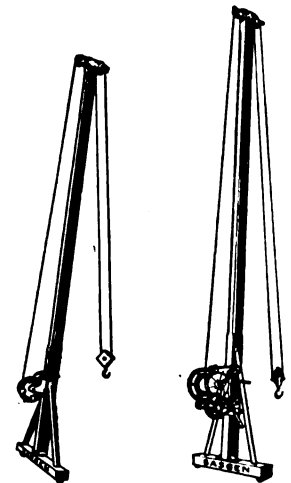
REGULAR SETTER DERRICK
Equipped with all malleable and steel fittings, including gears. Has sheave frame at top and clamps for fastening extension pole

Cap., lbs.	Length, ft.	Price
4000	18	\$82.00
4000	20	84.00
4000	22	88.00



SASGEN "A" FRAME DERRICK

Practical for setting timbers, girders, columns, etc. Capacity 2500 lbs., with 125 ft. of cable. Price..... \$105.00
Combination pole and "A" frame, price... 115.00



SASGEN POLE DERRICKS

Used by contractors, stone and iron setters. Equipped with crucible steel top sheave frame, lugs for guy lines, and sheave in back to bring cable to hoisting drum. Bottom sill has rollers. Equipped with 125 ft. crucible steel cable, block, complete for use

Length, ft.	Size, in.	Capacity	Price
18	6 x 6	2,500	\$69.00
20	6 x 6	to	71.00
22	6 x 6	3,000 lbs.	73.00

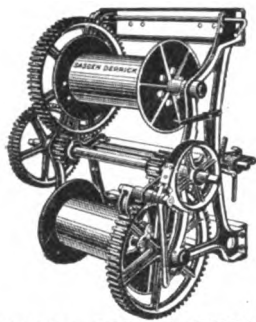
For additional lengths add \$2.00 per ft.

Length, ft.	Size, in.	Capacity	Price
18	6 x 8	4,000	\$103.00
20	6 x 8	to	106.00
22	6 x 8	5,000 lbs.	109.00

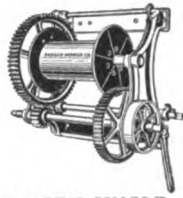
For additional lengths add \$3.00 per ft.

Length, ft.	Size, in.	Capacity	Price
18	8 x 8	8,000	\$186.00
20	8 x 8	to	190.00
22	8 x 8	10,000 lbs.	194.00

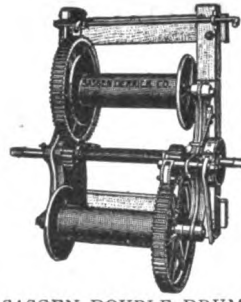
For additional lengths add \$4.00 per ft.



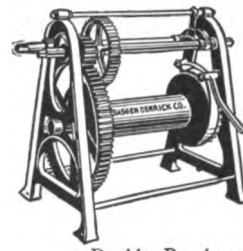
SASGEN DOUBLE DRUM
DOUBLE PURCHASE
WINCH



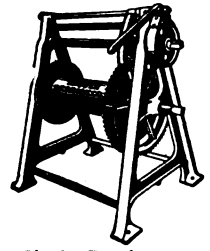
SASGEN SINGLE
DRUM DOUBLE
PURCHASE WINCH



SASGEN DOUBLE DRUM
GEARED WINCH



Double Purchase
SASGEN HOISTING CRABS



Single Purchase
SASGEN HOISTING CRABS

DATA, SASGEN WINCHES, GEARS AND
FRAME BEST MALLEABLE

No.	Diameter and length of drum, in.	Diameter of gear and pinion, in.	Lift 2 men 2 lines, lbs.	Lift 2 men 4 lines, lbs.	Price, each
DOUBLE DRUM DOUBLE PURCHASE WINCH					
150	9 x 14	22 x 15-4	10,000	20,000	\$135.00
151	9 x 16	" " "	"	"	139.00
152	9 x 18	" " "	"	"	143.00
153	9 x 20	" " "	"	"	147.00

SINGLE DRUM DOUBLE PURCHASE WINCH					
160	9 x 14	22 x 15-4	10,000	20,000	\$103.00
161	9 x 16	" " "	"	"	106.00
162	9 x 18	" " "	"	"	109.00
163	9 x 20	" " "	"	"	112.00

DOUBLE DRUM GEARED WINCH					
140	5 x 14	18 x 4	3,000	6,000	\$82.00
141	5 x 16	" " "	"	"	85.00
142	5 x 18	" " "	"	"	88.00
143	7 x 14	" " "	"	"	89.00
144	7 x 16	" " "	"	"	92.00
145	7 x 18	" " "	"	"	95.00

SINGLE DRUM GEARED WINCH					
130	5 x 14	18 x 4	3,000	6,000	\$50.00
131	5 x 16	" " "	"	"	52.00
132	5 x 18	" " "	"	"	54.00
133	7 x 14	" " "	"	"	55.00
134	7 x 16	" " "	"	"	57.00
135	7 x 18	" " "	"	"	59.00

JUNIOR SINGLE DRUM GEARED WINCH					
5	5 1/2 x 8	10 x 3	1,500	3,000	\$24.00
6	5 1/2 x 12	" " "	"	"	26.00

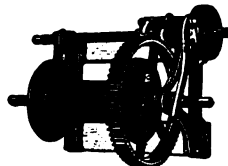
SMALL DOUBLE DRUM GEARED WINCH					
112	4 x 8	12 x 3	2,000	3,000	\$46.00

SMALL SINGLE DRUM GEARED WINCH					
110	4 x 8	12 x 3	2,000	3,000	\$19.00

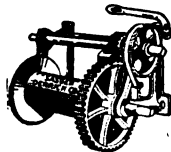
With bronze bushings, \$21.00.

DATA, SASGEN SAFETY WORM GEAR
WINCH MADE OF BEST MALLEABLE

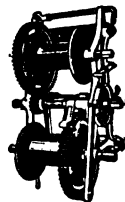
No.	Diameter and length of drum, in.	Worm gear	Capacity 1 man 1 line, lbs.	Capacity 1 man 2 lines, lbs.	Price, each
1	5 1/2 x 6	.....	750	1,500	\$18.00



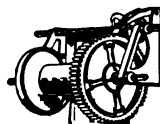
Single Drum



Junior
SINGLE DRUM
GEARED WINCHES



Double Drum



Single Drum
SASGEN SMALL
GEARED WINCHES



SASGEN SAFETY
WORM GEAR WINCH

DATA, SASGEN HOISTING CRABS AND
WINCH, GEARS AND FRAME BEST
MALLEABLE

No.	Diameter and length of drum, in.	Diameter of gear and pinion, in.	Lift 2 men 2 lines, lbs.	Lift 2 men 4 lines, lbs.	Price, each
DOUBLE PURCHASE HOISTING CRAB					
220	6 x 16	24 x 12-1 1/2	8,000	16,000	\$109.00
221	6 x 18	" " "	"	"	112.00
222	6 x 20	" " "	"	"	115.00
223	6 x 22	" " "	"	"	118.00
224	7 x 18	" " "	"	"	119.00
225	7 x 20	" " "	"	"	122.00
226	7 x 22	" " "	"	"	125.00
227	7 x 24	" " "	"	"	128.00

SINGLE PURCHASE HOISTING CRAB					
120	5 x 16	18 x 4	3,000	6,000	\$68.00
121	5 x 18	" " "	"	"	70.00
122	5 x 20	" " "	"	"	72.00
123	5 x 22	" " "	"	"	74.00
124	7 x 16	" " "	"	"	75.00
125	7 x 18	" " "	"	"	77.00
126	7 x 20	" " "	"	"	79.00
127	7 x 22	" " "	"	"	81.00

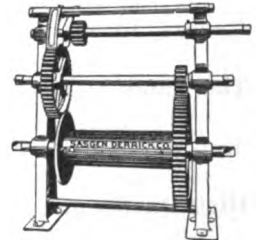
DOUBLE PURCHASE WAGON WINCH					
230	7 x 16	18 x 12-4 1/2	6,000	12,000	\$70.00
231	7 x 18	" " "	"	"	73.00
232	7 x 20	" " "	"	"	76.00
233	7 x 22	" " "	"	"	79.00
234	7 x 26	" " "	"	"	82.00
235	7 x 30	" " "	"	"	85.00

SINGLE PURCHASE WAGON WINCH					
240	6 x 14	18 x 4	3,000	6,000	\$56.00
241	6 x 16	" " "	"	"	58.00
242	6 x 18	" " "	"	"	60.00
243	6 x 20	" " "	"	"	62.00
244	6 x 22	" " "	"	"	64.00
245	6 x 24	" " "	"	"	66.00

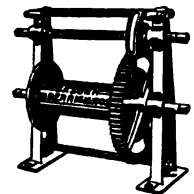
DATA, SASGEN SINGLE SHAFT GEARED
WINCH

No.	Diameter and length of drum, in.	Geared	Lift 2 men 2 lines, lbs.	Lift 2 men 4 lines, lbs.	Price, each
115	4 1/2 x 5	3 to 1	1,500	3,000	\$28.00

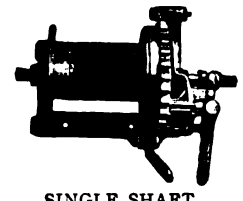
SMALL WINCH, NOT GEARED					
3	3 1/2 x 7	.....	800	1,600	\$10.00



DOUBLE PURCHASE
WAGON WINCH



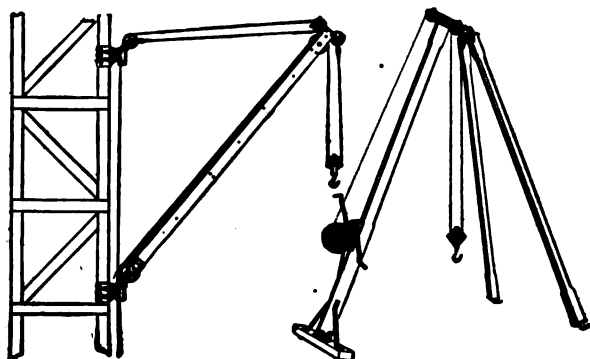
SINGLE PURCHASE
WAGON WINCH



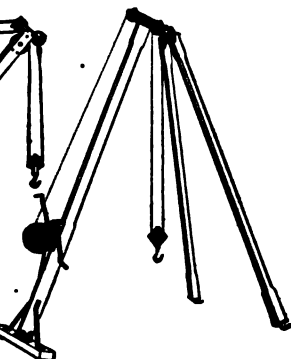
SINGLE SHAFT
GEARED WINCH



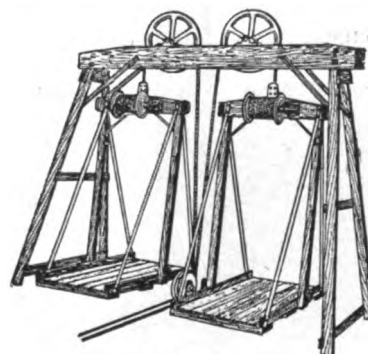
SASGEN SMALL
WINCH, NOT GEARED



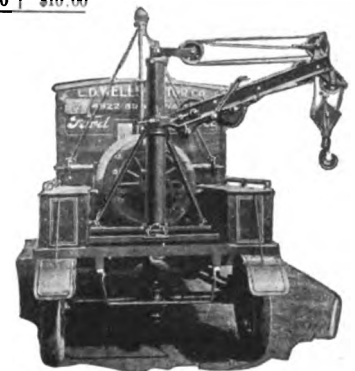
SASGEN TOWER BOOM
Has all crucible steel fittings; practical, light and strong; load and boom can be operated by power.
Price, 14-ft. boom..... \$78.00
Add \$1.50 per ft. up to 24 ft.
Price for fittings, per set \$64.00



SASGEN TRIPOD
Capacity 3,000 lbs. Equipped with geared winch, 100-ft. cable.
Price \$64.00



MATERIAL ELEVATOR
Cages 3 ft. 4 in. by 6 ft. Built of oak; well braced; fittings malleable iron except sheaves.
No. 300. Complete, without guides, \$128.00
No. 301. Brake attached for horse power..... 146.00
3/4-in. cable, 9 1/2¢ per ft.; 1/2-in. cable, 11¢ per ft. Guides, 28¢ per ft.



SASGEN IDEAL TRUCK DERRICK
For service trucks; the only machine operated in any direction and whose boom can be raised or lowered to suit the work. Winches so powerful that one man does the work; also raise car in front or back, making it possible to go underneath without lying on ground. Price, \$138.00

WHITLOCK CORDAGE COMPANY

Manufacturers of Manila and Sisal Rope Products

TELEPHONE:
BOWLING GREEN 9080

46 South Street
NEW YORK, N. Y.

CABLE ADDRESS:
"CORDWORKS"

BOSTON, MASS.

BRANCH OFFICES
CHICAGO, ILL. KANSAS CITY, MO.
FACTORY AND WAREHOUSES: JERSEY CITY, N. J.

HOUSTON, TEX.

Products.

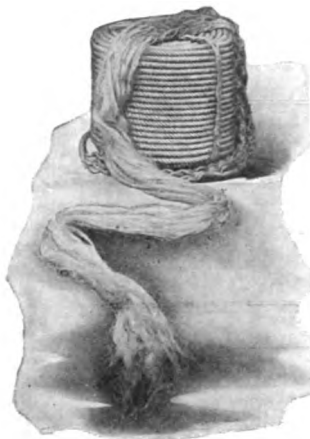
A full line of MANILA and SISAL ROPE, DRILLING CABLES, TARRED HEMP GOODS.

The Name—"Whitlock."

The name "Whitlock" on cordage stands for honesty in manufacture and reliability in service.

High Quality and Workmanship.

Whitlock rope, cordage and twine are made of high quality materials by expert ropemakers trained by long experience. A thorough knowledge of the exacting requirements which their products usually have to meet has led the manufacturers to develop rope of great strength and wearing quality. Whitlock All-Manila rope is guaranteed superior to Government Bureau of Standards Specifications in every respect, including quality of fiber, strength, yardage and tare. Quality of fiber is of extreme importance. There are many grades of manila. Engineers should demand rope of highest grade.



TRANSMISSION ROPE
SHOWING FIBER

Whitlock Manila Transmission Rope.

Made of very high grade manila hemp, and is lubricated with our special compound, made for the purpose. This semifluid compound is put inside the rope during process of manufacture and permeates every yarn; it will not evaporate or run out, and keeps rope moist and serviceable for the longest possible time. Transmission rope is sometimes made in three-strand form in small sizes, but is generally four-strand, with heart. Regular sizes, 1/2- to 2-in. diameter.

It is fully lubricated but not "loaded," has minimum possible weight per foot, and therefore maximum yardage or length per pound. Were the price per pound the same as other ropes, Whitlock products would cost considerably less per 100 ft., and, even at a higher price per pound, they



WHITLOCK ALL-MANILA ROPE
SHOWING LAY

often cost less per foot than ordinary rope. Unsurpassed in durability and life. Prices on application.

The "Lay" Is Adjusted for Minimum Stretch.

The turn in each successive operation of making rope is in a different direction from the preceding and this, to some extent, preserves the parallelism of fibers. In Whitlock rope the "lay" is firm without being too stiff and is properly adjusted for easy splicing, minimum stretch and long wear.

Quality Is Built Right Into the Product.

Hemp is first passed through a series of combing machines which produce a smooth, even stream or "sliver." These are fed to spinning machines called "jenneys" and twisted into yarn on large spools. For smaller ropes, yarns are "formed" into strands and "laid" into rope simultaneously. For larger ropes, these operations are separate. Hay rope is made by twisting two or more yarns together, while lath and ring yarn are made by forming a large number of yarns to the strand. Drilling cables are made of three finished ropes laid together. Tarred goods have their yarns passed through liquid tar before forming into strands.

Throughout each of these operations, the greatest degree of skill and care is used. Whitlock quality and honest methods follow all the way through. Every foot of Whitlock rope is guaranteed.



SCENE IN PREPARATION ROOM OF WHITLOCK PLANT

Actual Tests Show Whitlock Rope Is Stronger.

The added security obtained by using Whitlock rope is evident from the following strength tests made on samples of 1-in. diameter Whitlock manila rope and similar samples of other ropes by a well-known firm of testing engineers:

	Breaking Strength
Sample A.....Whitlock Manila.....	11,170 lbs.
Sample B.....	10,040 lbs.
Sample C.....	9,430 lbs.
Sample D.....	9,120 lbs.

Whitlock rope proved to be the strongest by a wide margin and was also the lightest. In the yardage tests, Sample B was 10% heavier, C was 8% heavier, and D was 3% heavier than Whitlock manila. It is to be noted that the lightest rope—next to Whitlock—was the weakest, and that the strongest rope—next to Whitlock—was 10% heavier. Particulars regarding these tests on request.

Wide Variety of Grades and Applications.

Whitlock manila and sisal rope and cordage are made to cover every field and application of engineering work.

Three- and Four-strand Manila or Sisal Rope—

Regular three-strand manila rope is the most widely used and best known cordage product. Sisal rope is not so strong as manila but is largely used in farming and industrial work. Four-strand rope is made with or without a heart. The former is generally firmer in lay and used in the contracting field in hoisting, hauling, etc., and for derricks, cranes, dredges and elevators.

Whitlock rope is regularly furnished in full coils of 1200 ft., and half coils of 600 ft. each, except in sizes under 1/2-in. diameter. Be sure to specify half coils when 600-ft. lengths are wanted.

Whitlock Manila Bolt Rope—This rope is made of selected high grade manila hemp of great strength and is used in many industries. Basis price 3/4-in. diameter and larger. Three- or four-strand quoted on application. Extra for small sizes, same as manila.



THREE-STRAND BOLT ROPE

Lariat Rope—Manufactured from manila and sisal, lariat rope is made either of three or four strands (no heart), hard lay, regularly without oil, from 3/8-in to 5/8-in. diameter. Three-strand lariat costs 4¢ above basis; four-strand, 5¢.

Whitlock Drilling Cable—Made of three

manila ropes, specially lubricated and laid for drilling purposes. Possesses remarkable strength and resistance to abrasion and the elements. All Whitlock manila rope is guaranteed to be made of high-grade manila hemp of great strength and wearing power. Does not contain inferior fibers of any kind.



THREE-STRAND MANILA DRILLING CABLE

Lath and Ring Yarn—Lath yarn is a strand of tarred sisal yarns, averaging 200 ends for the fine grade, 130 for medium and 110 for coarse. Coils 50, 100 and 200 lbs. each. Medium and coarse basis price, fine yarn 1/2¢ over basis. Details of fodder and wood yarn on application. Ring yarn similar in make, price and size to lath, except untarred. Uncoiled ring, 1¢ extra. Used for baling, tying, etc.



MEDIUM LATH YARN

DATA OF WHITLOCK ALL-MANILA ROPE

Size, in.	Diam.	Cir.	Differentials	Weights (lbs. and decimals)		Lengths (ft. and decimals)		Strengths (lbs.)	
				Full Coils (Gross)	Per 100 ft. (Net)	Full coils	Pt. in 1 lb. (Net)	Breaking strengths	Working strains
1/4	1/4	1/4	2 1/2 c.	33	1.33	2400	75	500	100
1/4	1/4	1/4	2 c.	50	1.67	2950	60	725	150
1/4	1/4	1/4	2 c.	55	2.50	2175	40	1225	250
1/4	1/4	1/4	1 1/2 c.	65	3.45	1850	29	1500	300
1/4	1/4	1/4	1 c.	75	4.76	1550	21	1800	350
1/4	1/4	1/4	1 c.	85	6.90	1200	14.5	2500	500
1/4	1/4	1/4	1 c.	120	9.75	1200	10.25	3250	650
1/4	1/4	1/4	1 c.	150	12.2	1200	8.22	4200	850
1/4	1/4	1/4	1 c.	190	15.4	1200	6.48	5200	1050
1/4	1/4	1/4	1 c.	230	18.7	1200	5.36	6400	1300
1/4	1/4	1/4	1 c.	270	21.9	1200	4.56	7700	1550
1/4	1/4	1/4	1 c.	320	26.0	1200	3.85	9000	1800
1/4	1/4	1/4	1 c.	375	30.5	1200	3.28	10200	2100
1/4	1/4	1/4	1 c.	430	34.9	1200	2.86	11700	2400
1/4	1/4	1/4	1 c.	500	40.6	1200	2.46	13200	2700
1/4	1/4	1/4	1 c.	570	46.3	1200	2.16	15000	3000
1/4	1/4	1/4	1 c.	715	58.1	1200	1.72	18300	3700
1/4	1/4	1/4	1 c.	885	71.9	1200	1.39	22300	4500
1/4	1/4	1/4	1 c.	1065	86.5	1200	1.15	26400	5300
1/4	1/4	1/4	1 c.	1275	103.6	1200	.965	31000	6200
1/4	1/4	1/4	1 c.	1500	121.9	1200	.821	35500	7100
1/4	1/4	1/4	1 c.	1740	141.4	1200	.707	40000	8000
1/4	1/4	1/4	1 c.	2000	162.5	1200	.615	45500	9000
1/4	1/4	1/4	1 c.	2275	184.8	1200	.541	51500	10500

PRICES, WHITLOCK ALL-MANILA ROPE

SIZES		Approximate cost per 100 ft., including "Differentials" 'Basis Price at top of each column. Pound Price of each size in heavy type																													
Diam.	Cir.	.10	.11	.12	.13	.14	.15	.16	.17	.18	.19	.20	.21	.22	.23	.24	.25	.26	.27	.28	.29	.30									
☆	½	1.12 ¹⁷	1.13 ¹⁸	1.14 ¹⁹	1.15 ²⁰	1.16 ²¹	1.17 ²²	1.18 ²³	1.19 ²⁴	1.20 ²⁵	1.21 ²⁶	1.22 ²⁷	1.23 ²⁸	1.24 ²⁹	1.25 ³⁰	1.26 ³¹	1.27 ³²	1.28 ³³	1.29 ³⁴	1.30 ³⁵	1.31 ³⁶	1.32 ³⁷									
¼	¾	1.12 ¹⁷	1.13 ¹⁸	1.14 ¹⁹	1.15 ²⁰	1.16 ²¹	1.17 ²²	1.18 ²³	1.19 ²⁴	1.20 ²⁵	1.21 ²⁶	1.22 ²⁷	1.23 ²⁸	1.24 ²⁹	1.25 ³⁰	1.26 ³¹	1.27 ³²	1.28 ³³	1.29 ³⁴	1.30 ³⁵	1.31 ³⁶	1.32 ³⁷									
☆	1	1.12 ¹⁷	1.13 ¹⁸	1.14 ¹⁹	1.15 ²⁰	1.16 ²¹	1.17 ²²	1.18 ²³	1.19 ²⁴	1.20 ²⁵	1.21 ²⁶	1.22 ²⁷	1.23 ²⁸	1.24 ²⁹	1.25 ³⁰	1.26 ³¹	1.27 ³²	1.28 ³³	1.29 ³⁴	1.30 ³⁵	1.31 ³⁶	1.32 ³⁷									
¾	1½	1.11 ⁴⁰	1.12 ⁴¹	1.13 ⁴²	1.14 ⁴³	1.15 ⁴⁴	1.16 ⁴⁵	1.17 ⁴⁶	1.18 ⁴⁷	1.19 ⁴⁸	1.20 ⁴⁹	1.21 ⁵⁰	1.22 ⁵¹	1.23 ⁵²	1.24 ⁵³	1.25 ⁵⁴	1.26 ⁵⁵	1.27 ⁵⁶	1.28 ⁵⁷	1.29 ⁵⁸	1.30 ⁵⁹	1.31 ⁶⁰	1.32 ⁶¹								
☆	1¾	1.11 ⁴⁰	1.12 ⁴¹	1.13 ⁴²	1.14 ⁴³	1.15 ⁴⁴	1.16 ⁴⁵	1.17 ⁴⁶	1.18 ⁴⁷	1.19 ⁴⁸	1.20 ⁴⁹	1.21 ⁵⁰	1.22 ⁵¹	1.23 ⁵²	1.24 ⁵³	1.25 ⁵⁴	1.26 ⁵⁵	1.27 ⁵⁶	1.28 ⁵⁷	1.29 ⁵⁸	1.30 ⁵⁹	1.31 ⁶⁰	1.32 ⁶¹								
½	1½	1.52 ⁵²	1.57 ⁵³	1.62 ⁵⁴	1.67 ⁵⁵	1.71 ⁵⁶	1.76 ⁵⁷	1.81 ⁵⁸	1.86 ⁵⁹	1.90 ⁶⁰	1.95 ⁶¹	1.00 ⁶²	1.05 ⁶³	1.09 ⁶⁴	1.14 ⁶⁵	1.19 ⁶⁶	1.24 ⁶⁷	1.28 ⁶⁸	1.33 ⁶⁹	1.38 ⁷⁰	1.43 ⁷¹	1.47 ⁷²	1.51 ⁷³								
		1.76 ⁷⁶	1.83 ⁷⁷	1.90 ⁷⁸	1.97 ⁷⁹	1.04 ⁸⁰	1.10 ⁸¹	1.17 ⁸²	1.24 ⁸³	1.31 ⁸⁴	1.38 ⁸⁵	1.45 ⁸⁶	1.52 ⁸⁷	1.56 ⁸⁸	1.66 ⁸⁹	1.72 ⁹⁰	1.79 ⁹¹	1.86 ⁹²	1.93 ⁹³	2.00 ⁹⁴	2.07 ⁹⁵	2.14 ⁹⁶									
☆	1¾	1.11 ¹⁰⁷	1.12 ¹⁰⁸	1.13 ¹⁰⁹	1.14 ¹¹⁰	1.15 ¹¹¹	1.16 ¹¹²	1.17 ¹¹³	1.18 ¹¹⁴	1.19 ¹¹⁵	1.20 ¹¹⁶	1.21 ¹¹⁷	1.22 ¹¹⁸	1.23 ¹¹⁹	1.24 ¹²⁰	1.25 ¹²¹	1.26 ¹²²	1.27 ¹²³	1.28 ¹²⁴	1.29 ¹²⁵	1.30 ¹²⁶	1.31 ¹²⁷	1.32 ¹²⁸								
¾	2	1.10 ¹⁰⁷	1.11 ¹⁰⁸	1.12 ¹⁰⁹	1.13 ¹¹⁰	1.14 ¹¹¹	1.15 ¹¹²	1.16 ¹¹³	1.17 ¹¹⁴	1.18 ¹¹⁵	1.19 ¹¹⁶	1.20 ¹¹⁷	1.21 ¹¹⁸	1.22 ¹¹⁹	1.23 ¹²⁰	1.24 ¹²¹	1.25 ¹²²	1.26 ¹²³	1.27 ¹²⁴	1.28 ¹²⁵	1.29 ¹²⁶	1.30 ¹²⁷	1.31 ¹²⁸								
★¾	2½	1.28 ¹⁰⁸	1.40 ¹⁰⁹	1.53 ¹¹⁰	1.65 ¹¹¹	1.77 ¹¹²	1.89 ¹¹³	2.01 ¹¹⁴	2.14 ¹¹⁵	2.26 ¹¹⁶	2.38 ¹¹⁷	2.50 ¹¹⁸	2.62 ¹¹⁹	2.74 ¹²⁰	2.87 ¹²¹	2.99 ¹²²	3.11 ¹²³	3.23 ¹²⁴	3.35 ¹²⁵	3.48 ¹²⁶	3.60 ¹²⁷	3.72 ¹²⁸	3.84 ¹²⁹								
		1.10 ¹⁰⁷	1.11 ¹⁰⁸	1.12 ¹⁰⁹	1.13 ¹¹⁰	1.14 ¹¹¹	1.15 ¹¹²	1.16 ¹¹³	1.17 ¹¹⁴	1.18 ¹¹⁵	1.19 ¹¹⁶	1.20 ¹¹⁷	1.21 ¹¹⁸	1.22 ¹¹⁹	1.23 ¹²⁰	1.24 ¹²¹	1.25 ¹²²	1.26 ¹²³	1.27 ¹²⁴	1.28 ¹²⁵	1.29 ¹²⁶	1.30 ¹²⁷	1.31 ¹²⁸								
		1.54 ¹⁰⁹	1.69 ¹¹⁰	1.85 ¹¹¹	2.00 ¹¹²	2.16 ¹¹³	2.31 ¹¹⁴	2.46 ¹¹⁵	2.62 ¹¹⁶	2.77 ¹¹⁷	2.93 ¹¹⁸	3.08 ¹¹⁹	3.23 ¹²⁰	3.39 ¹²¹	3.55 ¹²²	3.70 ¹²³	3.85 ¹²⁴	4.00 ¹²⁵	4.16 ¹²⁶	4.31 ¹²⁷	4.47 ¹²⁸	4.62 ¹²⁹	4.78 ¹³⁰								
1½	2½	1.87 ²¹⁹	2.06 ²²⁰	2.24 ²²¹	2.43 ²²²	2.62 ²²³	2.81 ²²⁴	2.99 ²²⁵	3.18 ²²⁶	3.37 ²²⁷	3.55 ²²⁸	3.74 ²²⁹	3.93 ²³⁰	4.11 ²³¹	4.30 ²³²	4.49 ²³³	4.67 ²³⁴	4.86 ²³⁵	5.05 ²³⁶	5.24 ²³⁷	5.42 ²³⁸	5.61 ²³⁹	5.79 ²⁴⁰								
1	3	2.19 ²¹⁹	2.41 ²²⁰	2.63 ²²¹	2.85 ²²²	3.07 ²²³	3.29 ²²⁴	3.50 ²²⁵	3.72 ²²⁶	3.94 ²²⁷	4.16 ²²⁸	4.38 ²²⁹	4.60 ²³⁰	4.82 ²³¹	5.04 ²³²	5.26 ²³³	5.47 ²³⁴	5.69 ²³⁵	5.91 ²³⁶	6.13 ²³⁷	6.35 ²³⁸	6.57 ²³⁹	6.79 ²⁴⁰								
1	3½	2.60 ²²⁰	2.86 ²²¹	3.12 ²²²	3.38 ²²³	3.64 ²²⁴	3.90 ²²⁵	4.16 ²²⁶	4.42 ²²⁷	4.68 ²²⁸	4.94 ²²⁹	5.20 ²³⁰	5.46 ²³¹	5.72 ²³²	5.98 ²³³	6.24 ²³⁴	6.50 ²³⁵	6.76 ²³⁶	7.02 ²³⁷	7.28 ²³⁸	7.54 ²³⁹	7.80 ²⁴⁰									
1¼	3¼	3.05 ³⁴⁹	3.36 ³⁵⁰	3.66 ³⁵¹	3.97 ³⁵²	4.27 ³⁵³	4.58 ³⁵⁴	4.88 ³⁵⁵	5.19 ³⁵⁶	5.46 ³⁵⁷	5.80 ³⁵⁸	6.10 ³⁵⁹	6.41 ³⁶⁰	6.71 ³⁶¹	7.02 ³⁶²	7.32 ³⁶³	7.62 ³⁶⁴	7.93 ³⁶⁵	8.24 ³⁶⁶	8.54 ³⁶⁷	8.84 ³⁶⁸	9.15 ³⁶⁹	9.45 ³⁷⁰								
1½	3½	3.49 ³⁴⁹	3.84 ³⁵⁰	4.19 ³⁵¹	4.54 ³⁵²	4.89 ³⁵³	5.24 ³⁵⁴	5.58 ³⁵⁵	5.93 ³⁵⁶	6.28 ³⁵⁷	6.63 ³⁵⁸	6.98 ³⁵⁹	7.33 ³⁶⁰	7.68 ³⁶¹	8.03 ³⁶²	8.38 ³⁶³	8.72 ³⁶⁴	9.07 ³⁶⁵	9.42 ³⁶⁶	9.77 ³⁶⁷	10.12 ³⁶⁸	10.47 ³⁶⁹	10.82 ³⁷⁰								
1¾	3¾	4.06 ³⁵⁰	4.47 ³⁵¹	4.87 ³⁵²	5.28 ³⁵³	5.68 ³⁵⁴	6.09 ³⁵⁵	6.49 ³⁵⁶	6.90 ³⁵⁷	7.31 ³⁵⁸	7.71 ³⁵⁹	8.12 ³⁶⁰	8.53 ³⁶¹	8.93 ³⁶²	9.34 ³⁶³	9.74 ³⁶⁴	10.15 ³⁶⁵	10.56 ³⁶⁶	10.96 ³⁶⁷	11.37 ³⁶⁸	11.77 ³⁶⁹	12.18 ³⁷⁰									
1¼	4	4.63 ⁵⁸¹	5.09 ⁵⁸²	5.56 ⁵⁸³	6.02 ⁵⁸⁴	6.48 ⁵⁸⁵	6.95 ⁵⁸⁶	7.41 ⁵⁸⁷	7.87 ⁵⁸⁸	8.33 ⁵⁸⁹	8.80 ⁵⁹⁰	9.26 ⁵⁹¹	9.72 ⁵⁹²	10.19 ⁵⁹³	10.65 ⁵⁹⁴	11.11 ⁵⁹⁵	11.57 ⁵⁹⁶	12.04 ⁵⁹⁷	12.50 ⁵⁹⁸	12.96 ⁵⁹⁹	13.43 ⁶⁰⁰	13.89 ⁶⁰¹	14.35 ⁶⁰²								
1½	4½	5.81 ⁵⁸¹	6.39 ⁵⁸²	6.97 ⁵⁸³	7.55 ⁵⁸⁴	8.13 ⁵⁸⁵	8.72 ⁵⁸⁶	9.30 ⁵⁸⁷	9.88 ⁵⁸⁸	10.46 ⁵⁸⁹	11.04 ⁵⁹⁰	11.62 ⁵⁹¹	12.20 ⁵⁹²	12.78 ⁵⁹³	13.36 ⁵⁹⁴	13.94 ⁵⁹⁵	14.52 ⁵⁹⁶	15.11 ⁵⁹⁷	15.69 ⁵⁹⁸	16.27 ⁵⁹⁹	16.85 ⁶⁰⁰	17.43 ⁶⁰¹	18.01 ⁶⁰²								
1¾	5	7.19 ⁵⁸²	7.91 ⁵⁸³	8.63 ⁵⁸⁴	9.35 ⁵⁸⁵	10.07 ⁵⁸⁶	10.79 ⁵⁸⁷	11.50 ⁵⁸⁸	12.22 ⁵⁸⁹	12.94 ⁵⁹⁰	13.66 ⁵⁹¹	14.38 ⁵⁹²	15.10 ⁵⁹³	15.82 ⁵⁹⁴	16.54 ⁵⁹⁵	17.26 ⁵⁹⁶	17.97 ⁵⁹⁷	18.69 ⁵⁹⁸	19.41 ⁵⁹⁹	20.13 ⁶⁰⁰	20.85 ⁶⁰¹	21.57 ⁶⁰²	22.29 ⁶⁰³								
1¾	5½	8.66 ¹⁰³⁶	9.52 ¹⁰³⁷	10.38 ¹⁰³⁸	11.25 ¹⁰³⁹	12.12 ¹⁰⁴⁰	12.98 ¹⁰⁴¹	13.84 ¹⁰⁴²	14.71 ¹⁰⁴³	15.57 ¹⁰⁴⁴	16.44 ¹⁰⁴⁵	17.30 ¹⁰⁴⁶	18.17 ¹⁰⁴⁷	19.03 ¹⁰⁴⁸	19.90 ¹⁰⁴⁹	20.76 ¹⁰⁵⁰	21.62 ¹⁰⁵¹	22.49 ¹⁰⁵²	23.35 ¹⁰⁵³	24.22 ¹⁰⁵⁴	25.08 ¹⁰⁵⁵	25.95 ¹⁰⁵⁶	26.82 ¹⁰⁵⁷								
2	6	12.19 ¹⁰³⁶	13.41 ¹⁰³⁷	14.63 ¹⁰³⁸	15.85 ¹⁰³⁹	17.07 ¹⁰⁴⁰	18.29 ¹⁰⁴¹	19.50 ¹⁰⁴²	20.72 ¹⁰⁴³	21.94 ¹⁰⁴⁴	23.16 ¹⁰⁴⁵	24.38 ¹⁰⁴⁶	25.60 ¹⁰⁴⁷	26.82 ¹⁰⁴⁸	28.04 ¹⁰⁴⁹	29.26 ¹⁰⁵⁰	30.47 ¹⁰⁵¹	31.69 ¹⁰⁵²	32.91 ¹⁰⁵³	34.13 ¹⁰⁵⁴	35.35 ¹⁰⁵⁵	36.57 ¹⁰⁵⁶	37.79 ¹⁰⁵⁷								
2¼	7	14.14 ¹⁶²⁵	15.55 ¹⁶²⁶	16.97 ¹⁶²⁷	18.38 ¹⁶²⁸	19.80 ¹⁶²⁹	21.21 ¹⁶³⁰	22.62 ¹⁶³¹	24.04 ¹⁶³²	25.45 ¹⁶³³	26.87 ¹⁶³⁴	28.28 ¹⁶³⁵	29.69 ¹⁶³⁶	31.11 ¹⁶³⁷	32.52 ¹⁶³⁸	33.94 ¹⁶³⁹	35.35 ¹⁶⁴⁰	36.76 ¹⁶⁴¹	38.18 ¹⁶⁴²	39.59 ¹⁶⁴³	41.01 ¹⁶⁴⁴	42.42 ¹⁶⁴⁵	43.83 ¹⁶⁴⁶								
2½	7½	16.25 ¹⁶²⁵	17.88 ¹⁶²⁶	19.50 ¹⁶²⁷	21.13 ¹⁶²⁸	22.75 ¹⁶²⁹	24.38 ¹⁶³⁰	26.00 ¹⁶³¹	27.63 ¹⁶³²	29.25 ¹⁶³³	30.88 ¹⁶³⁴	32.50 ¹⁶³⁵	34.13 ¹⁶³⁶	35.75 ¹⁶³⁷	37.38 ¹⁶³⁸	39.00 ¹⁶³⁹	40.62 ¹⁶⁴⁰	42.25 ¹⁶⁴¹	43.87 ¹⁶⁴²	45.50 ¹⁶⁴³	47.12 ¹⁶⁴⁴	48.75 ¹⁶⁴⁵	50.38 ¹⁶⁴⁶								
2¾	8	18.48 ¹⁶²⁵	20.32 ¹⁶²⁶	22.18 ¹⁶²⁷	24.02 ¹⁶²⁸	25.87 ¹⁶²⁹	27.72 ¹⁶³⁰	29.57 ¹⁶³¹	31.42 ¹⁶³²	33.26 ¹⁶³³	35.11 ¹⁶³⁴	36.96 ¹⁶³⁵	38.81 ¹⁶³⁶	40.66 ¹⁶³⁷	42.50 ¹⁶³⁸	44.35 ¹⁶³⁹	46.20 ¹⁶⁴⁰	48.05 ¹⁶⁴¹	49.90 ¹⁶⁴²	51.75 ¹⁶⁴³	53.60 ¹⁶⁴⁴	55.45 ¹⁶⁴⁵	57.30 ¹⁶⁴⁶								

AMERICAN STEEL & WIRE COMPANY

Manufacturers of Wire Rope

SALES OFFICES

CHICAGO, 208 South La Salle Street
 NEW YORK, 30 Church Street
 WORCESTER, 94 Grove Street
 BOSTON, 120 Franklin Street
 PHILADELPHIA, Widener Building
 PITTSBURGH, Frick Building
 BUFFALO, 337 Washington Street
 DETROIT, Foot of First Street
 CINCINNATI, Union Trust Building

CLEVELAND, Western Reserve Building
 BALTIMORE, 32 South Charles Street
 WILKES-BARRE, PA., Miners Bank Building
 ST. LOUIS, Third National Bank Building
 ST. PAUL-MINNEAPOLIS, Pioneer Building, St. Paul
 OKLAHOMA CITY, State National Bank Building
 BIRMINGHAM, ALA., Brown-Marx Building
 DENVER, First National Bank Building
 SALT LAKE CITY, Walker Bank Building

EXPORT REPRESENTATIVES, UNITED STATES STEEL PRODUCTS Co., 30 Church Street, New York

PACIFIC COAST REPRESENTATIVES, UNITED STATES STEEL PRODUCTS Co., San Francisco, Los Angeles, Portland, Seattle

Products.

All kinds of WIRE ROPE in the following qualities: Iron, Crucible Cast Steel, Extra Strong Crucible Cast Steel, Plow Steel and Monitor Plow Steel or Tico Special.

Also manufacturers of a full line of Wire Rope Fittings: Slings, Thimbles, Clips, Clamps, Sockets, Hooks, Turnbuckles, Shackles, Blocks, Sheaves, etc.

For Concrete Reinforcement, see pages 128-34; for Electric Wires and Cables, see pages 594-611.

Qualities of Wire Rope and Their Uses.

Wire rope is made in the following 5 qualities:

Iron Rope—The wires are made from the best quality iron, being soft, tough and flexible. They are of low tensile strength, approximately 85,000 lbs. per sq. in. Iron hoisting rope is most generally used for elevator hoisting, where the strength is sufficient. It is almost universally employed for counterweight ropes, except on traction elevators. For traction elevators this company recommends mild steel hoisting rope.

Crucible Cast Steel Rope—This is a medium strength material, tough and pliable, of moderate cost and general utility. Weighs only about half as much as iron for same strength; is harder, and better resists external wear. This rope is applicable to a great variety of uses, among which may be noted mine hoisting, logging, elevators, derricks, hay presses, dredges, cableways, inclined planes, coal hoists, conveyors, ballast unloaders, skip hoists and many other uses.

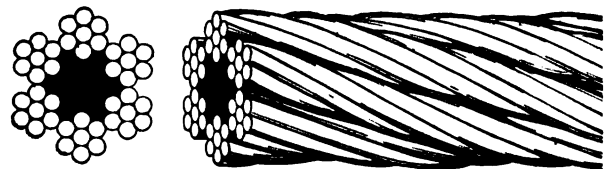
Extra Strong Crucible Cast Steel Rope—Of higher tensile strength than the crucible steel, and is tough, pliable, a little lighter for the same strength than crucible steel, and about two and one-half times the strength of iron. It has been found particularly useful for oil well drilling and tubing lines. Its other general uses are similar to those of the crucible steel, except that it may be used where loads are somewhat heavier.

Plow Steel Rope—Combines lightness and great strength; is somewhat stiffer than crucible steel and nearly three times as strong. Used particularly for heavy mine hoisting, derricks, inclined planes, dredges, cableways, for heavy logging and similar uses. It is the most economical rope to use where the weight of the rope has to be considered, or where the capacity of the machinery is to be increased without a corresponding increase in sheaves and drums.

Monitor Plow Steel Rope—This is the highest strength rope made. It is somewhat stiffer in the same diameter than the plow and crucible steel grades, but, strength for strength, it is equally flexible. Very useful where great strength, lightness and abrasive resisting qualities are required.

Transmission, Haulage or Standing Rope.

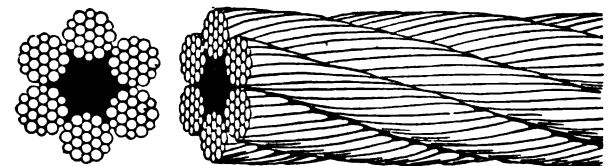
The coarsest rope, i. e., 6 by 7 construction, a relatively stiff rope with large wires, capable of resisting external wear or abrasion; but it is the least flexible.



TRANSMISSION, HAULAGE OR STANDING ROPE (6 x 7)

Hoisting Rope.

Composed of 6 strands of 19 wires each, with hemp core. Used for elevators, mine hoisting, derricks, dredges, cableways, inclined planes, coal hoists, conveyors, ballast unloaders, skip hoist, oil well drilling and tubing lines.

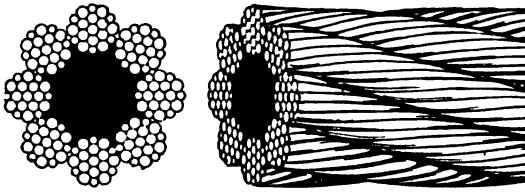


HOISTING ROPE (6 x 19)

Extra Flexible Hoisting Rope.

This rope is composed of 8 strands of 19 wires each, laid around a hemp core. The addition of these 2 strands over the standard hoisting rope increases the flexibility and permits the rope being used over comparatively smaller sheaves and drums.

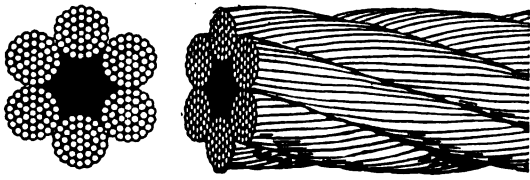
Adaptable for derricks, steam dredges, coal and ore handling machinery, pile drivers, and also for logging purposes, as well as tubing lines for oil wells.



EXTRA FLEXIBLE STEEL HOISTING ROPE (8 x 19)

Special Flexible Hoisting Rope.

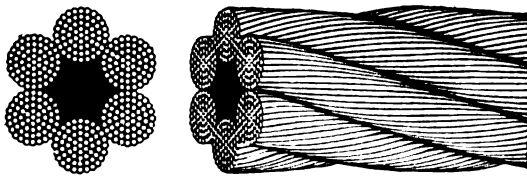
This rope is composed of 6 strands of 37 wires each, laid around a hemp core. This is a very flexible rope, and used largely on cranes and similar machinery where sheaves, of a necessity, are small.



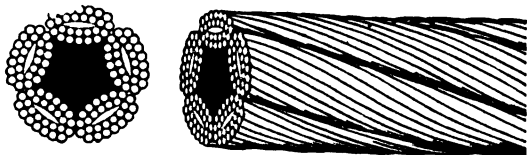
SPECIAL FLEXIBLE STEEL HOISTING ROPE (6 x 37)

Extra Special Flexible Hoisting Rope.

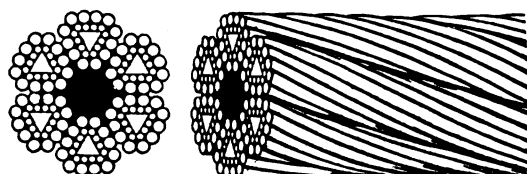
Composed of 6 strands of 61 wires each, with 1 hemp core, and recommended for dredging purposes, for which it is usually made with special wire center.

EXTRA SPECIAL FLEXIBLE HOISTING ROPE
(6 x 61)**Flattened Strand Hoisting Ropes.**

These ropes compare in flexibility with the standard hoisting rope, but possess about 150% greater wearing surface than the round strand ropes of same diameter, and have been used generally in the same places. (For data see following page.)



Type A (5 x 28)



Type B (6 x 25)

FLATTENED STRAND HOISTING ROPES

DATA, VARIOUS CONSTRUCTIONS AND GRADES OF WIRE ROPE

IRON				CRUCIBLE CAST STEEL		EXTRA STRONG CRUCIBLE CAST STEEL		FLOW STEEL		MONITOR FLOW STEEL	
Diam. in ins.	Weight per ft. in lbs.	Proper working load in tons of 2000 lbs.	Diam. of drum or sheave in ft. advised	List price per ft.	Proper working load in tons of 2000 lbs.	Diam. of drum or sheave in ft. advised	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.
TRANSMISSION, HAULAGE OR STANDING ROPE—6 STRANDS, 7 WIRES TO STRAND, 1 HEMP CORE											
1½	3.55	6.4	16	\$0.51	12.6	11	\$0.60	14.6	\$0.75	16.4	\$1.05
1¼	3	5.6	15	.43	10.6	10	.51	12.6	.64	14.4	.88
1⅓	2.45	4.6	13	.36	9.2	9	.43	10.8	.53	12	.72
1½	2	3.8	12	.30	7.4	8	.36	8.6	.44	9.4	.58
1	1.58	3	10.5	.24	6.2	7	.29	7	.35	7.6	.48
¾	1.20	2.4	9	.18½	4.8	6	.22½	5.6	.27	6.2	.37
½	.89	1.7	7.5	.14	3.7	5	.17	4.2	.20	4.6	.28½
⅜	.75	1.5	7.25	.12	3.1	4½	.14½	3.3	.17	3.6	.24½
⅝	.62	1.2	7	.10	2.6	4½	.12	2.9	.14½	3.2	.20½
⅞	.50	.96	6	.08½	2	4	.10	2.2	.12	2.4	.17
1	.39	.74	5.5	.06½	1.5	3½	.08	1.8	.09½	2	.13½
1¼	.30	.62	4.5	.05½	1.1	3	.06½	1.25	.07½	1.4	.11½
1½	.22	.44	4	.04½	.92	2½	.05½	1.05	.06	1.2	.08¾
1¾	.15	.34	3.5	.03½	.70	2¼	.04½	.79	.05½	.88	.06
2	.12½	.24	3	.03¼	.50	1¾	.04	.59	.05	.68	.05½

HOISTING ROPE—6 STRANDS, 19 WIRES TO STRAND, 1 HEMP CORE													
2 1/2	11.95	22.2	17	\$1.70	42.2	11	\$2.10	48.6	\$2.55	55	\$3.00	63	\$3.45
2 1/4	9.85	18.4	15	1.40	34	10	1.75	40	2.10	46	2.50	53	2.80
2 1/8	8	14.4	14	1.17	26.6	9	1.44	32	1.70	37	2.00	42	2.50
2	6.30	11	12	.95	21.2	8	1.16	24.6	1.34	28	1.68	33	1.85
1 3/4	5.55	10	12	.88	19	8	1.02	22.4	1.25	25	1.48	30	1.75
1 3/8	4.85	8.8	11	.80	17	7	.90	19.8	1.10	22	1.30	27	1.60
1 1/2	4.15	7.6	10	.65	14.4	6.5	.77	16.6	.94	19	1.08	22	1.30
1 1/8	3.65	6.8	9	.57	12.8	6	.66	14.6	.80	16	.93	20	1.10
1 1/4	3	5.8	8.5	.49	11.2	5.5	.56	12.8	.68	14	.79	17	.90
1 1/8	2.45	4.56	7.5	.40	9.4	5	.46	10.6	.56	12	.65	14	.75
1 1/4	2	3.72	7	.33	7.6	4.5	.38	8.6	.46	9.4	.54	11	.65
1 1/8	1.58	2.90	6	.26	6	4	.31	6.80	.37	7.6	.43	9	.50
1 1/4	1.20	2.36	5.5	.20	4.6	3.5	.24	5.20	.29	5.8	.34	7	.39
3/4	.89	1.70	4.5	.16	3.5	3	.19	4.04	.22	4.6	.26	5.3	.31
3/8	.62	1.20	4	.12	2.5	2.5	.14	2.80	.16 1/2	3.1	.19	3.8	.23 1/2
3/8	.50	.94	3.5	.10	2	2.25	.12	2.24	.14	2.4	.16	2.9	.19
1/2	.39	.78	3	.08 1/2	1.68	2	.11	1.84	.12 1/2	2	.14	2.4	.17
1/2	.30	.68	2.75	.07 1/2	1.30	1.75	.10	1.45	.11 1/2	1.6	.13	1.9	.16 1/2
1/2	.22	.48	2.25	.07	.96	1.50	.09 1/2	1.06	.11	1.15	.12 1/2	1.35	.14 1/2
1/2	.15	.30	2	.06 1/2	.82	1.25	.09 1/2	.76	.10 1/2	.9	.10 1/2	.9	.13 1/2
1/4	.10	.22	1.50	.06 1/4	.44	1.00	.09	.49	.10 1/2	.53	.12	.63	.13

EXTRA FLEXIBLE HOISTING ROPE—6 STRANDS, 19 WIRES TO STRAND, 1 HEMP CORE													
1 1/2	3.19			\$0.73	11.6	3.75	\$0.73	13	\$0.88	14.8	\$1.03	16	\$1.19
1 1/8	2.70			.62	10.2	3.5	.51	11	.75	12.8	.87	13	.98
1 1/4	2.20			.51	8.4	3.2	.42	9.4	.62	10.4	.72	11	.83
1 1/8	1.80			.42	6.8	2.83	.34	7.6	.51	8.6	.60	9.2	.68
1	1.42	3.1	6	.29	5.2	2.5	.34	5.9	.41	6.6	.48	7.2	.55
3/4	1.08	2.6	5.5	.22	4	2.16	.27	4.6	.32	5.2	.38	5.6	.43
3/8	.80	1.9	4.5	.18	3.06	1.83	.21	3.5	.25	4	.29	4.4	.34
3/8	.56	1.4	4	.14	2.18	1.75	.16	2.5	.18 1/2	2.8	.21	3	.25
3/8	.45	1.2	3.5	.11 1/2	1.74	1.5	.14	2	.16	2.32	.18	2.4	.22
3/8	.35	1	3	.09 1/2	1.46	1.33	.12	1.6	.14	1.74	.16	1.9	.19
1/2	.27				1.14	1.16	.11	1.26	.13	1.38	.15		
1/2	.20				.84	1	.10 1/2	.93	.12 1/2	1.02	.14		
1/2	.13				.55	.83	.10 1/4	.61	.12	.67	.13 1/2		
1/4	.09				.36	.75	.10	.40	.11 1/4	.45	.13 1/2		

SPECIAL FLEXIBLE HOISTING ROPE—6 STRANDS, 37 WIRES TO STRAND, 1 HEMP CORE													
2 1/2	11.95			\$2.30	40	3.75	\$2.90	47	\$3.30	55	\$3.75		
2 1/4	9.85			1.92	32	3.5	2.35	37	2.75	45	3.15		
2 1/8	8			1.60	25	3	1.90	30	2.20	37	2.50		
2	6.30			1.35	21	2.5	1.55	26	1.80	27	2.10		
1 3/4	5.55			1.20	18.8	2.1	1.41 1/2	23.8	1.65	25	1.92 1/2		
1 3/8	4.85			1.06	17	1.8	1.28	22	1.50	23	1.75		
1 1/2	4.15			.89	14	1.5	1.07	18	1.25	19	1.45		
1 1/8	3.65			.79	12	3.75	.96	16	1.10	17	1.25		
1 1/4	3			.65	11	3.5	.78	14	.91	14	1.05		
1 1/8	2.45			.55	9	3.2	.65	10	.75	11	.86		
1 1/4	2			.46	7	2.83	.46	8	.55	9	.75		
1 1/8	1.58			.37	6	2.5	.37	6.4	.44	7	.51		
1 1/4	1.20			.28	5	2.16	.28	5	.34	5	.40		
3/4	.89			.23	3.5	1.83	.23	3.8	.27	4	.31		
3/8	.62			.18	2.2	1.75	.18	2.5	.21	3	.24		
3/8	.50			.15	1.9	1.5	.15	2.1	.17 1/2	2.3	.20		
3/8	.39			.13	1.45	1.33	.13	1.65	.15	1.85	.17		
3/8	.30			.12 1/2	1.1	1.16	.12 1/2	1.27	.14	1.4	.16		
1/2	.22			.12	.84	1	.12	.93	.13	1	.15		

Diameter of drum advised for extra strong crucible cast steel, plow steel and monitor plow steel ropes is same as for crucible cast steel.
The tensile strength is 5 times the proper working load given above.

EXTRA SPECIAL FLEXIBLE HOISTING ROPE—6 STRANDS, 61 WIRES TO EACH, 1 HEMP CORE

Diam. in.	Weight per ft. in lbs.	Diam. of drum or sheave in ft. advised	CRUCIBLE CAST STEEL		EXTRA STRONG CRUCIBLE CAST STEEL		FLOW STEEL		MONITOR FLOW STEEL	
			Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.
3 1/4	16.60	11	56		63		70		74	
3	14.20	10	48		55		62		65	
2 3/4	11.95	9	40	\$2.53	47	\$3.08	63	\$3.63	56	\$4.12
2 1/2	9.85	8	32	2.11	37	2.58	43	3.02	45	3.46
2 1/4	8.00	7	25	1.76	30	2.09	35	2.42	37	2.75
2	6.30	6	21	1.48	23	1.70	26	1.98	27	2.31

DATA, FLATTENED STRAND HOISTING ROPES

Diam. ins.	IRON				CRUCIBLE CAST STEEL					EXTRA STRONG CRUCIBLE CAST STEEL*			MONITOR FLOW STEEL			
	Type A				Type A	Type B		Types A and B		Type A	Type B	Types A and B	Type A	Type B	Types A and B	
	Proper working load in tons of 2000 lbs.	Weight per ft. in lbs.	Diam. of drum or sheave in ft. advised	List price per ft.	Proper working load in tons of 2000 lbs.	Proper working load in tons of 2000 lbs.	Weight per ft. in lbs.	Diam. of drum or sheave in ft. advised	List price per ft.	Proper working load in tons of 2000 lbs.	Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	Proper working load in tons of 2000 lbs.	Diam. of drum or sheave in ft. advised.	List price per ft.
2 1/2	14.4	8.00	11 1/4	\$1.52	26.6	29.2	9.20	8 1/2	\$1.82	32	35.2	\$2.20	42	46.2	12	\$2.85
2 1/4	11	6.30	10 3/4	1.20	21.2	23.4	7.25	8	1.44	24.6	27	1.77	33.2	36.6	11	2.25
2 1/8	8.8	4.85	9	1.04	17.0	18.8	5.60	7 1/4	1.21	19.8	21.8	1.55	26.6	29.2	9	2.08
1 3/4	7.6	4.15	7 3/4	.82	14.4	15.8	4.75	6 3/4	.96	16.6	18.2	1.30	22	24.2	8 1/2	1.56
1 3/8	6.6	3.55	6 3/4	.74	12.8	14.0	4.00	5 3/4	.86	14.6	16	1.05	19.6	21.6	8	1.37
1 3/16	5.6	3.00	5 3/4	.625	11.2	12.4	3.45	5 1/2	.73	12.8	14	.90	16.8	18.4	7 1/2	1.12
1 1/4	4.6	2.45	4 3/4	.52	9.4	10.4	2.80	5	.595	10.6	11.6	.70	13.8	15.2	7	.89
1 1/8	3.72	2.00	4 1/4	.43	7.6	8.4	2.30	4 1/2	.50	8.6	9.4	.59	11.2	12.4	6	.71
1 1/16	2.99	1.58	4 1/4	.34	6.0	6.6	1.80	4	.395	6.8	7.4	.48	9	10.0	5	.60
1 1/32	2.36	1.20	4	.26	4.6	5.0	1.38	3 3/4	.30	5.2	5.8	.38	7	7.8	4 1/2	.49
1 1/64	1.70	.89	3 1/2	.21	3.5	3.86	1.00	3	.24	4.04	4.44	.30	5.26	5.8	4	.375
1 1/128	1.20	.62	3	.155	2.5	2.76	.72	2 3/4	.18 1/4	2.80	3.08	.225	3.8	4.2	3 1/2	.28
1 1/256	.94	.50	2 1/2	.13	2	2.2	.58	2 1/2	.165	2.24	2.46	.195	2.9	3.2	3	.25
1 1/512	.78	.39	2	.105	1.68	1.86	.45	1 1/2	.145	1.84	2.02	.175	2.42	2.7	2 1/2	.20 1/4
1 1/1024	.48	.22	1	.095												

Weight, for Types A and B respectively are the same for all constructions. Standard Plow Steel grade is also furnished if desired.
 *Diameters of drums are the same as for Crucible Cast Steel.



FLATTENED STRAND HAULAGE OR TRANSMISSION ROPE
Type C (5 x 9)



FLATTENED STRAND HAULAGE OR TRANSMISSION ROPE
Type D (6 x 8)

Flattened Strand Haulage or Transmission Ropes.

These ropes are designed to give increased wearing surface above that to be obtained from a round strand rope. Used in logging, coal dock haulage and similar plans.

Tiller or Hand Rope.

Used for starting and stopping elevators, and also for steering lines on yachts and motor boats.

DATA, FLATTENED STRAND HAULAGE OR TRANSMISSION ROPES

TYPE C—5 STRANDS OF 9 WIRES EACH, 1 HEMP CORE
 TYPE D—6 STRANDS OF 8 WIRES EACH, 1 HEMP CORE

Diam. in ins.	Diam. of drum or sheave in ft. advised	CRUCIBLE CAST STEEL					EXTRA STRONG CRUCIBLE CAST STEEL					MONITOR PLOW STEEL					Diam. of drum or sheave in ft. advised	
		Type C		Type D		Both Types	Type C		Type D		Both Types	Type C		Type D		Both Types		
		Proper working load in tons of 2000 lbs.	Weight per ft. in lbs.	Proper working load in tons of 2000 lbs.	Weight per ft. in lbs.		List price per ft.	Proper working load in tons of 2000 lbs.	Weight per ft. in lbs.	Proper working load in tons of 2000 lbs.		Weight per ft. in lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	Weight per ft. in lbs.			Proper working load in tons of 2000 lbs.	Weight per ft. in lbs.	List price per ft.
1 1/2	8 1/2	12.6	3.65	13.6	4.00	\$0.75	14.6	3.65	15.8	4.00	\$0.93							
1 1/4	8	10.6	3.10	11.4	3.45	.64	12.6	3.10	13.6	3.45	.80							
1 1/8	7 1/4	9.2	2.55	10	2.80	.54	10.8	2.55	11.6	2.80	.68	13.4	2.55	14.6	2.80	\$0.88	9 1/4	
1 1/16	6 3/4	7.4	2.05	8	2.30	.45	8.6	2.05	9.2	2.30	.54	10.4	2.05	11.2	2.30	.70	8	
1 1/16	5 3/4	6.2	1.65	6.8	1.80	.35	7.0	1.65	7.6	1.80	.45	8.4	1.65	9.2	1.80	.58	6 3/4	
1 1/16	5	4.8	1.24	5.2	1.38	.275	5.6	1.24	6.0	1.38	.35	6.6	1.24	7.2	1.38	.44	5	
1 1/16	4 1/4	3.72	.92	4	1.00	.205	4.2	.92	4.54	1.00	.27	5.0	.92	5.4	1.00	.35	5 1/4	
1 1/16	3 3/4	2.6	.64	2.8	.72	.14	2.9	.64	3.14	.72	.18	3.5	.64	3.8	.72	.25	4 1/4	
1 1/16	2 1/2	1.54	.40	1.66	.45	.10	1.77	.40	1.92	.45	.14	2.2	.40	2.38	.45	.16 1/4	3 3/4	
1 1/16	2	.92	.23	1	.25	.07	1.05	.23	1.14	.25	.11							

DATA, TILLER OR HAND ROPE 6 STRANDS OF 42 WIRES EACH, 7 HEMP CORES

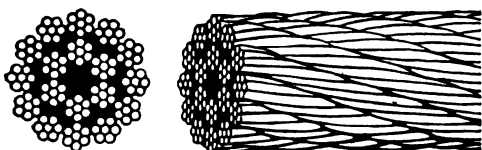
Diam. ins.	Weight per ft. in lbs.	Diam. of drum or sheave in ft. advised	IRON		CRUCIBLE CAST STEEL	
			Approx. Breaking strength, in lbs.	List price per ft.	Approx. Breaking strength, in lbs.	List price per ft.
1	1.10	24	22000	\$0.33	35000	\$0.43
3/4	.84	21	15500	.27	26000	.36
1/2	.62	18	11000	.22	18000	.30
3/8	.43	15	7000	.17	13500	.24
5/16	.35	13 1/4	6300	.14	11000	.20
1/4	.28	12	5800	.11 1/2	9000	.17
3/16	.21	10 3/4	4000	.10	6500	.15
5/32	.16	9	3000	.09	4800	.14
1/8	.11	7 1/4	1900	.08	3600	.12 1/4
3/32	.07	6	1300	.07 1/4	2500	.11
1/16	.04	5	750	.07	1350	.10



TILLER OR HAND ROPE (6 x 42)

Non-spinning Hoisting Rope.

This type of rope is so constructed that it prevents the rotating of a free load suspended on the end of a single line. It is recommended for "back haul" or single line derricks.

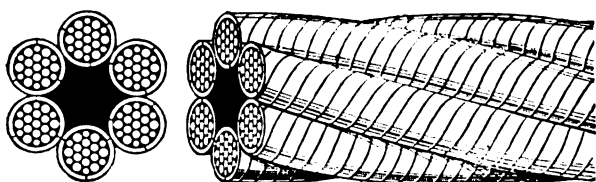


NON-SPINNING HOISTING ROPE (18 x 7)

Steel Clad Hoisting Rope.

Each strand is spirally wound with flat steel strips, which gives considerable wearing surface over the ordinary type. When the flat strips of a steel clad rope have worn through, there still remains the complete hoisting rope with unimpaired strength. Where ropes wear out quickly, this feature is a distinct advantage.

Made in 3 constructions: 6 by 19 wires each; special flexible, 6 strands of 37 wires each; and extra special flexible, 6 strands of 61 wires each.

STEEL CLAD HOISTING ROPE
6 STRANDS, 19 WIRES TO STRAND

Diam., in ins.	Weight per ft., in lbs.	Diam. of drum or sheave in ft. advised	CRUCIBLE CAST STEEL		EXTRA STRONG CRUCIBLE CAST STEEL		FLOW STEEL		MONITOR FLOW STEEL	
			Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.
2 1/4	8.45	8	21.2	\$1.56	24.6	\$1.74	28	1.98	33	\$2.25
2 1/2	6.70	7.5	19.2	1.29	22.4	1.52	25	1.73	30	2.02
2 3/4	6.02	7	17.0	1.16	19.8	1.36	22	1.56	27	1.86
1 3/4	5.25	6.5	14.4	1.01	16.6	1.18	19	1.32	22	1.54
1 1/2	4.62	6	12.8	.89	14.6	1.03	16	1.16	20	1.33
1 1/4	3.95	5.5	11.2	.78	12.8	.90	14	1.01	17	1.12
1 1/8	3.30	5	9.4	.67	10.6	.77	12	.86	14	.96
1 1/16	2.80	4.5	7.6	.57	8.6	.65	9.4	.73	11	.81
1 1/32	2.12	4	6.0	.49	6.8	.55	7.6	.61	9	.68
1 1/64	1.72	3.5	4.6	.41	5.2	.46	5.8	.51	7	.56
1 1/128	1.30	3	3.5	.36	4.04	.39	4.6	.43	5.3	.48
1 1/256	1.00	2.5	2.5	.30	2.80	.32	3.1	.35	3.8	.38
1 1/512	.70	2	1.68	.26	1.84	.27	2.0	.29	2.4	.32

Galvanized Iron Ship's Rigging or Guy Rope.

In the ship building industry, standard hoisting ropes as shown on the foregoing pages are in general use for handling materials.

The ropes described are used as part of the mechanical equipment of ships, besides being employed for other purposes.

Galvanized iron ship's rigging or guy rope is used for ship's rigging, guys for derricks, smokestacks, and for general standing rope service; it is not designed to run over drums or sheaves.

Construction, 6 strands, 7 or 12 wires to strand, 1 hemp core.

DATA, NON-SPINNING HOISTING ROPE
18 STRANDS, 7 WIRES EACH, 1 HEMP CORE

Diam., in ins.	Weight per ft., in lbs.	Diam. of drum or sheave in ft. advised	IRON		CRUCIBLE CAST STEEL		EXTRA STRONG CRUCIBLE CAST STEEL		FLOW STEEL		MONITOR FLOW STEEL	
			Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.
1 3/4	5.50	7.00	9.1	\$0.80	17.1	\$0.90	20.2	\$1.10	22.2	\$1.30	24.4	\$1.60
1 1/2	4.90	6.50	7.9	.65	14.8	.77	17.5	.94	19.2	1.08		
1 1/4	4.32	6.00	6.8	.57	12.7	.66	15.0	.80	16.5	.93	18.1	1.10
1 1/8	3.60	5.50	5.6	.49	10.4	.56	12.4	.68	13.7	.79	15.1	.90
1 1/16	2.80	5.00	4.6	.40	8.7	.46	10.3	.56	11.3	.65	12.5	.75
1 1/32	2.34	4.50	3.9	.33	7.3	.38	8.6	.46	9.5	.54	10.4	.62
1 1/64	1.73	4.00	2.9	.26	5.6	.31	6.6	.37	7.2	.43	7.8	.50
1 1/128	1.44	3.50	2.3	.20	4.5	.24	5.3	.29	6.3	.34	7.0	.39
1 1/256	1.02	3.00	1.7	.16	3.3	.19	3.9	.22	4.9	.26	5.4	.31
1 1/512	.70	2.50	1.1	.12	2.2	.14	2.6	.16 1/2	3.1	.19	3.4	.22 1/2
1 1/1024	.87	2.25	.97	.10	1.8	.12	2.1	.14	2.5	.16		
1 1/2048	.42	2.00	.73	.08 1/2	1.3	.11	1.6	.12 1/2	1.9	.14	2.1	.17
1 1/4096	.31	1.75	.52	.07 1/2	.98	.10	1.1	.11 1/2	1.3	.13		
1 1/8192	.25	1.50	.42	.07	.78	.09 1/2	.92	.11	1.1	.12 1/2	1.2	.14 1/2

DATA, STEEL CLAD, SPECIAL FLEXIBLE HOISTING ROPE
6 STRANDS, 37 WIRES TO STRAND, 1 HEMP CORE

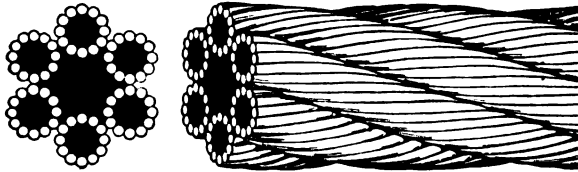
Diam., in ins.	Weight per ft., in lbs.	Diam. of drum or sheave in ft. advised	CRUCIBLE CAST STEEL		EXTRA STRONG CRUCIBLE CAST STEEL		FLOW STEEL		MONITOR FLOW STEEL	
			Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.
2 3/4	12.05	8	32	\$2.52	37	\$2.95	43	\$3.35	45	\$3.75
2 1/2	9.90	7	25	2.10	30	2.40	35	2.70	37	3.00
2 1/4	8.00	6	21	1.75	23	1.95	26	2.20	27	2.50
2	6.60	5.25	18	1.47	21.2	1.68	23.8	1.92	25	2.19
1 3/4	4.90	4.75	17	1.31	19	1.54	22	1.76	23	2.01
1 1/2	4.30	4.25	14	1.13	16	1.31	18	1.49	19	1.69
1 1/4	3.70	3.75	12	1.02	14	1.18	16	1.33	17	1.48
1 1/8	3.05	3.25	11	.87	12	1.00	14	1.13	14	1.27
1 1/16	2.50	2.75	9	.76	10	.86	11	.96	11	1.07
1 1/32	2.00	2.25	7	.65	8	.74	9	.83	9.2	.94
1 1/64	1.60	1.83	6	.55	6.4	.62	7	.69	7.4	.77
1 1/128	1.25	1.56	5	.45	5	.51	5	.57	5.8	.63

DATA, STEEL CLAD, EXTRA SPECIAL FLEXIBLE HOISTING ROPE
6 STRANDS, 61 WIRES TO STRAND, 1 HEMP CORE

Diam., in ins.	Weight per ft., in lbs.	Diam. of drum or sheave in ft. advised	CRUCIBLE CAST STEEL		EXTRA STRONG CRUCIBLE CAST STEEL		FLOW STEEL		MONITOR FLOW STEEL	
			Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.	Proper working load in tons of 2000 lbs.	List price per ft.
3 1/4	16.80	10	48	\$3.90	55	\$4.55	62	\$5.10	65	\$5.70
3	14.35	9	40	3.23	47	3.78	53	4.33	55	4.82
2 3/4	12.05	8	32	2.71	37	3.18	43	3.62	45	4.06
2 1/2	9.90	7	25	2.26	30	2.59	35	2.92	37	3.25
2 1/4	8.45	6	21	1.88	23	2.10	26	2.38	27	2.71

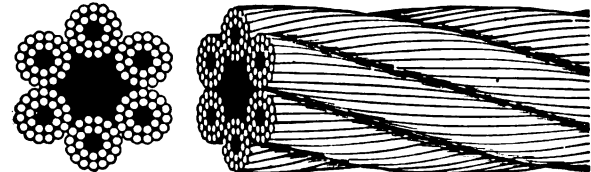
Galvanized Crucible Cast Steel Yacht Rigging or Guy Rope.

Made of crucible cast steel in 2 constructions: 6 strands, 7 wires to strand, 1 hemp core, for ship's or yacht's standing rigging and derrick guys; 6 strands, 19 wires to strand, 1 hemp core, for running rigging and mooring lines.

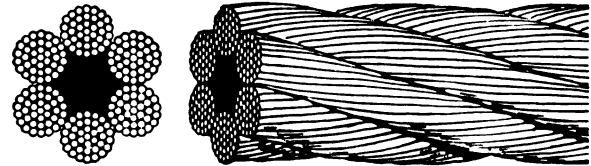


GALVANIZED IRON AND CRUCIBLE CAST STEEL RUNNING ROPE
6 STRANDS, 12 WIRES EACH, 7 HEMP CORES

Diam. in ins.	Approximate weight per ft. in lbs.	Approximate strength in tons of 2000 lbs.	
		Iron	Cast steel
1 1/4	1.18	10.1	22.5
1 1/2	1.05	5.7	19.5
1 3/4	.80	6.9	15.5
2	.68	6	13.5
2 1/4	.59	8.1	11.5
2 1/2	.42	3.6	8
2 3/4	.33	2.8	6.5
3	.26	2.2	5
3 1/4	.20	1.7	3.9
3 1/2	.14	1.3	2.85
3 3/4	.10	.82	1.98



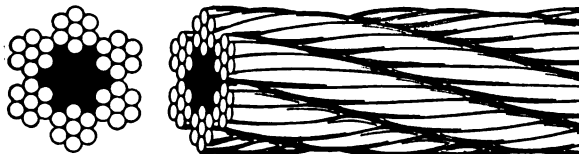
GALVANIZED STEEL HAWASERS AND MOORING LINES
6 strands, 12 or 24 wires each, 7 hemp cores



GALVANIZED STEEL DEEP SEA TOWING HAWASERS
6 strands, 37 wires each, 1 hemp core

DATA, GALVANIZED STEEL HAWASERS

Diam. in ins.	6 STRANDS, 12 WIRES EACH, 7 HEMP CORES		6 STRANDS, 24 WIRES EACH, 7 HEMP CORES		6 STRANDS, 37 WIRES EACH, 1 HEMP CORE	
	Approximate weight per ft. in lbs.	Approximate strength in tons of 2000 lbs.	Approximate weight per ft. in lbs.	Approximate strength in tons of 2000 lbs.	Approximate weight per ft. in lbs.	Approximate strength in tons of 2000 lbs.
2 1/4					8.82	188
2 1/2					8.36	182
2 3/4					8	171
2 1/2					7.06	155
2 1/4					6.65	140
2 1/2	4.43	83	5.81	113	6.30	132
2 3/4	4.20	77	5.51	106	5.84	125
2 1/2	3.89	71	5.09	98	5.13	112
2 1/4	3.42	66	4.48	88	4.85	104
2 1/2	3.23	61	4.24	82	4.42	97
2 1/4	2.94	57	3.86	76	4.15	87
2 1/2	2.76	53	3.63	74	3.55	76
2 1/4	2.36	45	3.10	63	3.24	72
2 1/2	2.16	41	2.92	55	3	66
2 1/4	2	38	2.62	50	2.45	54
2 1/2	1.63	31	2.15	42	2.21	47
2 1/4	1.47	28	1.93	38	2	42
2 1/2	1.33	26	1.75	34	1.77	38
2 1/4	1.18	22.5	1.54	27	1.58	31.5
2 1/2	1.05	19.5	1.38	25	1.20	26
2 1/4	.80	15.5	1.05	20	1.03	22
2 1/2	.68	13.5	.90	17	.89	20
2 1/4	.59	11.5	.78	14		
2 1/2	.42	8	.54	10.5		
2 1/4	.26	5	.34	6.6		
2 1/2	.14	2.85	.21	4		



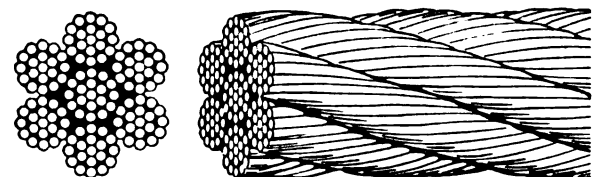
GALVANIZED IRON SHIP'S RIGGING OR GUY ROPE (6 x 7 or 6 x 12) AND GALVANIZED CRUCIBLE CAST STEEL YACHT ROPE (6 x 7 or 6 x 19)

IRON 6 STRANDS, 7 OR 12 WIRES EACH, 1 HEMP CORE			CRUCIBLE CAST STEEL 6 STRANDS, 7 OR 19 WIRES EACH, 1 HEMP CORE		
Diam. in ins.	Weight per ft. in lbs.	Strength in tons of 2000 lbs.	Diam. in ins.	Weight per ft. in lbs.	Strength in tons of 2000 lbs.
1 1/4	4.85	42	1 1/4	2.45	42
1 1/2	4.42	38	1 1/2	2.21	38
1 3/4	4.15	35	1 3/4	2	34
2	3.55	30	1 1/2	1.77	31
2 1/4	3.24	28	1 1/4	1.58	28
2 1/2	2.45	26	1 1/2	1.20	22
2 3/4	2.21	19	1 1/4	1.03	19
3	2	18	1 1/2	.89	16.8
3 1/4	1.77	16.1	1 1/4	.62	11.7
3 1/2	1.58	14.1	1 1/2	.50	9
3 3/4	1.20	11.1	1 1/4	.39	7
4	1.03	9.4	1 1/2	.34	6
4 1/4	.89	7.8	1 1/4	.30	5
4 1/2	.62	5.7	1 1/2	.22	4.2
4 3/4	.50	4.46	1 1/4	.15	3.2
5	.39	3.39			
5 1/4	.30	2.35			
5 1/2	.22	1.95			
5 3/4	.15	1.42			
5 STRANDS					
1 1/4	.125	1.20			
1 1/2	.09	.99			
1 3/4	.063	.79			
2	.04	.61			

List prices furnished on application.

Galvanized Steel Cables for Suspension Bridges.

Cables are supplied fitted with special bridge sockets ready for attaching to anchorage bolts.



GALVANIZED STEEL CABLE FOR SUSPENSION BRIDGES
6 STRANDS, WIRE CORE

DATA, STEEL CABLE FOR SUSPENSION BRIDGES

Diam. in ins.	3	2 3/4	2 1/2	2 1/4	2 1/2	2 1/4	2 1/2	2	1 3/4	1 1/2	1 1/4	1 1/2	1 1/4	1 1/2	1
Weight per ft. in lbs.	16.012	7.11	6.10	5.0	5.08	5.27	6.06	7.35	9.05	10.4	34.3	70.3	102	57.2	0.01
Strength in tons of 2000 lbs.	380	310	283	256	232	208	185	164	144	124	106	90	75	62	42

Continued on next page

Sash Cord.

Made "dead soft" unless ordered to the contrary. Used principally for window weights, bell cords, automobile brakes and whistles. $\frac{3}{32}$ -in. diameter galvanized sash cord is used on electric open car curtain fixtures; $\frac{1}{8}$ -in. galvanized sash cord is used on car curtain fixtures.



SASH CORD (6 x 7)
6 STRANDS OF 7 WIRES EACH, 1 COTTON CORE

Trade number	Diam., in. ins.	Weight per ft. in lbs.		Approximate breaking strength in lbs.			List price per ft.		
		Iron	Copper	Bright iron	Annealed iron	Bright copper	Iron annealed or bright	Tinned or galvanized iron	Copper
26	$\frac{1}{8}$	.101	.115	2200	1650	1320	\$0.03	\$0.04	\$0.09
27	$\frac{7}{32}$	.077	.087	1800	1411	1080	.02 $\frac{1}{4}$	.03 $\frac{1}{2}$	.07 $\frac{1}{2}$
27 $\frac{1}{2}$	$\frac{1}{4}$	.056	.064	1400	1100	840	.02 $\frac{1}{4}$	.03	.06
28	$\frac{1}{4}$	.025	.029	550	425	350	.01 $\frac{1}{4}$	.02 $\frac{1}{4}$	.04 $\frac{1}{2}$
28 $\frac{1}{2}$	$\frac{3}{8}$	.014	.016	320	250	200	.01 $\frac{1}{2}$	.02	.03 $\frac{1}{2}$
29	$\frac{1}{2}$	.006	.007	140	110	90	.01 $\frac{1}{4}$	.01 $\frac{1}{4}$	.03

Tinned High Strength Aeroplane Strand.

For reliable strength, light weight, flexibility, toughness, and elasticity, this strand is unrivaled. May be readily fastened and resists sudden strains and vibration better than a single stay wire.



TINNED HIGH STRENGTH AEROPLANE STRAND

Diam. in. ins.	Number of wires	Approximate weight per 100 ft. in lbs.	Breaking strength in lbs.
$\frac{1}{8}$	19	20.65	12,500
$\frac{7}{32}$	19	13.50	8,000
$\frac{1}{4}$	19	10.00	6,100
$\frac{5}{16}$	19	7.70	4,600
$\frac{3}{8}$	19	5.50	3,200
$\frac{7}{16}$	19	3.50	2,100
$\frac{1}{2}$	19	2.60	1,600
$\frac{5}{8}$	19	1.75	1,100
$\frac{3}{4}$	19	1.21	780
$\frac{7}{8}$	19	.78	500
$\frac{1}{2}$	7	.30	185

Galvanized or Tinned Flexible Aeroplane or Motor Boat Cord.

Designed to meet the demand for a light weight, flexible steel cord, with a minimum amount of stretch, to connect the control levers or wheel with the flexible



GALVANIZED OR TINNED FLEXIBLE AEROPLANE OR MOTOR BOAT CORD

Diam. in. ins.	Approximate weight per 100 ft. in lbs.	Breaking strength in lbs.
$\frac{1}{8}$	20.65	12,500
$\frac{7}{32}$	13.50	8,000
$\frac{1}{4}$	10.00	6,100
$\frac{5}{16}$	7.70	4,600
$\frac{3}{8}$	5.50	3,200
$\frac{7}{16}$	3.50	2,100
$\frac{1}{2}$	2.60	1,600
$\frac{5}{8}$	1.75	1,100
$\frac{3}{4}$	1.21	780
$\frac{7}{8}$	.78	500
$\frac{1}{2}$	.30	185

wing tips, ailerons, elevating planes and rudder in an aeroplane, or for small motor boat steering cord.

Tinned Aeroplane Cord.

In addition to the foregoing types, this company makes tinned aeroplane cord 7 by 7 construction, also 6 by 7 with cotton center.

Galvanized Mast Arm or Arc Light Rope.

More durable than manila rope and does not shrink.



GALVANIZED MAST ARM OR ARC LIGHT ROPE

Diam. in. ins.	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
Construction	9 x 7	9 x 7	9 x 7	9 x 4	9 x 4
Weight per ft. in lbs.	.335	.345	.163	.107	.077
Breaking strength in lbs.	4700	2400	2200	1530	1125

List prices furnished on application.

Stone Sawing Strand.

Suitable for sawing blocks of sandstone or similar soft stone, but should not be used for marble or granite.



STONE SAWING STRAND

3 wires twisted together

Diam. in. ins.	.25	.184	.16	.144	.126
Approximate gage of wire	12	13	14	15	16
Weight per 1000 ft. in lbs.	106	70	50	45	35
List price per 1000 ft.	\$19.00	16.50	14.00	12.00	10.50

Galvanized Steel Wire Strand.

Composed of 7 or 19 steel wires twisted into a single strand, galvanized or extra galvanized.

Used for guying stacks, telegraph and telephone poles; signal strand, for suspending trolley wire; messenger strand, for telephone cables.



STEEL WIRE STRAND

Diam., in. ins.	Sizes of wire American Steel & Wire Co.'s steel wire gage	Weight per 1000 ft. in lbs.	Strength in lbs.	List price per 100 ft.
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7 STEEL WIRES TWISTED INTO A SINGLE STRAND, GALVANIZED OR EXTRA GALVANIZED

Diam., in. ins.	3	1200	18 000	\$14.00
$\frac{1}{8}$	5	800	14,000	8.50
$\frac{7}{32}$	6	650	11,000	7.00
$\frac{1}{4}$	8	510	8,500	5.50
$\frac{5}{16}$	9	415	6,500	4.50
$\frac{3}{8}$	11	295	5,000	3.50
$\frac{7}{16}$	12	210	3,800	2.50
$\frac{1}{2}$	13	160	2,800	2.25
$\frac{5}{8}$	14	125	2,300	1.75
$\frac{3}{4}$	15	95	1,800	1.50
$\frac{7}{8}$	16	75	1,400	1.25
$\frac{1}{2}$	17	55	900	1.15
$\frac{3}{4}$	18	40	700	1.10
$\frac{1}{2}$	19	32	500	1.00
$\frac{3}{4}$	21	20	400	.80
$\frac{1}{2}$	22	13	300	.70

19 STEEL WIRES TWISTED INTO A SINGLE STRAND, GALVANIZED OR EXTRA GALVANIZED

Diam., in. ins.	.200	2100	32000	\$26.00
$\frac{1}{8}$	.175	1610	24000	20.70
$\frac{7}{32}$	.150	1200	18000	16.80
$\frac{1}{4}$	.125	800	14000	11.00
$\frac{5}{16}$	.110	650	11000	9.25
$\frac{3}{8}$	.100	510	8500	7.30

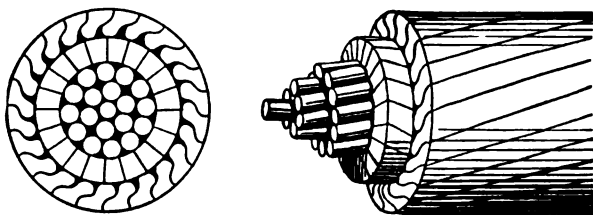
DATA, EXTRA GALVANIZED SPECIAL STRAND
7 OR 19 STEEL WIRES TWISTED INTO SINGLE STRAND

7 WIRES					19 WIRES				
Diam. in ins.	Tensile strength in lbs.	List price per 100 ft.	Tensile strength in lbs.	List price per 100 ft.	Diam. in ins.	Tensile strength in lbs.	List price per 100 ft.	Tensile strength in lbs.	List price per 100 ft.
SIEMENS-MARTIN									
1	.....	.....	51,000	\$22.50	1	4,860	\$2.50	.....	.....
7/8	.....	.....	38,000	16.65	7/8	.....	.....	.....	.....
3/4	.....	.....	28,400	13.35	3/4	4,380	2.05	.....	.....
5/8	19,000	\$8.25	20,000	10.00	5/8	3,060	1.70	.....	.....
1/2	15,000	6.00	15,000	8.25	1/2	.....	.....	.....	.....
3/8	11,000	5.25	11,000	6.75	3/8	2,000	1.35	.....	.....
1/4	9,000	4.30	9,000	5.60	1/4	900	.90	.....	.....
3/16	6,800	3.25	6,800	4.50	3/16	.....	.....	.....	.....
HIGH STRENGTH									
1	.....	.....	87,400	30.00	3/8	11,500	4.40	11,500	\$5.25
7/8	.....	.....	64,000	23.50	7/8	8,100	3.20	.....	.....
3/4	.....	.....	47,400	17.50	3/4	.....	.....	.....	.....
5/8	29,600	12.00	33,000	12.25	5/8	7,300	2.80	.....	.....
1/2	24,500	9.50	22,000	10.65	1/2	5,100	2.25	.....	.....
3/8	18,800	7.25	18,000	9.00	3/8	3,300	1.80	.....	.....
1/4	14,500	6.00	15,000	7.00	1/4	1,500	1.20	.....	.....
EXTRA HIGH STRENGTH									
1	.....	.....	120,000	37.00	3/8	17,250	5.25	17,250	\$6.50
7/8	.....	.....	90,000	28.50	7/8	12,100	4.25	.....	.....
3/4	.....	.....	70,000	22.00	3/4	.....	.....	.....	.....
5/8	42,500	14.60	47,000	15.50	5/8	10,900	3.50	.....	.....
1/2	35,000	11.70	38,000	13.25	1/2	7,600	2.85	.....	.....
3/8	27,000	8.80	27,000	11.00	3/8	4,900	2.40	.....	.....
1/4	22,500	7.20	22,500	8.50	1/4	2,250	1.60	.....	.....

When either intermediate sizes or strengths are called for, if they are exactly midway between 2 sizes provided for, the average price of the 2 sizes shall apply; otherwise the price of the nearest size and strength shall apply.

Round Wire Track Cable and Locked Wire Cable for Aerial Tramways and Cableways.

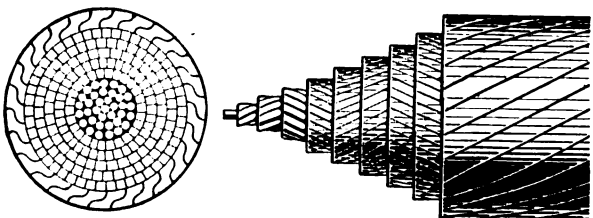
There have been devised these 2 special cables which present fairly smooth surfaces for wheels to run upon. The better is the locked type, as it presents the smoother external surface.



LOCKED WIRE TRACK CABLE FOR AERIAL TRAMWAYS

Crucible cast steel

Diam. in ins.	1 1/8	1 1/2	1 3/4	1 7/8	2	2 1/4	2 1/2
Weight per ft. in lbs.	6.30	5.30	4.40	3.70	3.00	2.35	1.80
Strength in tons of 2000 lbs.	103	89	75	62	50	40	30
List price per ft.	\$1.17	1.00	0.85	0.72	0.60	0.49	0.37

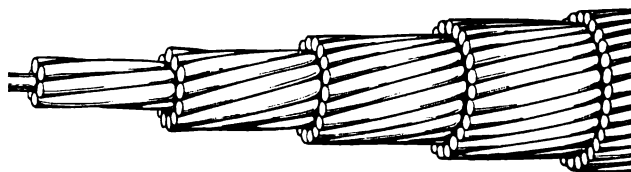


LOCKED WIRE TRACK CABLE FOR AERIAL TRAMWAYS

Crucible cast steel

DATA, LOCKED WIRE CABLE FOR AERIAL TRAMWAY

Diam. in ins.	Approximate weight per ft. in lbs.	Approximate breaking stress in tons of 2000 lbs.	List price per ft.
2 1/2	15.60	240	\$3.00
2 1/4	12.50	190	2.20
2	10.00	160	1.75
1 3/4	7.65	120	1.35
1 1/2	6.60	103	1.17
1 1/8	5.70	89	1.00
1 1/4	4.75	75	.85
1 1/2	3.80	62	.72
1 1/8	3.15	50	.60
1 1/4	2.50	40	.49
3/4	1.88	30	.37
5/8	1.30	22	.27
3/4	.90	15.5	.18
1/2	.72	12.5	.16
3/8	.57	10	.14



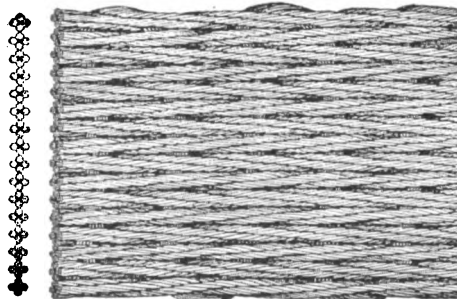
1 Wire 7 Wires 19 Wires 37 Wires 61 Wires 91 Wires

ROUND TRACK CABLE FOR AERIAL TRAMWAYS

Diam. in ins.	Number of wires in strand	Weight per 100 ft. in lbs.	CRUCIBLE STEEL		FLOW STEEL	
			Breaking stress in tons of 2000 lbs.	List price per 100 ft.	Breaking stress in tons of 2000 lbs.	List price per 100 ft.
2 1/2	91	1310	285.00	\$176.00	335.00	\$246.50
2 1/4	91	1036	233.00	137.50	266.00	192.50
2 1/8	91	935	204.00	123.25	240.00	172.50
2	61	840	185.00	115.50	218.00	161.75
1 3/4	61	728	161.00	101.50	189.00	142.00
1 3/8	61	659	145.80	87.75	171.00	122.75
1 1/2	61	563	124.00	76.00	146.00	106.50
1 1/4	37	488	108.40	68.00	127.50	95.25
1 3/8	37	401	88.80	53.00	105.00	74.25
1 1/4	37	323	71.80	44.25	84.60	62.00
1 1/8	37	270	60.00	38.25	70.70	53.50
1	19	220	49.20	31.25	58.00	43.75
7/8	19	169	37.60	24.75	44.40	34.75
3/4	19	124	27.60	19.00	32.50	26.50
5/8	19	86	19.20	14.75	22.30	20.75

Flat Rope.

A remarkably strong hoisting rope, used to a great extent by the large mines of the West. It is composed of a number of wire ropes called "flat rope strands" of alternate right and left lay, placed side by side, then secured or sewed together with soft Swedish iron wire, thus forming a complete rope.



FLAT ROPE

Crucible steel—plow steel

GEO. C. MOON COMPANY, INC.

Manufacturers of Wire Rope

GARWOOD, N. J.

BRANCH OFFICES

NEW YORK, N. Y., 124 White Street

BOSTON, MASS., 118 Oliver Street

SAN FRANCISCO, CAL., PORTLAND, ORE., and SEATTLE, WASH., ROLPH MILLS & Co.

CLEVELAND, OHIO, Rockefeller Building

PHILADELPHIA, PA., 214-216 No. Delaware Avenue

Products.

CRESCENT WIRE ROPE, standard and special, for all purposes, made of Swedes Iron, Crucible Cast Steel, Mild Plow Steel, Plow Steel and Improved Plow Steel.

CRESCENT HEMP CLAD WIRE ROPE; GALVANIZED ROPE; ROPE ACCESSORIES.

Also manufacturers of Wire.



Standard and Special Ropes.

Crescent Standard Ropes are made and kept in stock in sufficient quantity and variety to meet all the needs of average service. Customers can almost invariably secure immediate shipment from stock of ropes exactly suited to their requirements.

Special ropes can be furnished to order for unusual requirements which can not be met properly with standard ropes.

Qualities and Uses of Standard Ropes.

The 5 grades of Crescent Standard Ropes, in the order of increasing strength, are:

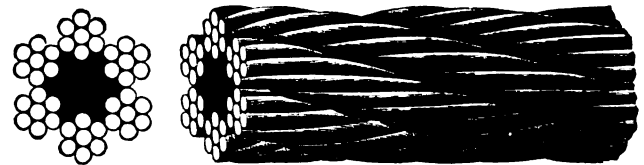
Swedes Iron Rope—Used exclusively for elevator hoisting.

Crucible Cast Steel Rope—For haulage and hoisting, sand lines, derricks, dredges, cableways, inclined railways, conveying, drilling, pile driving, guying and running rope.

Mild Plow Steel Rope—Serves the same purposes as ropes made of crucible cast steel, and, being stronger, in some cases allows of smaller sizes being used.

Plow Steel Rope—Can be used where greater strength is required without any increase in the rope's diameter. It is employed for heavy hoisting, cableways, skidders, derricks and for long hoists. This company makes a special flexible rope of this material and recommends the smaller sizes for use on electric traveling hoists and the larger sizes for dredges.

Improved Plow Steel Rope—The highest grade rope manufactured. It combines great tensile strength, the highest degree of ductility, and unsurpassed toughness. Applicable for the heaviest haulage, dredging, derricks and sand lines.



CRESCENT WIRE ROPE FOR HAULAGE, ETC.

Hemp Clad Ropes.

These are generally made by spirally binding 5 wire strands with the highest grades of tarred yacht marline. This prevents friction between the strands and affords protection against moisture, acid, water, and foreign matter. The wire is of the same grades as are used in our standard ropes. Hemp clad rope is greatly superior to manila rope, being flexible, as easily handled, three to five times stronger, size for size, and 50% lighter when strengths are equal. There is no swelling when wet, as in the case of manila rope, and ice in winter does not affect it.

Galvanized Rope.

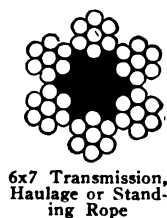
Rope that is to be subjected to severe corrosion, such as salt water or damp sea air, corroding fumes from smokestacks, etc., should be galvanized. It should never be employed for hoisting, for which service, where abrasion is a factor, ungalvanized rope is most suitable.

Rope Accessories.

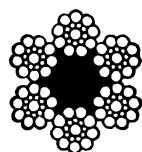
The accessories kept in stock include thimbles, clips, closed and open sockets, shackles, hooks, turnbuckles, etc. They are furnished plain or galvanized and either loose or properly fitted to the ends of ropes. When ordering, state complete details regarding thimbles, splicing, etc.

Catalogue.

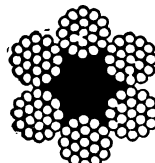
The Moon catalogue gives complete details of all types of Crescent wire rope and accessories and contains much interesting and instructive general data for rope users. A copy will be sent on request.



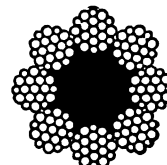
6x7 Transmission, Haulage or Standing Rope



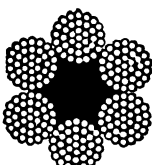
6x19 Seale Lay Hoisting Rope



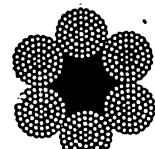
6x19 Hoisting Rope



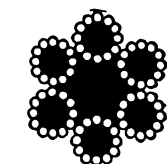
8x19 Extra Flexible Hoisting Rope



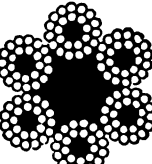
6x37 Special Flexible Hoisting Rope



6x61 Extra Special Flexible Hoisting Rope



6x12 Hawser and Mooring Lines



6x24 Hawser and Mooring Lines



6x6x7 Tiller or Hand Rope



9x7 Mast-Arm or Arc Light Rope



6x7 Sash Cord



5x19 Hemp Clad Hoisting Rope

CRESCENT STANDARD WIRE ROPES

JOHN A. ROEBLING'S SONS COMPANY

Makers of Iron, Steel and Copper Wire Rope and Wire; Wire Rope Fittings;
Insulated Wires and Cables

Engineers

MAIN OFFICE
TRENTON, N. J.

BRANCH OFFICES

CHICAGO, ILL., 165 West Lake Street
PHILADELPHIA, PA., 223-27 Arch Street

CLEVELAND, OHIO, 701 St. Clair Avenue, N. E.
ATLANTA, GA., 69 Walton Street

WORKS: TRENTON, N. J., ROEBLING, N. J.

JOHN A. ROEBLING'S SONS COMPANY OF NEW YORK

NEW YORK, N. Y., 117-21 Liberty Street

BOSTON, MASS., 93-95 Pearl Street

WAREHOUSES: 169-75 Hudson Street, NEW YORK, N. Y.

JOHN A. ROEBLING'S SONS COMPANY OF CALIFORNIA

SAN FRANCISCO, CAL., 624-46 Folsom Street
LOS ANGELES, CAL., 216 South Alameda Street

SEATTLE, WASH., 900 First Avenue, South
PORTLAND, ORE., 82 Fourth Street

Products and Services.

WIRE ROPE and BARE WIRES; INSULATED WIRES
and CABLES.

A full line of WIRE ROPE FITTINGS, such as Hooks,
Clamps, Clips, Pulleys, Sheaves, Sockets, Tackle Blocks,
Thimbles, Turnbuckles, Slings; Alligator Wrenches,
Reels for Hawsers, Riggers' Vise; Track Rollers, etc.

Our Engineering Department specializes in design-
ing and constructing Suspension Bridges, Tramways,
Cableways, and installations for the Transmission of
Power by Wire Rope.

Uses of Wire Rope and Cables.

Wire rope and cables are made for the following
purposes: conveyors, tramways, power transmission,
suspension bridges, cableways, elevators, airplanes, for
drilling, dredges, steam shovels, rigging, and all hoists
and haulages where wire rope can be advantageously
used.

Blue Center Steel Rope.

Blue center steel rope is a special rope for special
purposes, and is recommended as the very best rope
for exceptional service where extreme conditions tend
to produce extraordinarily severe and unexpected
strains.

Wire Rope Slings for Industrial Plant and Construc- tion.

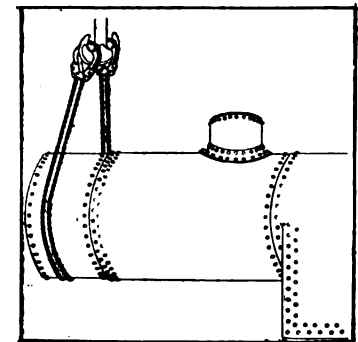
Roebling wire rope slings are the ideal practical
equipment for the safe and efficient hoisting of heavy
materials in shop and field. They are made from our
blue center steel; are compact, light and adjustable, and
through equalizing features in certain types the stress
of the load lifted is distributed throughout the entire
sling. Forgings in tension are eliminated wherever
possible. The slings are made in the anchor, bridle

and many special industrial types. Complete informa-
tion gladly furnished.

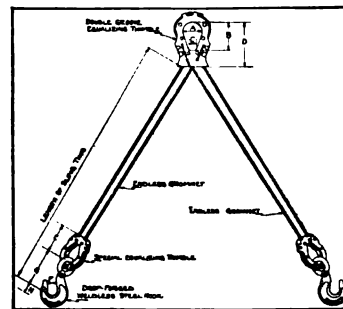
Send for Catalogue A-247.



ANCHOR SLING



WIRE ROPE SLING CS-160
"Blue Center Steel" equalizing grom-
met slings for handling large circular
bodies



WIRE ROPE SLING CS-175



ROEBLING WIRE ROPE
CLIP

WIRE ROPE CLIP TESTS ON 6 x 19 PLOW STEEL ROPE

Diameter of rope, ins.	Number of clips	Length of wrench, ins.	Ultimate strength of rope, lbs.	Clip strength, lbs.	Efficiency, per cent
1/2	3	12	20,000	15,800	79.00
3/4	4	12	31,000	23,900	77.09
1	5	18	46,000	35,600	77.39
1 1/4	5	18	58,000	45,900	79.13
1 1/2	5	24	76,000	59,200	77.89
1 3/4	5	24	94,000	75,200	80.00
2	6	24	116,000	95,300	82.15

COMPARATIVE BREAKING STRENGTHS OF WIRE ROPE PER GIVEN DIAMETER IN TONS OF 2000 LBS.

ROEBLING STANDARD HOISTING ROPE (6 x 19).

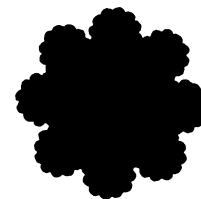
Diameter in ins.	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2	5 3/4	6	6 1/4	6 1/2	6 3/4	7	7 1/4	7 1/2	7 3/4	8
Iron, approx. strength..	111	92	72	55	50	44	38	33	28	22.8	18.6	14.5	11.8	8.5	6	4.7	3.9	2.9	2.4	1.5	1.1			
Cast steel ..	211	170	133	106	96	85	72	64	56	47	38	30	23	17.5	12.5	10	8.4	6.5	4.8	3.1	2.2			
Ex. strong cast steel, approx. strength	243	200	160	123	112	99	83	73	64	53	43	34	26	20.2	14	11.2	9.2	7.25	5.30	3.50	2.43			
Plow steel ..	275	229	186	140	127	112	94	82	72	58	47	38	29	23	15.5	12.3	10	8	5.75	3.8	2.65			
Blue center steel, approx. strength	315	263	210	166	150	133	110	98	84	69	56	45	35	26.3	19	14.5	12.1	9.4	6.75	4.50	3.15			
Appr. wt. per ft. in lbs.	11.95	9.85	8	6.30	5.55	4.85	4.15	3.55	3	2.45	2	1.58	1.2	.89	.62	.50	.39	.30	.22	.15	.10			



ROEBLING HOISTING ROPE (6 X 19)

ROEBLING EXTRA PLIABLE HOISTING ROPE (8 x 19).

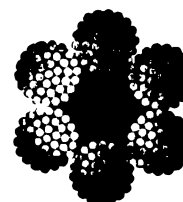
Diameter in ins.	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2	5 3/4	6
Cast steel, approx. strength	58	51	42	34	26	20	15.3	10.9	8.7	7.3	5.7	4.2	2.75	1.8					
Extra strong cast steel, approx. strength	66	57	47	38	29.7	23	17.6	12.4	10.1	8	6.3	4.66	3.05	2.02					
Plow steel ..	74	64	52	43	33	26	20	14	11.6	8.7	6.9	5.12	3.35	2.25					
Blue center steel, approx. strength	80	68	56	46	36	28	22	15	12	9.5									
Approx. wt. per ft. in lbs.	3.19	2.70	2.20	1.80	1.42	1.08	.80	.56	.45	.35	.27	.20	.13	.09					



ROEBLING HOISTING ROPE (8 X 19)

ROEBLING EXTRA PLIABLE HOISTING ROPE (6 x 37).

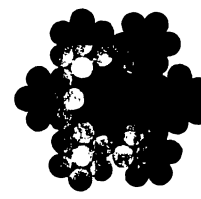
Diameter in ins.	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2	5 3/4	6	6 1/4	6 1/2	6 3/4	7	7 1/4	7 1/2	7 3/4	8
Cast steel, approx. strength.....	200	160	125	105	84	71	63	55	45	34	29	23	17.5	11.2	9.5	7.25	5.5	4.2						
Extra strong cast steel, approx. strength.....	233	187	150	117	95	79	71	61	50	39	32	25	19	12.6	10.5	8.25	6.35	4.65						
Plow steel, ..	265	214	175	130	108	90	80	68	55	44	35	27	21	14	11.5	9.25	7.2	5.1						
Blue center steel, approx. strength	278	225	184	137	113	95	84	71	58	46	37	29	23	16	12.5	9.75	7.50	5.30						
Approx. wt. per ft. in lbs.	11.95	9.85	8	6.30	4.85	4.15	3.55	3	2.45	2	1.58	1.20	.89	.62	.50	.39	.30	.22						



ROEBLING HOISTING ROPE (6 X 37)

ROEBLING STANDARD COARSE LAID ROPE (6 x 7).

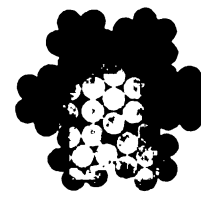
Diameter in ins.	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2	5 3/4	6
Iron, approx. strength.....	32	28	23	19	15	12	8.8	7.3	6	4.8	3.7	2.6	2.2	1.7	1.2				
Cast steel, ..	63	53	46	37	31	24	18.6	15.4	13	10	7.7	5.5	4.6	3.5	2.5				
Extra strong cast steel, approx. strength	73	63	54	43	35	28	21	16.7	14.5	11	8.85	6.25	5.25	3.95	2.95				
Plow steel, ..	82	72	60	47	38	31	23	18	16	12	10	7	5.9	4.4	3.4				
Blue center steel, approx. strength	90	79	67	52	42	33	25	20	17.5	13	11	7.75	6.5						
Approx. wt. per ft. in lbs.	3.55	3	2.45	2	1.58	1.20	.89	.75	.62	.50	.39	.30	.22	.15	.125				



ROEBLING COARSE LAID ROPE (6 X 7)

ROEBLING GALVANIZED SUSPENSION BRIDGE CABLES

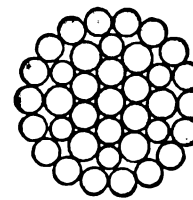
Diameter in ins.	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2	5 3/4	6
Approximate strength.....	310	283	256	232	208	185	164	144	124	106	90	75	62	
Approx. wt. per ft. in lbs.	12.7	11.6	10.5	9.50	8.52	7.60	6.73	5.90	5.10	4.34	3.70	3.10	2.57	



ROEBLING BRIDGE CABLE (7 X 7)

ROEBLING TRAMWAY STRAND (19 TO 55 WIRES, ACCORDING TO DIAMETER OF STRAND)

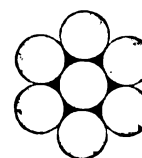
Diameter in ins.	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2	5 3/4	6
Cast steel, approx. strength.....	124	108.4	88.8	71.8	60	49.2	37.6	27.6	19.2										
Plow steel, ..	146	127.5	105	84.6	70.7	58.0	44.4	32.5	22.3										
Weight per 100 ft. in lbs.	563	488	401	323	270	220	169	124	86										



ROEBLING TRAMWAY STRAND (19 TO 55)

ROEBLING GALVANIZED STEEL WIRE STRAND (7 WIRES).

Diameter in ins.	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 1/2	1 3/4	2
Approximate breaking strength in lbs...	8,500	6,500	5,000	3,800	2,300	1,800	1,400	900	500	400
Approx. wt. per 1,000 ft. in lbs.....	510	415	295	210	125	95	75	55	32	20



ROEBLING STEEL WIRE STRAND (7)

WATERBURY COMPANY

Manufacturers of Wire and Fiber Rope

63 Park Row
NEW YORK, N. Y.

CHICAGO, ILL., 609 North La Salle Street
SAN FRANCISCO, CAL., 151-61 Main Street

BRANCHES
NEW ORLEANS, LA., 1018 Maison-Blanche Building
DALLAS, TEX., A. T. POWELL & Co., Southwestern Life Building
FACTORY, BROOKLYN, N. Y.

Products.

WIRE ROPE; ARMORED WIRE ROPE; FIBERCLAD (Marline Covered) WIRE ROPE; MANILA and SISAL ROPE; MANILA TRANSMISSION ROPE; DRILLING CABLE; MUSIC WIRE.

Also manufacturers of Non-spinning Wire Hoisting Rope, Mining Rope, Wire Transmission Rope.

Waterbury Wire Rope.

Made in grades known as Swedish Iron, Crucible Cast Steel, Extra Strong Cast Steel, Plow Steel and Green Strand Giant Steel, the latter being the highest grade of improved plow steel.



WATERBURY WIRE ROPE

Waterbury Armored Wire Rope (Gore Patent).

Made 6 strands, 19 wires, 37 wires or 61 wires to the strand, in crucible cast steel, extra strong cast steel, plow steel or Giant improved plow steel stock.

The initial factor of safety is maintained longer than in any other class of rope. The strands are wound or served with flat wires having convex edges, which take the abrasion on the crown strands. This gives a great advantage over rope of ordinary construction, as wear on crown strands does not occur until this serving has worn down and becomes packed into the interstices of the rope, making it cylindrical and materially increasing the efficiency of the rope.



WATERBURY ARMORED WIRE ROPE

Waterbury Fiberclad Rope (Marline Covered).

A wire rope, each strand of which is served with the best grade of tarred Russian hemp marline. Tarred marline affords protection against acid fumes, moisture or foreign matter, such as coal dust and residue. Is not affected by atmospheric conditions, as in the case of manila or wire rope; is about one-third the diameter of manila rope of the same strength; is flexible and will coil down as readily as manila rope, and outwear bare wire rope or manila rope under all ordinary working conditions.



WATERBURY FIBERCLAD ROPE

Waterbury Manila Transmission Rope.

A special rope for power transmission purposes,



TRADE-MARK

made from the best selected Cebu manila hemp. Made 4 strands with heart, unless otherwise ordered. The yarns are treated with a special composition, which thoroughly lubricates the strands and individual fibers, making the rope practically waterproof. Especially adapted for rope driving and made as nearly perfect as the best machinery, superior quality of material and workmanship can produce.



WATERBURY MANILA TRANSMISSION ROPE

Waterbury Manila and Sisal Ropes (for General Use).

Made in the several standard grades of manila and sisal, and may be depended upon to be of the very highest quality in their respective grades.



WATERBURY MANILA AND SISAL ROPE

Waterbury "Drillwell" Manila Drilling Cable.

Made from carefully chosen grades of fiber, graded for toughness and general wearing quality. Drilling cables are 3 ropes laid into 1 (or 9 strands), of correct lay and tension in each of the 3 ropes forming the finished cable. Drilling cables are referred to as hawser-laid rope, i.e., 3 ropes twisted together, the twist being in opposite direction to twist of the ropes. Advantages over other types of rope are greater elasticity or springiness and greater wearing surface.

All Waterbury drilling cables are especially lubricated to prevent internal friction and to keep the fiber from becoming very dry, this preventing disintegration.



WATERBURY "DRILLWELL" MANILA DRILLING CABLE

Waterbury Wire Drilling Cables.

Generally made left lay, in all standard sizes, 6x19, 6x8, or 6x7 construction. The line includes crucible cast steel stock, extra strong and plow steel stock. Also sand lines, tubing, casing and sucker rod lines, pumping lines, cleaning out cables and steel wire dead lines.

Waterbury Music Wire.

For springs, musical instruments, dental and surgical instruments and all cutting purposes.

Prices, Handbook, etc.

Ask for prices, samples and the 220-page cloth bound Rope Handbook, containing valuable rope data and describing the complete Waterbury line.

WICKWIRE SPENCER STEEL CORPORATION

Manufacturers of Wire Rope and Fittings

WORCESTER, MASS.

BUFFALO, N. Y.

DISTRICT OFFICES

BOSTON, MASS., John Hancock Building

NEW YORK, N. Y., 120 Broadway

PHILADELPHIA, PA., 327 North Sixth Street

SAN FRANCISCO, CAL., 111 Townsend Street

DETROIT, MICH., Book Building, Washington Boulevard

CHICAGO, ILL., 215-17 West Ontario Street

TULSA, OKLA., 329 Mayo Building

Products.

WIRE ROPE.

Also a full line of Wire Rope and Fittings.

For Electrically Welded Wire Fabric, see page 156.

Uses of Wire Ropes.

Wire ropes are made for the following purposes:

Hoisting, haulage, derricks, cranes, dredges, elevators, power transmission, cableways, tramways, rigging, etc.

Quality and Workmanship.

Long experience in manufacturing wire rope for all purposes, and a thorough knowledge of the exacting requirements due to the various uses to which it is put, warrant the statement that Gray Strand and Excelsior wire ropes are unexcelled for uniformly high tensile strength, torsion and ductility, which insure, beyond security and safety, maximum life of the rope.

Grades of Wire Rope.

We furnish rope of iron, crucible cast steel, extra strong crucible cast steel, plow steel and Gray Strand high grade plow steel, as described hereafter:

Iron Rope—Soft, tough and pliable, particularly adapted for drum type passenger elevators and similar service where tendency to abrasion is slight and drums are designed to prevent undue bending. The wires, softer than those of steel ropes, will not wear grooves in drums to the same extent.

A higher factor of safety is recommended for elevator service than for general hoisting.

Cast Steel Rope—Recommended for general hoisting, such as mine hoists, derricks, coal hoists, cableways, conveyors, freight elevators, etc. This rope, being tough and pliable, will bend over comparatively small sheaves and resist abrasion which tends to result from rapid hoisting. The wire in cast steel rope has nearly twice the strength of that in iron rope and much higher elastic limit.

Extra Strong Cast Steel Rope—Occupies an intermediate place between cast steel and plow steel rope. It is used in place of cast steel when desirable to increase factor of safety for given diameter. May be used to advantage for general hoisting, the wire being carefully selected to insure high degree of strength, ductility and toughness.

Plow Steel Rope—Made of wire drawn from especially selected high strength steel, to produce rope of great strength and toughness, capable of resisting severe abrasive tendencies. Can be used in place of cast steel rope to reduce the dead weight of the rope itself, or where it is necessary to use a much stronger rope without increasing its diameter.

Wickwire

TRADE-MARK

Recommended for logging lines, scraper, dredge and wrecking ropes, heavy cranes, ballast unloader ropes, and for all rough uses requiring maximum strength and toughness.

Gray Strand Rope—A special rope for special purposes, recommended as the best rope for exceptional service where extreme conditions produce extraordinarily severe and unexpected strains. Made from an extra high grade of steel, and excels all other wires for strength, toughness and uniformity.

Rope with strands of this wire is the latest and most improved product of the selection of metals and drawing wire for rope making.

This rope can be used to advantage in place of standard hoisting rope where extra severe strains and hard conditions of service tend to overtax the latter.

Construction and Adaptability.

Transmission, Haulage or Standing Rope—6 strands, 7 wires to strand, 1 hemp center, recommended for transmission of power, winding, mine and other haulage, oil well drilling and sand lines, and where sheaves and pulleys are of large diameter, and where rope is not liable to reverse bends.

Hoisting Rope—6 strands, 19 wires to strand, 1 hemp center, recommended for colliery and mine hoisting, elevators, derricks, ballast unloaders, railway switching ropes, dredges, steam shovels, oil well purposes, such as drilling, casing, tubing, dead lines, and where drums, sheaves and pulleys are not undersized for the particular size of rope used.

This construction in the grade of plow steel is used extensively for main line hauling and skidding operations in logging camps.

Extra Flexible Hoisting Rope—8 strands, 19 wires to the strand, 1 hemp center, is much more flexible than the standard 6 strands, 19 wires, and can be used to advantage where conditions are such that sheaves of smaller diameter must be employed.

Special Flexible Hoisting Rope—6 strands, 37 wires to strand, 1 hemp center, recommended for large electric cranes; on dredges, for cargo falls on steamers, and other purposes where very flexible rope in large diameter is required.

Galvanized Guy Rope—6 strands, 7 wires to strand, 1 hemp center, is better for guys for derricks than hemp rope or rods linked together.

Tiller or Hand Ropes—Composed of 252 wires, and made up of a hemp core, around which are twisted 6 ropes, each consisting of 6 strands, 7 wires to strand, enclosing a hemp center. Used for steering ropes on river steamers, for hand ropes on elevators, and in any place where a smooth and extremely flexible rope is required.

WILLIAMSPORT WIRE ROPE CO.

MAIN OFFICE AND WORKS
WILLIAMSPORT, PA.

BRANCH OFFICE, 122 South Michigan Avenue, CHICAGO, ILL.

Products.

WIRE ROPE of all kinds and constructions for all purposes.

Also Rope Accessories, including Clamps; Turnbuckles; Clips; Sheaves; Hooks and Sockets.

General Information.

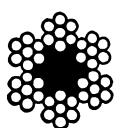
Standard hoisting wire rope is composed of 6 strands of 19 wires each and a hemp center. Standard haulage or transmission wire rope is composed of 6 strands of 7 wires each and a hemp center.

Seale lay wire rope, composed of 6 strands of 19 wires each and a hemp center, is recommended for either hoisting or haulage rope, but in no case should be used over drums or sheaves smaller than those recommended in the tables. On account of the large outer wires the Seale lay ropes will withstand abrasion, while the smaller inner wires give it flexibility.

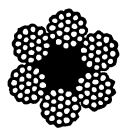
Haulage ropes are made either standard or lang lay. In the lang lay construction the wires and strands are both laid in the same direction, allowing greater wearing service and giving more flexibility than standard lay.

Breaking Strengths of Williamsport Wire Rope.

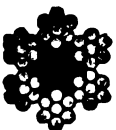
The strength of the wire from which our ropes are made ranges from 180,000 lbs. per sq. in. for crucible steel to 300,000 lbs. per sq. in. for improved plow steel. The standard working loads are calculated at one-fifth the breaking strain, excepting in shafts or elevators, where the working load should not be more than one-tenth the breaking strain.



Standard Lay



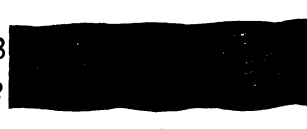
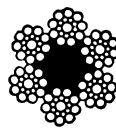
STANDARD HOISTING ROPE



Lang Lay
COARSE LAID ROPE

Scale Lay Rope.

Composed of 6 strands of 19 wires each and a hemp center. This rope is recommended for hoisting and haulage purposes where large drums or sheaves are used.



SEALE LAY ROPE

DATA, CRUCIBLE CAST STEEL

Diam., in.	Approx. wt. per ft.	Approx. strength in tons of 2000 lbs.	Proper working load in tons of 2000 lbs.	Diam. of drum or sheave advised, ft.
1 3/4	4.85	85	17	7
1 5/8	4.15	72	14.4	6.5
1 1/2	3.55	64	12.8	6
1 1/4	3	56	11.2	5.5
1 3/8	2.45	47	9.4	5
1 1/8	2	38	7.6	4.5
1	1.58	30	6	4
7/8	1.20	23	4.6	3.5
3/4	.89	17.5	3.5	3
5/8	.62	12.5	2.5	2.5
1/2	.50	10	2	2.25
3/8	.39	8.4	1.68	2
1/4	.30	6.5	1.30	1.75
3/16	.22	4.8	.96	1.50
1/8	.15	3.1	.62	1.25
1/16	.10	2.2	.44	1

DATA, CRUCIBLE CAST STEEL

Diam., in.	Approx. wt. per ft.	Approx. strength in tons of 2000 lbs.	Proper working load in tons of 2000 lbs.	Diam. of drum or sheave advised, ft.
1 1/2	3.55	63	12.6	11
1 3/8	3	53	10.6	10
1 1/4	2.45	46	9.2	9
1 3/8	2	37	7.4	8
1 1/8	1.58	31	6.2	7
1	1.20	24	4.8	6
7/8	.89	18.6	3.7	5
3/4	.75	15.4	3.1	4 3/4
5/8	.62	13	2.6	4 1/2
1/2	.50	10	2	4
3/8	.39	7.7	1.5	3 1/2
1/4	.30	5.5	1.1	3
3/16	.22	4.6	.92	2 3/4
1/8	.15	3.5	.70	2 1/4
1/16	.125	2.5	.50	1 3/4

DATA, PLOW STEEL SEALE LAY HOISTING ROPE

Diam., in.	Approx. wt. per ft.	Approx. strength in tons of 2000 lbs.	Proper working load in tons of 2000 lbs.	Diam. of drum or sheave advised, ft.
1 3/4	4.85	112	22	7
1 5/8	4.15	94	19	6.5
1 1/2	3.55	82	16	6
1 1/4	3	72	14	5.5
1 3/8	2.45	58	12	5
1 1/8	2	47	9.4	4.5
1	1.58	38	7.6	4
7/8	1.20	29	5.8	3.5
3/4	.89	23	4.6	3
5/8	.62	15.5	3.1	2.5
1/2	.50	12.3	2.4	2.25
3/8	.39	10	2	2
1/4	.30	8	1.6	1.75
3/16	.22	5.75	1.15	1.50
1/8	.15	3.8	.76	1.25
1/16	.10	2.65	.53	1

BUFFALO HOIST & DERRICK CO.

Manufacturers of Clamshell Buckets

129 Erie Street
BUFFALO, N. Y.

NEW YORK OFFICE, 30 Church Street

Products.

CLAMSHELL BUCKETS.

For Locomotive Cranes and Hoists, see page 64.

Service.

The Engineering Department of this company will co-operate and place at the client's disposal its experience and service where problems involving a special type of bucket may arise.

Buffalo Buckets.

The Buffalo clamshell bucket is the result of a thorough scientific study by a corps of engineers building buckets for the past 20 years, and its remarkable efficiency is obtained through this and through the fact that it is the embodiment of practical contractors' ideas.

These buckets are manufactured in two main types that cover the general needs of the contractor. Other types are also manufactured for special uses.

The Buffalo equalizing arm is the predominating feature in all types of Buffalo buckets. It causes the scoops to travel with uniform speed, thereby increasing

the efficiency of the bucket and insuring a maximum capacity.

Standard Type—This type bucket is suitable for handling coal, sand, gravel and similar material.

Made in capacities from $\frac{1}{2}$ to 3 cu. yds.

Monarch Type—This type bucket is suitable for handling and digging hard clay, slag, frozen limestone and for all other purposes requiring a powerful heavy digging bucket.

The teeth on this bucket are forged steel and are bolted in place, so that they can be easily removed when not needed.

Made in capacities from $\frac{1}{2}$ to 3 cu. yds.

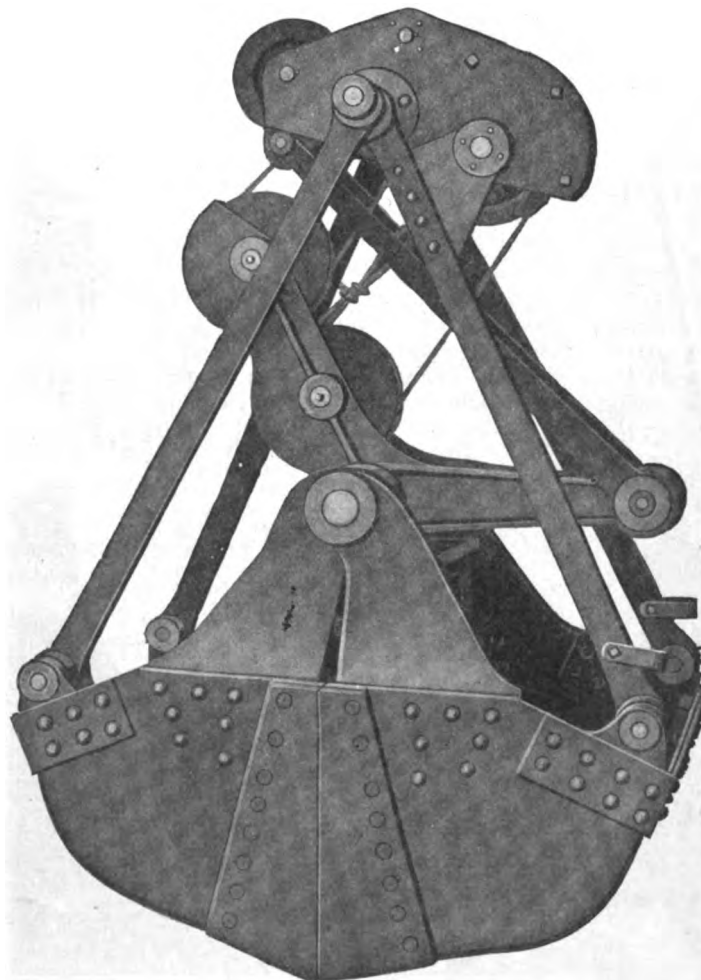
Other Types—Buffalo buckets are also made in 4 other types:

CLEAN-UP TYPE—For use in cars, boats, etc.

THREE-LINE TYPE—Designed for use on overhead or monorail cranes, where it is not practicable to maintain alignment of bucket by means of a steady carriage.

FOUR-LINE TYPE—Designed to operate on cable or man trolley bridges.

SLAG TYPE—For handling granulated slag.



STANDARD TYPE BUFFALO CLAMSHELL BUCKET
Suitable for handling coal, sand, gravel and similar material

FOUNDED 1880

THE BROWN HOISTING MACHINERY CO.

Manufacturers of Grab Buckets

MAIN OFFICE AND WORKS
CLEVELAND, OHIO

BRANCH OFFICES

NEW YORK, N. Y., 50 Church Street
CHICAGO, ILL., 208 South La Salle Street

PITTSBURGH, PA., Oliver Building
SAN FRANCISCO, CAL., Monadnock Building

EUROPEAN REPRESENTATIVE, H. E. HAYES, 12 Rue de Phalsbourg, PARIS, FRANCE

Products.

BROWNHOIST GRAB BUCKETS.

Also manufacturers of Storage Bins; Transfer Tables; Water Closet Shields; Fer-roinclave, a combined Reinforcement and Centering for concrete roofs, sides, stairs, bins, floors, etc.

For Locomotive Cranes, see pages 60-61; for Suspended Bins, Coal and Ash Handling Machinery, see page 702.

Brownhoist Grab Buckets.

These buckets are made to dig in coal, gravel, sand, crushed stone, cinders, ore, etc., and will excavate in ordinary soil. The excavating bucket is for excavating in stiff materials.

A grab bucket is usually subjected to extremely hard usage on account of the high rate of speed at which it is handled, and therefore the Brownhoist grab bucket has been made very strong in all parts, as will be seen in the illustrations.

The bucket is so designed that it does not have to be dropped onto the material with pile hammer force to insure its filling. This results in the least damage to cars, boats, trucks, etc., and also saves wear on the bucket. Another important feature of this bucket is the wide spread of the spades when open, which gives a greater digging power than a bucket of same capacity but with a shorter spread of the spades. The ropes and sheaves are fully protected from the material being handled. The spades can be removed when worn and new ones applied.

BROWNHOIST

TRADE-MARK

Types.

Three general types of Brownhoist buckets are built: The patent grab bucket which includes the coal bucket (Fig. 1), ore bucket (Fig. 3), and the special grab bucket (Fig. 2); the contractor's type bucket (Fig. 5); and the drag line bucket (Fig. 7).

Operation.

The Brownhoist patent grab bucket is a two-rope bucket and can be operated on any two-drum machine. The two ropes, the closing and the holding ropes, are so spaced that there is little tendency for the bucket to twist while being hoisted and lowered.

The bucket spade arms are attached to a crosshead which is operated up and down on the inside of the bucket by the closing rope. This opens and closes the spades. To dump the bucket; the holding rope is held fast and the closing rope payed out which permits the spades to open.

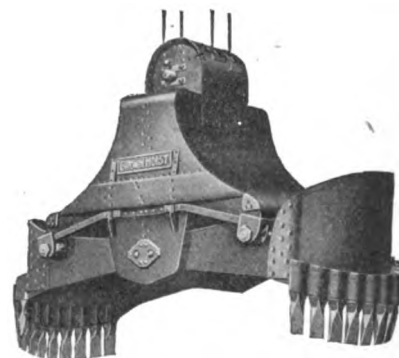


FIG. 2. BROWNHOIST SPECIAL GRAB BUCKET FOR DIGGING IN VERY HARD AND LARGE LUMP MATERIALS

Made with round cast steel spades with manganese steel teeth

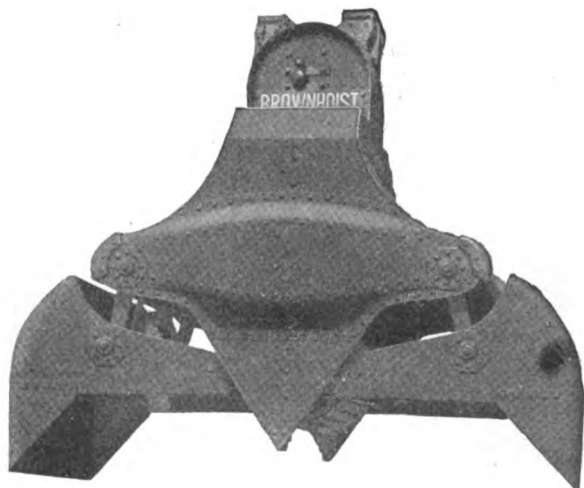


FIG. 1. BROWNHOIST LINK-TYPE GRAB BUCKET
For handling coal, coke, crushed stone, cinders, etc.

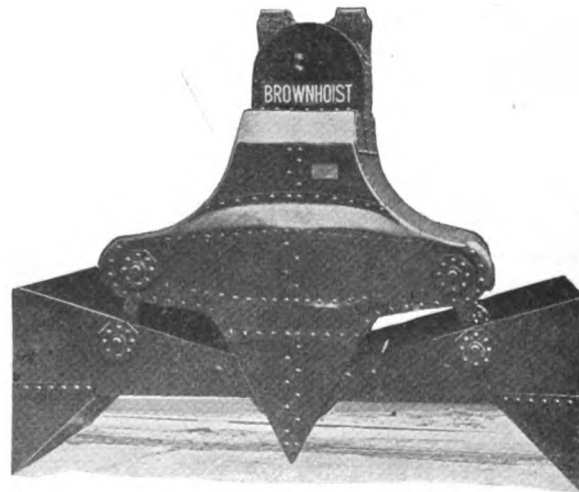


FIG. 3. BROWNHOIST LINK-TYPE GRAB BUCKET
With backs of spades left open for handling ore and for doing excavating work

Dimensions, with Diagram.

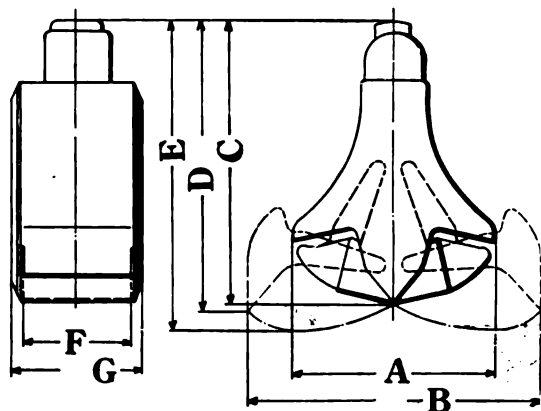


FIG. 4. DIAGRAM OF BROWNHOIST PATENTED BUCKET

Showing dimensions. See tables

COAL BUCKET, FIGS. 3 AND 4

Type	Code word	Capacity, cu. ft.	A	B	C	D	E	F	G	Net weight of bucket, lbs.	Measurement, cu. ft.
CG1	Rebac	27	5 5	7 11	6 10	7 0	7 7	3 2	3 8	3300	135
CG2	Rebed	40	6 1	8 9	7 5	7 9	8 3	4 0	4 8	4100	210
CG3	Rebif	54	6 9	9 8	7 10	8 0	8 9	4 5	5 1	4600	268
CG5	Rebuh	70	7 5	11 0	8 2	8 6	9 3	4 5	5 0	6000	303
CG6	Rebyk	84	8 1	12 1	9 4	9 8	10 6	4 5	5 2	8000	389
CG7	Rebwa	100	8 6	11 10	8 6	8 10	9 6	5 5	6 1	7500	435
CG12	Rebbi	110	8 6	12 9	8 3	8 4	9 3	5 3	5 11	7800	400
CG13	Rebco	180	9 7	14 5	11 5	11 12	12 6	6 0	7 0	10000	765
CG14	Rebka	230	11 11	17 8	12 10	13 3	14 5	5 6	6 6	13625	990
CG15	Rebno	260	11 10	17 7	13 4	13 9	14 11	7 8	8 8	15800	1360
CG16	Rebsi	360	11 10	17 7	13 4	13 9	14 11	9 0	10 0	17980	1580

ORE BUCKETS, FIGS. 3 AND 4

Type	Code word	Capacity, cu. ft.	A	B	C	D	E	F	G	Net weight of bucket, lbs.	Measurement, cu. ft.
OG1	Rabab	17	6 1	8 9	7 5	7 9	8 3	4 0	4 8	3900	210
OG2	Rabec	27	6 7	9 7	7 10	8 0	8 9	4 5	5 1	4400	262
OG3	Rabid	40	7 5	11 0	8 2	8 6	9 3	3 10	4 5	5800	268

EXCAVATING BUCKETS, FIGS. 3 AND 4

Type	Code word	Capacity, cu. ft.	A	B	C	D	E	F	G	Net weight of bucket, lbs.	Measurement, cu. ft.
EG1	Ribad	40	6 9	9 7	7 4	7 7	8 3	4 5	5 1	4400	242
EG2	Ribef	54	7 6	10 10	7 9	8 1	8 9	3 10	4 6	5300	263
EG3	Ribig	66	9 8	13 10	9 10	0 11	0 3	3 3	3 11	5550	390
EG4	Riboh	80	9 8	13 10	11 11	3 12	2 3	10 4	10	8700	510
EG5	Ribuk	115	11 10	17 6	13 1	13 5	14 8	5 0	6 0	12800	1412

SPECIAL GRAB BUCKETS, FIGS. 2 AND 4

Type	Code word	Capacity, cu. ft.	A	B	C	D	E	F	G	Net weight of bucket, lbs.	Measurement, cu. ft.
B1	Ritab	27	6 10	10 8	7 10	7 9	8 7	2 11	3 7	5800	190
B2	Ritak	40	7 11	11 9	8 1	8 3	9 0	4 2	4 11	7780	330

CONTRACTOR'S TYPE BUCKETS, FIGS. 5 AND 6

Type	Code word	Capacity, cu. yds.	A	B	C	D	E	F	G	H	Net weight of bucket, lbs.
Con. N1	Rutan	1½	4 10	5 7	4 10	5 5	2 11	3 0	3 3	2 11	1800
Slag L1	Rusam	1	6 3	7 8	6 4	7 2	2 11	3 0	3 3	3 3	2500
Con. N2	Rutil	1½	7 5	8 7	7 5	8 8	3 3	3 4	3 8	3 3	3500
Slag L2	Rusot	1½	7 5	8 7	7 5	8 8	3 3	3 4	3 8	3 3	3500
Con. N3	Rutof	2	7 10	9 3	8 1	9 6	3 6	3 8	3 10	3 7	4500
Slag L3	Rusog	2	7 10	9 3	8 1	9 6	3 6	3 8	3 10	3 7	4500
Con. N4	Ruted	2	7 10	9 3	8 1	9 6	3 6	3 8	3 10	3 7	4500
Slag L4	Ruseb	2	7 10	9 3	8 1	9 6	3 6	3 8	3 10	3 7	4500

Prices furnished on application.

Brownhoist Contractor's Type Bucket.

Designed especially for working in sand, gravel, ashes, slag, etc. All bearings fitted with keyed bushings of manganese steel, which withstand the cutting tendency of fine particles of sand, etc. Digging edges are of manganese steel and can be easily removed when worn.

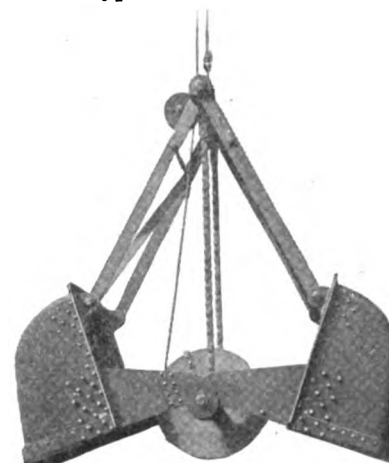


FIG. 5. BROWNHOIST CONTRACTOR'S TYPE BUCKET

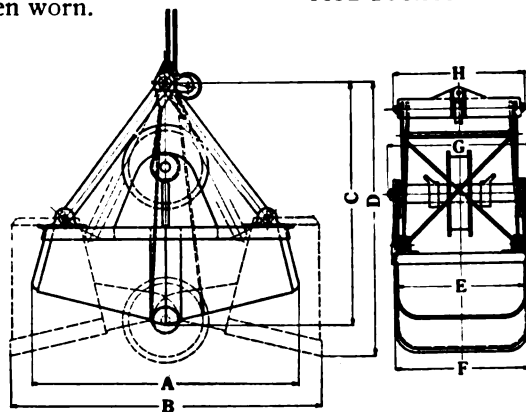


FIG. 6. DIAGRAM OF CONTRACTOR'S TYPE BUCKET

Showing dimensions. See table

Brownhoist Dragline Bucket.

A back-dumping bucket. It is operated by two lines, dragline and hoistline.

All standard buckets are equipped with steel cutting edge and two-part teeth. Each tooth is tipped with a manganese steel point. There are three types of points—which one to use depends upon whether the bucket is to work in loose digging, hardpan, or rock. Inquiries must state the class of work.



FIG. 7. BROWNHOIST SHNABLE PATENT DRAGLINE BUCKET

DRAGLINE BUCKETS, FIG. 7

Type	Code word	Capacity, cu. yds.	Width of cutting edge, in.	Net weight, lbs.
A-1	Ramab	1	3 0	2850
A-2	Ramac	1½	3 6	4550
A-3	Ramad	2	4 2	5650
A-4	Ramaf	2½	4 10	6850
A-5	Ramal	3	5 4	8200
A-6	Ramak	3½	5 10	9600

THE HAYWARD COMPANY

Manufacturers of Orange Peel and Clam Shell Automatic Buckets, Drag Scraper and Electric Motor Buckets

Hudson Terminal Building
NEW YORK, N. Y.

Products.

ORANGE PEEL BUCKETS, CLAM SHELL BUCKETS, DRAG SCRAPER BUCKETS, ELECTRIC MOTOR BUCKETS, HAYWARD COUNTERWEIGHT DRUMS, GRAPPLES.

Also manufacturers of Skid Excavators, Coal Handling and Dredging Machinery.



Trade **HAYCO** Mark
TRADE-MARKS

Service.

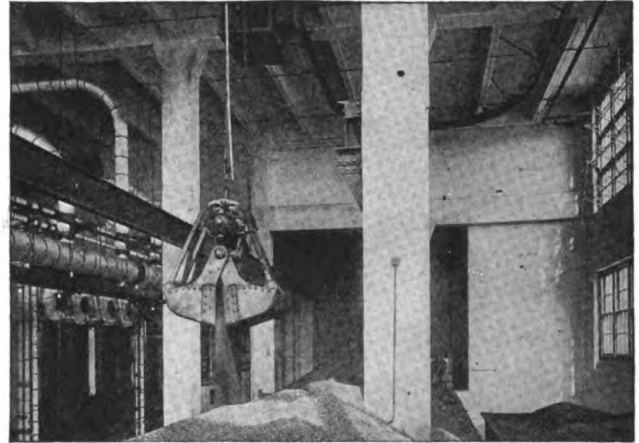
The automatic bucket—originally considered a digging or loading machine—has developed a much wider field and today is also part of the conveying and rehandling systems of foundries, steel mills and power plants.

No single machine has been more generally adopted in the universal effort to handle bulk material more economically by mechanical means.

The succeeding pages merely suggest a few of the many applications of Hayward buckets to construction and industrial problems.

These typical examples may in some instances parallel conditions existing in your plant and hence demonstrate sufficiently the adaptability of Hayward buckets. If not, the Hayward engineers will be glad to co-operate in solving material handling problems most efficiently and economically.

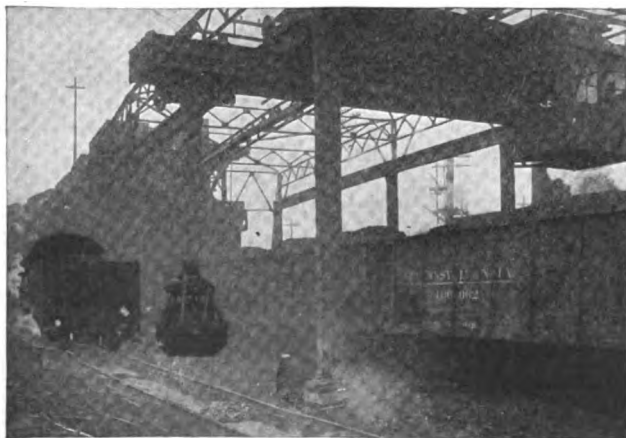
Bulletins on particular classes of work and recommendations on individual problems will gladly be sent without the request incurring the slightest obligation. Forty-one years of bucket building experience and ample manufacturing facilities are at your disposal.



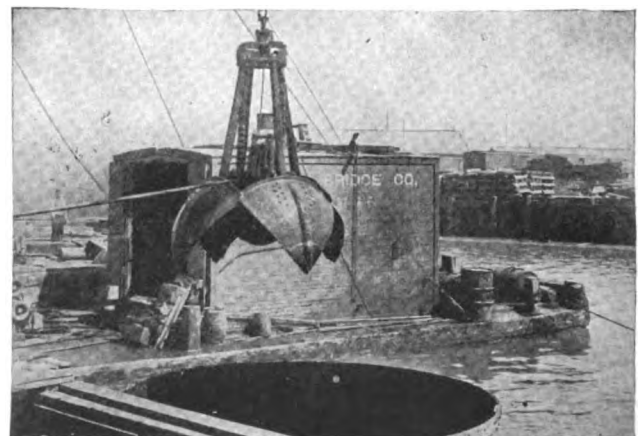
No. A-2456. HAYWARD ELECTRIC MOTOR BUCKET
Rehandling fuel in a boiler room from car to bunkers



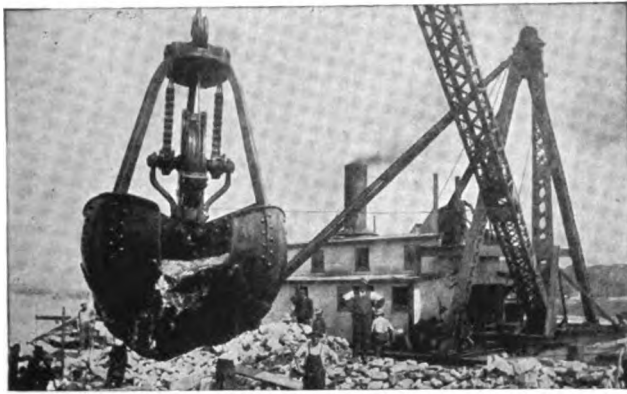
No. A-904. HAYWARD CLASS "E" CLAM SHELL BUCKET
On a mast and gaff rig, unloading coal from barge and dumping into hopper



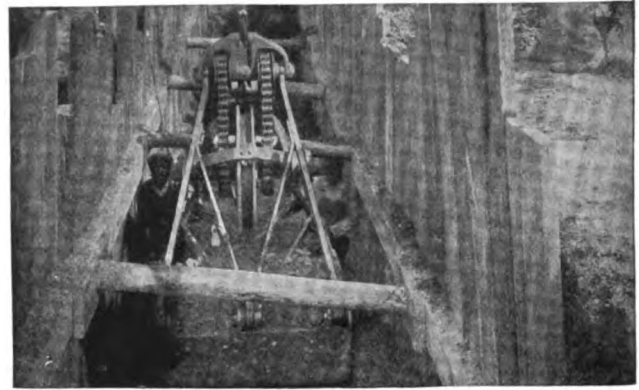
HAYWARD ELECTRIC MOTOR BUCKET
In railroad ash pit service



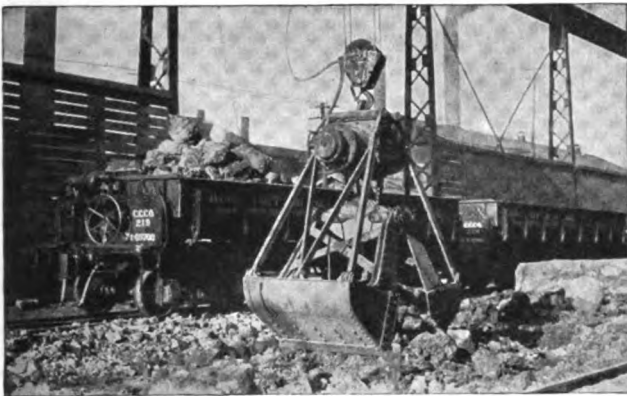
No. A-2648. HAYWARD ORANGE PEEL BUCKET
Excavating material from within a caisson as it is being sunk



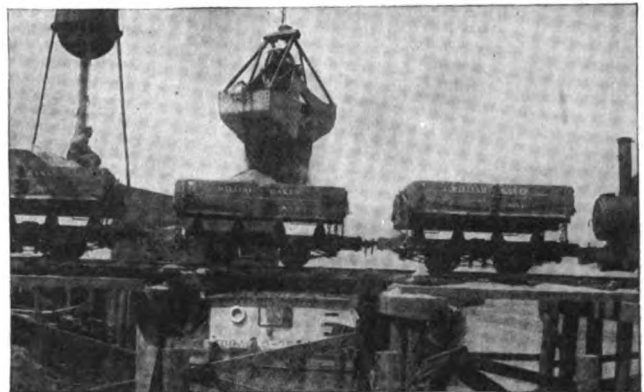
No. A-2358. HAYWARD 3-SIDED ORANGE PEEL BUCKET WITH CUT-OFF BLADES
Handling a boulder larger than itself



No. A-1645. HAYWARD CLASS "H" MULTI-POWER CLAM SHELL BUCKET (1½ CU. YDS.)
Working between sheeting 10 ft. apart and digging in sand, loam and gravel



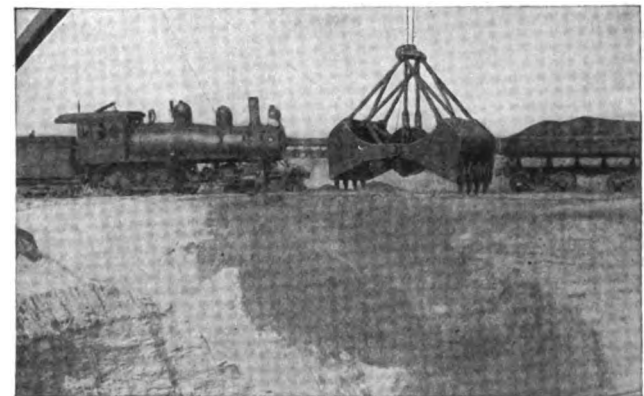
No. C-495. HAYWARD ELECTRIC MOTOR BUCKET (3 CU. YDS.)
Loading broken open hearth slag into cars



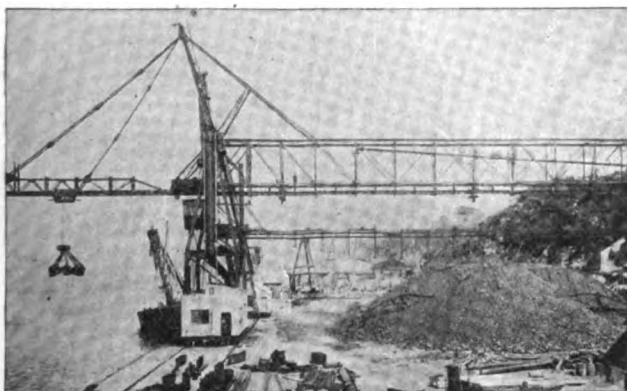
No. A-1675. HAYWARD CLAM SHELL BUCKET WITH ORE BOWL
Rehandling contractor's materials. Note the clean, accurate dump



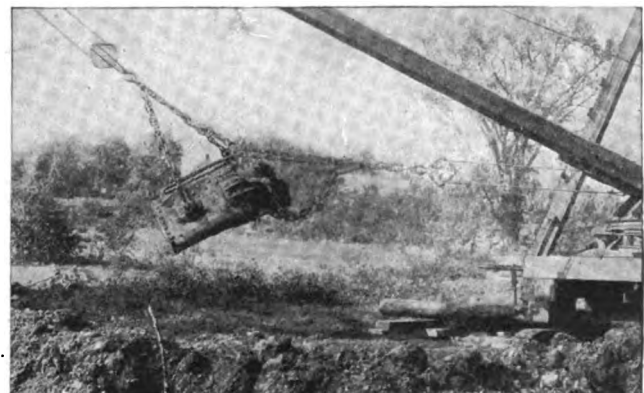
No. C 355. HAYWARD CLAM SHELL BUCKET
Unloading crushed stone from barges



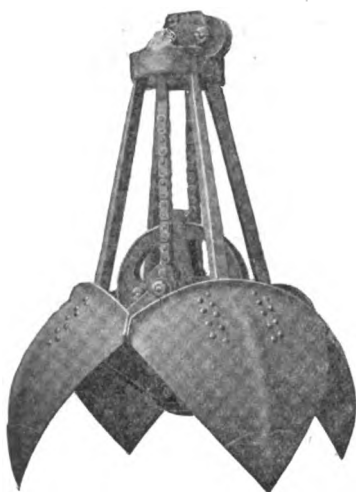
No. A-1927. HAYWARD CLAM SHELL BUCKET WITH ORE BOWL
Fitted with teeth for digging in hard packed sand or other compact materials



No. A-1584. HAYWARD SPECIAL CLAM SHELL BUCKET (2-TON CAPACITY)
Operating on bridge with 180-ft. span, unloading coal



No. A-1839. HAYWARD DRAG SCRAPER BUCKET
Digging in hard-pan. Note the full load cleanly carried



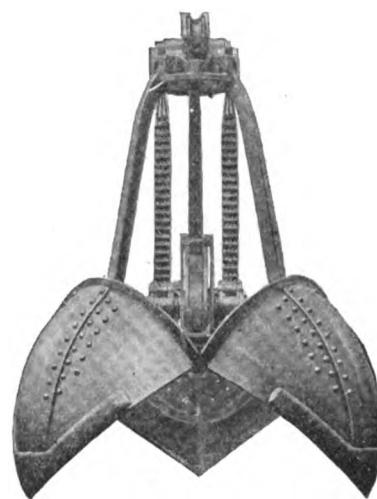
No. A-794. HAYWARD STANDARD ORANGE PEEL BUCKET

A 2-line bucket for general contractors' use. Recommended for dredging, excavating and rehandling bulk materials. Sizes from 2 cu. ft. up



No. A-798. HAYWARD MULTI-POWER ORANGE PEEL BUCKET

An extra heavy digging bucket with a 2-part side chain which gives nearly 60% more penetrating power. Sizes from 2 cu. ft. up



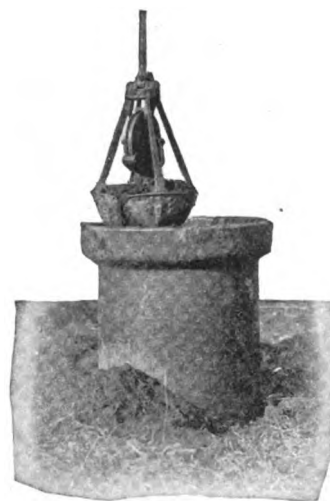
No. A-2515. HAYWARD 3-SIDED ORANGE PEEL BUCKET

Designed primarily to handle blasted rock and other hard and odd-shaped material, but is also an all around digging bucket. Sizes from 21 cu. ft. up



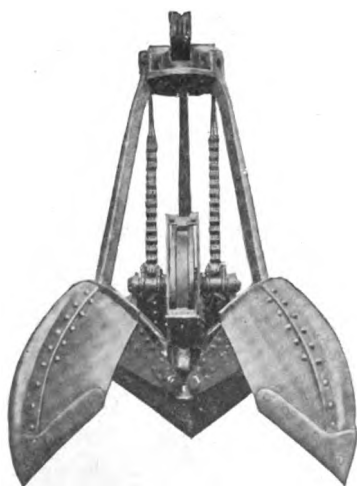
No. A-2503. HAYWARD ROPE REEVED ORANGE PEEL BUCKET

The latest model of the original Hayward bucket. Closing power is varied to suit conditions. Arranged to close by 3, 4, 5, 6 or 7 parts of line and to be operated in the bight of the line or direct. Sizes from 21 cu. ft. up



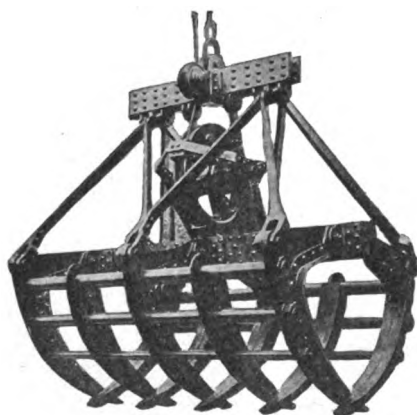
No. D-939. HAYWARD DWARF ORANGE PEEL BUCKET

A hand-operated miniature of the large orange peel buckets. Will dig inside a 12-in. pipe—the depth only limited by the length of the operating lines. Sizes from 100 cu. in. to 1 cu. ft.



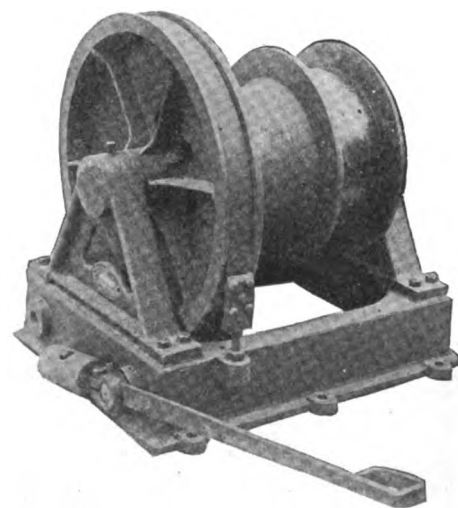
No. A-1943. HAYWARD EXTRA HEAVY 3-SIDED ORANGE PEEL BUCKET WITH CUT-OFF BLADES

The heaviest type (outside of special buckets) of orange peel, made for handling rock and specially reinforced for severe usage



No. A-159-a. HAYWARD GRAPPLES

Made in various styles for handling irregular-shaped bulk material such as logs, stumps, sugar cane, tin scrap, cord wood and similar uneven material



No. A-947. HAYWARD COUNTERWEIGHT DRUM

Takes the place of an additional drum on the engine. Is not connected to hoisting engine so may be placed in any convenient location for leading the holding line to the bucket and the counterweight line to the counterweight. Band brake operated by foot or hand lever



No. A-2565. HAYWARD CLASS "E" CLAM SHELL BUCKET WITH REGULAR BOWL

The light "E" bucket is recommended for handling coal and other light, loose materials; the heavy "E" for dredging. The shape of the bowls allows a gradual yet rapid discharge. Sizes from $\frac{1}{2}$ cu. yd. up



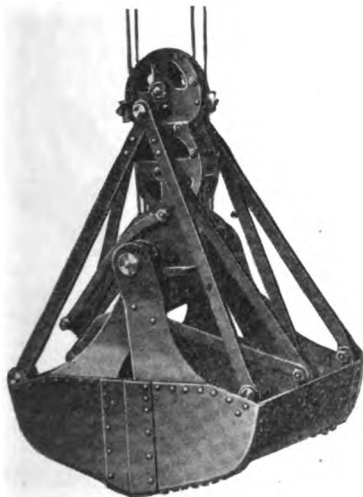
No. A-719. HAYWARD CLASS "E" CLAM SHELL BUCKET WITH ORE BOWL

In proportion to size, ore bowl buckets carry larger loads and will dig harder materials than regular bowls, owing to their shovel-like shape. Sizes from $\frac{1}{2}$ cu. yd. up



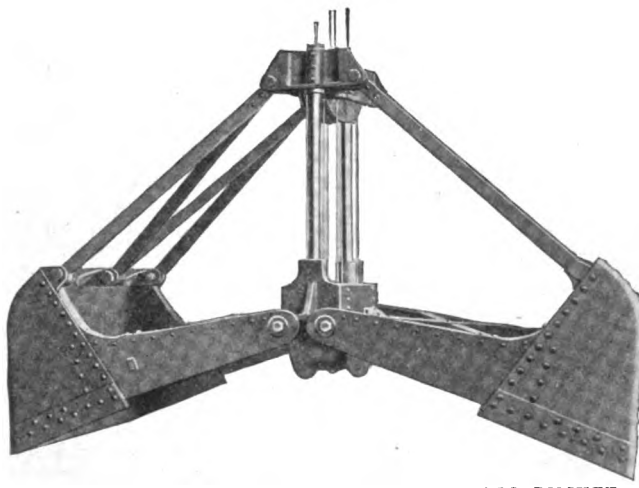
No. A-1037. HAYWARD CLASS "H" CLAM SHELL BUCKET

Has 60% more closing power than a Class "E" bucket and thus is slower, but the penetration is much greater and there is less tendency to lift while closing. Sizes from $1\frac{1}{2}$ cu. yds. up



No. A-1323. HAYWARD CLASS "G" CLAM SHELL BUCKET WITH ORE BOWL

A rope reeved bucket. May be operated in bight of the line and practically twice the load handled without increasing size of hoisting engine. Advantageous on cableways, as no headroom is lost. Sizes from $\frac{1}{2}$ cu. yd. up



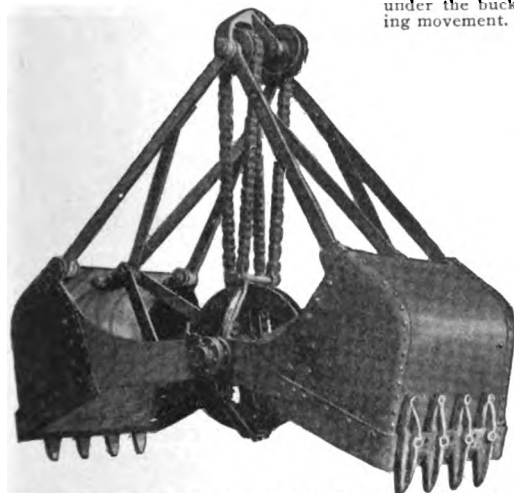
No. A-1599. HAYWARD SCRAPER CLAM SHELL BUCKET

Recommended for handling iron ore, pumped sand and other densely packed and heavy materials. Fills with but little material under the bucket, gathering its load by a combined digging and scraping movement. Sizes from $2\frac{1}{2}$ cu. yds. up



No. A-2377. HAYWARD ELECTRIC MOTOR CLAM SHELL BUCKET WITH ORE BOWL

Can be hung on a crane or any hoisting apparatus. Bowls are electrically operated with self-contained mechanism. Works within its own height. Digging and discharge under control at every stage. Sizes from $7\frac{1}{2}$ cu. ft. up, with A.C. or D.C. motors



No. A-1340. TEETH FOR HAYWARD CLAM SHELL BUCKETS

Made of steel. Recommended for handling some materials in their natural state. Can be attached to all styles and sizes of Hayward clam shell buckets with ore bowls



No. A-1232. HAYWARD DRAG SCRAPER BUCKET

May be operated on almost every type of machine with double drum engine. Can be adjusted to enter material at any angle—and has no rigid bale or bridle in the bucket, hence nothing to break if it lands on side or top. Sizes from $\frac{3}{4}$ cu. yd. up

FOUNDED 1873

INDUSTRIAL WORKS

Manufacturers of Clamshell Buckets

CABLE ADDRESS:
"INDUSWORKS, BAY CITY"

MAIN OFFICE AND WORKS
BAY CITY, MICH.

CODE:
ABC, Third Edition

NEW YORK, N. Y., 50 Church Street
PHILADELPHIA, PA., Widener Building

BRANCH OFFICES

CHICAGO, ILL., McCormick Building
DETROIT, MICH., Book Building

AGENCIES

ST. LOUIS, MO., J. G. MILLER
BIRMINGHAM, ALA., C. B. DAVIS ENGINEERING CO.
SAN FRANCISCO, CAL., N. B. LIVERMORE & CO.
DENVER, COLO., LANDES & Co.
SALT LAKE CITY, UTAH, LANDES & Co.

MINNEAPOLIS, MINN., COPELAND & KLINGEL
EL PASO, TEX., EL PASO BRIDGE & IRON CO.
PORTLAND, ORE., NORTHWESTERN EQUIPMENT CO.
SEATTLE, WASH., NORTHWESTERN EQUIPMENT CO.
MONTREAL, CANADA, F. H. HOPKINS & Co., LTD.
TORONTO, CANADA, F. H. HOPKINS & Co., LTD.

Products.

POWER WHEEL, HIGH POWER and MULTI-POWER CLAMSHELL BUCKETS.

For Locomotive Cranes, see pages 68-69.

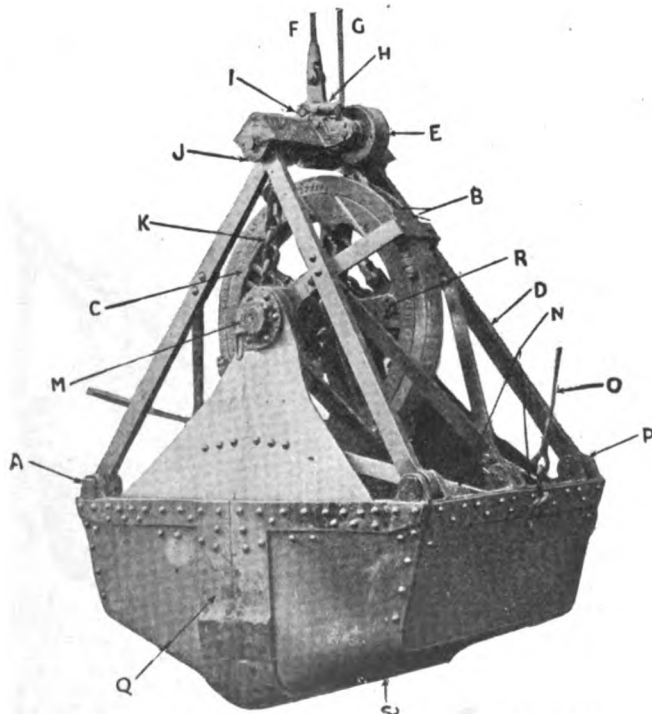
"Industrial" Power Wheel Bucket.

Owing to the simple and direct application of the opening and closing forces, this bucket is, without exception, the fastest operating bucket on the market today. It is extremely simple in design, which allows great strength, durability and rigidity with a moderate weight. At the same time no other bucket of the power wheel type has greater digging power.

This bucket is recommended for rehandling coal, gravel, sand, sugar beets, etc.

The power wheel type has many inherent advantages over other types of buckets. It may be rapidly attached or detached from the crane operating it. It is remarkably economical of hoisting rope, as one crane hoisting rope is fastened externally to the bucket head and the other hoisting rope winds about the large diameter power wheel and is guarded with roller guards against any possible chafing. The closing chains are round iron close link chains that can be repaired or renewed by any blacksmith.

This bucket is recommended as simple, safe and economical in operation. It will give a maximum of results with a minimum of repairs.



KEYED ILLUSTRATION OF POWER WHEEL BUCKET

Specifications—A—Hardened steel bushings in lower ends of connecting rods. (All wear is concentrated upon easily removable bushings.)

B—Patented steel rope guard extending completely around power wheel to prevent any possible fouling of closing line with consequent loss of time. Guard is made in halves and is large enough to allow spliced thimbles or open socket to pass through it.

C—Large heavy power wheel, bushed.

D—Heavy steel connecting rods, thoroughly braced to maintain proper alignment of bucket parts.

E—Hard alloy steel idler sheave, bushed.

F—Closing line, guarded at every point against chafing.

G—Opening line does not enter bucket.

H—Three roller rope guards about idler sheave.

I—Anchor pin for opening line, may be used with opening cable equipped either with thimble spliced in end or with open socket.

J—Hardened steel bushings in upper ends of connecting rods.

K—Best quality round iron chain, close link "dredge" type.

L—Patented crescent shaped equalizer distributes closing force between the two sides of chain and leads chain into grooves in power wheel hub. These grooves are arranged so chain leads into them with no unnecessary friction and greatly lengthens the service life of chains.

M—Steel shaft bearings. Note shaft is pinned to outside bearings to concentrate all wear on bushings in inner bearings.

N—Rigid braces to hold connecting rods in alignment.

O—Tagline connection that can be shifted to hold bucket at different angles.

P—Heavy cast steel corner brackets.

Q—Plate reinforcements scientifically located.

R—Simple way of fastening rope. Either spliced thimble or babbitted open socket may be used on closing line and either will pass all rope guards except at idler sheave. Rope clamps, not necessary but may be used. Bucket can be attached to or removed from crane ropes in 3 minutes. Only 3 pins need be removed (R, I, and pin in idler sheave E) and ropes are entirely free from bucket.

S—Replaceable hard alloy cast steel cutting edges.



PATENTED "ALL AROUND" ROPE GUARD



PATENTED ARRANGEMENT OF EQUALIZER AND GROOVES FOR THE CHAIN

DATA, POWER WHEEL BUCKETS

Capacity	Closed		Width	Open		Approximate weight
	Height	Length		Height	Length	
¾ cu. yd.	6'-0"	5'-4"	3'-5"	6'-11"	7'-2"	2600 lbs.
1 cu. yd.	6'-5"	5'-4"	3'-5"	7'-2"	7'-9"	3000 lbs.
1½ cu. yd.	7'-8"	6'-1"	3'-10"	8'-1"	9'-1"	3900 lbs.
2 cu. yd.	7'-11"	6'-2"	4'-8"	8'-6"	9'-8"	4800 lbs.

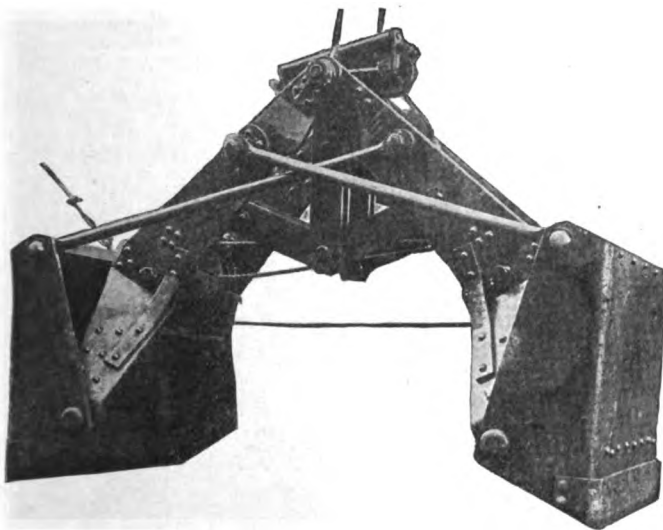
"Industrial" High Power Scraper Bucket.

This powerful bucket is of the scraper type and gathers its load by a combined digging and scraping action.

It is especially efficient in heavy ore, crushed stone, large lump coal, large producer coke, and water packed material, as it is one of the most powerful buckets in use, and shows no tendency to lift while closing. With the addition of hard alloy steel teeth it is available for severe excavating duty and will then operate in heavy clay, hardpan and other difficult materials.

Advantages—There are many advantages over buckets of the scraper type: (1) In the position of operating ropes and sheaves, as they are kept very high and out of the way of the material. (2) In the great power transmitted to edge of the blades, which increases as bucket is being closed; this brings the greatest crushing strength at the instant of closing and enables it to handle successfully materials impossible for ordinary buckets. (3) In the simple opening and closing mechanism that avoids the usual complicated link work. (4) In the increased speed of operation due to efficient arrangement of the cast steel connecting rods, which in closing force blades together rapidly and in opening pull them quickly to a dumping angle.

Trays are of flange steel with replaceable hard alloy steel shoes for cutting edges. Buckets are designed to concentrate all wear on the replaceable bushings, making renewals an easy and inexpensive matter. Rope sheaves are of hard alloy steel with finished treads and faces and are bronze bushed. A valuable feature is the complete system of rope guards to keep the rope in place and to reduce wear on it to a minimum. At the top of the bucket where the closing line enters, there are roller guards, so that from whatever direction the rope is pulled it can not rub. Special arrangements of holding lines may be provided for use on ore and coal bridges, traveling cranes, etc.

**"INDUSTRIAL" HIGH POWER SCRAPER BUCKET**

Capacity	Closed		Width	Open		Approximate weight
	Height	Length		Height	Length	
$\frac{3}{4}$ cu. yd.	7'-0"	6'-0"	3'-3 $\frac{1}{4}$ "	6'-6"	8'-2 $\frac{1}{4}$ "	3500 lbs.
1 cu. yd.	7'-10"	6'-0"	4'-2 $\frac{1}{4}$ "	6'-6"	8'-2 $\frac{1}{4}$ "	3800 lbs.
1 $\frac{1}{2}$ cu. yd.	8'-0 $\frac{3}{4}$ "	6'-0 $\frac{1}{4}$ "	4'-3"	6'-7 $\frac{1}{4}$ "	8'-7 $\frac{3}{4}$ "	4300 lbs.
2 cu. yd.	8'-6 $\frac{1}{4}$ "	6'-8"	4'-3"	6'-10 $\frac{1}{2}$ "	9'-5 $\frac{1}{2}$ "	4700 lbs.

"Industrial" Multi-power Bucket.

This multi-power bucket has been developed from the power wheel type of which the most important advantages have been retained and about one-third greater digging power added.

It is recommended for general service in run-of-mine and lump coal, packed sand and gravel, crushed stone and for emergency light excavating duty. It ranks midway between the other two types in digging power.

The "M-P" bucket is of the rope reeved type, but the hoisting ropes from the crane are not reeved back and forth inside the bucket mechanism. A short piece of rope entirely separate from the crane ropes is used. The bucket can be attached to or detached from the crane in 3 minutes.

Practical men will be attracted by the fact that this bucket operates entirely with wire rope, requiring inside the bucket a short piece which can be readily replaced when necessary.

Other attractions are the large diameter sheaves used, the small compact operating mechanism, the substantial appearance and the great closing power.

All "Industrial" features are maintained as to material, rigid bracing, concentration of wear upon renewable bushings and hard alloy steel renewable cutting edges.

The all around rope guard for the crane rope on the power wheel is a feature of this bucket, although removed to show the operating ropes in illustration below.

**"INDUSTRIAL" MULTI-POWER BUCKET**

Capacity	Closed		Width	Open		Approximate weight
	Height	Length		Height	Length	
1 $\frac{1}{2}$ cu. yd.	7'-2"	6'-1"	3'-10"	8'-0"	9'-1"	4500 lbs.
2 cu. yd.	7'-4"	6'-1"	4'-9"	8'-2"	9'-1"	5400 lbs.
2 $\frac{1}{2}$ cu. yd.	7'-4"	6'-1"	5'-8"	8'-2"	9'-1"	5800 lbs.
3 cu. yd.	8'-4"	7'-0"	6'-4"	9'-5"	10'-6"	6500 lbs.

ESTABLISHED 1892

THE GEORGE HAISS MFG. CO., INC.

Contractors' and Coal Dealers' Excavating and Rehandling Machinery

Canal Place and East 141st Street

NEW YORK, N. Y.

TELEPHONE:
MOTT HAVEN 0157CABLE ADDRESS:
"COAL-HOIST, NEW YORK"

Products.

GRAB BUCKETS and COUNTERWEIGHT HOLDING DRUMS.

A line of Contractors' and Coal Dealers' Machinery including Floating, Portable and Tower Cranes; Steam and Electric Hoists; Mast and Gaff Hoist Fittings and Sheaves; Coal and Ore Hoisting Engines; Coal Car Cable Hauling Engines; Automatic Dumping Coal Cars; Coal and Ash Bins; Coal and Sand Cut-off Valves; Coal and Ash Gates and Chutes; Revolving and Shaker Screens; Tying Machines; Unloading Towers; Industrial Railways.

For Loaders, Unloaders and Belt Conveyors, see pages 722-23.

Haiss Type "Contractor" Grab Buckets.

Uses—Haiss type "Contractor" grab buckets are used for automatic digging from sand and gravel banks, crushed stone piles, and for unloading hard and soft coal, coke, sand, stone, ore, chemicals, etc., from boats and railroad cars. They are also employed for excavating and dredging canals, making railroad embankments and dams, and for other purposes when labor and time can be reduced in construction work.

Advantages—In the first place, a Haiss "Contractor" grab bucket digs, loads and discharges mechanically; and in the second place, being attached to any type of derrick or crane, the load of material which it has dug may be raised from almost any depth to any reasonable height, and swung or carried to a near or distant point before discharging its load. Under usual working conditions



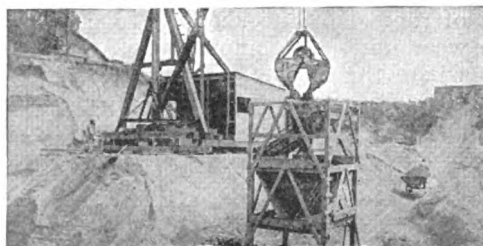
TRADE-MARK

most hoisting installations are capable of making two trips per minute; and since these buckets are built in capacities from $\frac{1}{4}$ cu. yd. to 3 cu. yds., it is easily calculable what amount of material per day the Haiss "Contractor" grab bucket can handle. Two hoisting cables

control the bucket operations.

Description—All Haiss grab buckets are constructed of heavy plate steel and steel castings. In the "Contractor" bucket, shown here, steel flat-link side chains are used. By rolling up on the hubs of the large closing wheel, these chains provide a 1:4 closing power ratio. The "High-Power" grab bucket, also shown, however, depends on the "block and fall" principle of cable reeving for drawing the two halves of the bowl together. A 1:7 closing power is thus obtained, and gives this particular bucket a powerful penetrating effect. Teeth can be bolted to the jaws of all Haiss buckets.

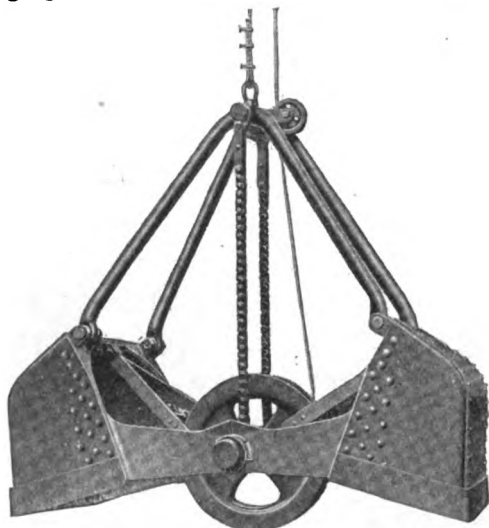
The Haiss "High-Power" grab bucket should be used for hard digging, such as clay, ore, and heavy earth excavation when made either above or under water.



HAISS "CONTRACTOR" BUCKET DIGGING IN A SAND PIT

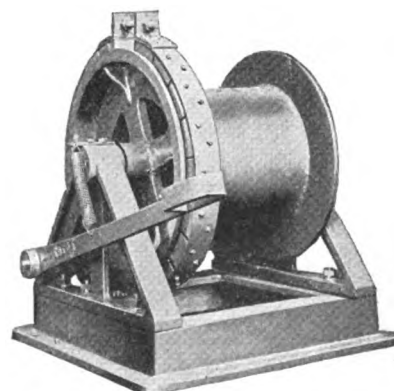


HAISS "HIGH-POWER" BUCKET FOR HARD DIGGING

HAISS TYPE "CONTRACTOR" GRAB BUCKET
OVER ALL DIMENSIONS AND WEIGHTS

Capacity, yds.	Weight, lbs.	Closed			Width, ft.	Open		
		Height, ft.	Length, in.	ft.		Height, ft.	Length, in.	ft.
$\frac{1}{4}$	1200	4	5	3	8	2	6	5
$\frac{1}{2}$	2100	5	2	4	3	3	2	5
$\frac{3}{4}$	2400	5	4	4	9	3	2	5
1	2800	5	11	5	1	3	5	6
$1\frac{1}{4}$	3300	6	3	5	6	3	10	7
$1\frac{1}{2}$	4000	7	2	6	5	3	10	8
$1\frac{3}{4}$	4250	7	2	6	5	4	2	8
2	5000	7	2	6	5	4	8	8

HOLDING DRUM—This drum controls the holding cable fastened to the top of the grab bucket. It takes the place of an extra drum on a hoisting engine and takes up automatically by means of a counterweight the slack in the holding cable when the closing cable is hoisting the loaded bucket. Full explanation for rigging this drum free on application.



COUNTERWEIGHT HOLDING DRUM

LAKEWOOD ENGINEERING COMPANY

Clamshell Buckets and Industrial Railway Equipment

CLEVELAND, OHIO

DISTRICT OFFICES

ATLANTA, GA., 90½ North Forsythe Street
BALTIMORE, MD., American Building
BOSTON, MASS., 453 Washington Street
BUFFALO, N. Y., 256 Main Street
CHICAGO, ILL., Lumber Exchange Building
CLEVELAND, OHIO, Racine Building
DALLAS, TEX., Sumpter Building
DES MOINES, IOWA, Hubbell Building
DETROIT, MICH., David Whitney Building

SAN FRANCISCO, CAL., Rialto Building

KANSAS CITY, MO., Railway Exchange Building
MEMPHIS, TENN., Central Bank Building
MILWAUKEE, WIS., Milwaukee Athletic Club Building
MINNEAPOLIS, MINN., 529 Second Avenue, South
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PHILADELPHIA, PA., Widener Building
PITTSBURGH, PA., Union Arcade
RICHMOND, VA., Times-Dispatch Building
ST. LOUIS, MO., Railway Exchange Building

Products.

CLAMSHELL BUCKETS; INDUSTRIAL RAILWAY EQUIPMENT; PLATFORM CARS; DUMP CARS; STEEL TRACK and JOINT TIE; TURNABLES.

Also Concrete Mixing and Placing Equipment and Road Building Machines.

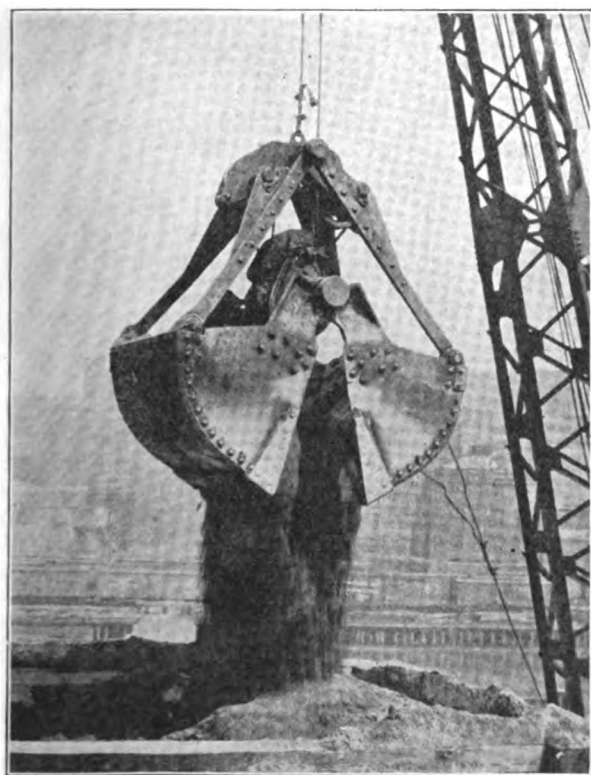
For Industrial Trailers and Trucks, see page 1221.

Clamshell Bucket.

Lakewood clamshell buckets are designed and built to get full loads every time, and they do it. The closing power increases as the shells come together. The Lakewood clamshell digs down as it closes, gets all it can hold and comes up filled to overflowing. Short cable overhaul speeds operation of bucket. Weight of counterweight can be adjusted to suit material handled. Upper sheaves on the closing arms give maximum digging force.

Speed in handling sand, stone, gravel, coal and other loose material has made the Lakewood clamshell popular for this work.

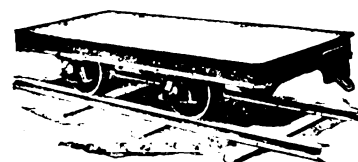
Lakewood handler buckets are built in sizes ½, ¾, 1 and 1½ yds. Lakewood diggers are built in sizes ¾, 1, 1½, 2 and 2½ yds.



LAKEWOOD CLAMSHELL BUCKET

Platform Car No. 271.

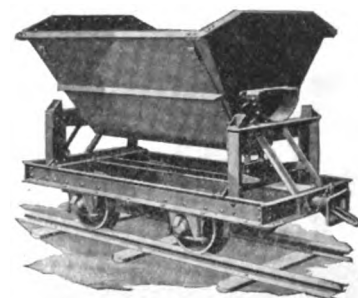
Designed for factory or yard work. Furnished with wood or steel top. Platform furnished in various sizes. Hyatt roller bearings. Built for locomotive or hand haulage. Gauges 24, 30 and 36 in. Capacities, 2 to 8 tons.



PLATFORM CAR NO. 271

V-Dump Car No. 241.

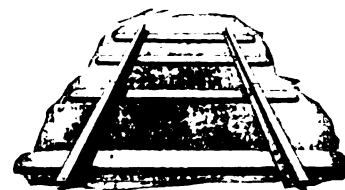
Designed for handling loose material, such as coal and slag. Built in capacities 18 cu. ft., 1, 1½ and 2 cu. yds. Body and frame rigid steel construction, cast steel draw head, link and pin type. For locomotive haulage, spring draft and spring pedestals are furnished. Gauges 24, 30 and 36 in.



V-DUMP CAR NO. 241

Lakewood Track and Joint Tie.

Narrow gauge track for temporary or permanent installation. Used by Allied armies during entire war. Pressed steel ties flanged all around, and riveted to rails to secure rigid section. Joint tie locks sections securely and takes the place of 4 fish plates, 8 bolts and nuts. Nothing to come loose. May be taken up repeatedly. Gauges 24 and 36 in. 20-lb. rail.



LAKEWOOD TRACK AND JOINT TIE

Lakewood Standard Turntable.

Made of best quality cast iron, with top grooved for flange wheels or plain checkered surface. Table revolves on a serpentine circular track, filled with 2-in. or larger balls. Turns easily with heavy load. Built for all track gauge. Diameter, 3½, 4, 5, 6, and 8 ft.



LAKEWOOD STANDARD TURN-TABLE

THE McMYLER INTERSTATE COMPANY

Manufacturers of Clamshell Buckets

CLEVELAND, OHIO

WORKS:
BEDFORD, OHIO

BRANCH OFFICES

BIRMINGHAM, ALA., Brown-Marx Building
CHICAGO, ILL., 812 Edison Building
DENVER, COLO., 18th and Wazee Streets

NEW ORLEANS, LA., 444 Maison Blanche Annex
NEW YORK, N. Y., 1756 Hudson Terminal Building
SAN FRANCISCO, CAL., 766 Folson Street
SEATTLE, WASH., Hoge Building

Product.

CLAMSHELL BUCKETS.

For Locomotive Cranes, see page 65; for Material Handling Machinery, see page 692.

Buckets of Quality.

McMyler-Interstate buckets are the result of many years of specialized experience, their performance and mechanical excellence having made them the choice of many leading industries.

They are of simple, powerful construction, are easily and rapidly operated with maximum efficiency and economy, and make for greater length of serv-

counts for the enormous increased sales each year.

This type is recommended for coal when the lumps are not too large, for loose sand, broken stone and similar material.

Also built for operation with two closing and two opening ropes.

Type R Multipower Clamshell Buckets.

This bucket was developed to meet conditions where the digging is hard.

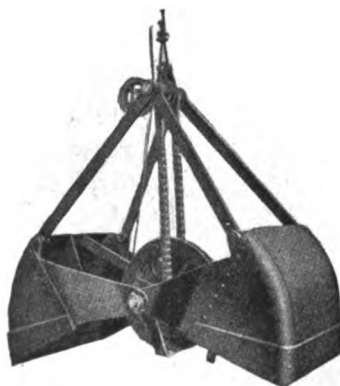
It is of heavy construction and has great closing power.

Recommended for coal if the lumps are large, for

SIZES, DIMENSIONS AND WEIGHTS OF McMYLER-INTERSTATE CLAMSHELL BUCKETS

Capacity, yds.	Weight, lbs.	Width	Length closed	Height closed	Length open	Height open
TYPE R						
3/4	3000	3' 4 1/2"	5' 2"	6' 9"	6' 4 1/2"	7' 7"
1	3200	3' 4 1/2"	5' 6"	6' 11"	7' 0 1/2"	7' 10"
1 1/4	3400	3' 4 1/2"	5' 10"	7' 2 1/2"	7' 11"	8' 1"
1 1/2	4300	4' 0"	5' 10"	7' 10 1/2"	8' 2 1/2"	8' 7"
2	4800	4' 0"	6' 13 1/2"	8' 6"	9' 6 1/2"	9' 10"
2 1/4	4900	4' 6"	6' 2 1/2"	8' 5 1/2"	9' 7"	8' 11 1/2"
2 1/2	6400	3' 11"	7' 10 1/2"	8' 11 1/2"	10' 3 1/2"	10' 3 1/2"
3	7000	4' 8"	7' 10 1/2"	8' 11 1/2"	10' 3 1/2"	10' 3 1/2"
3 1/2	9800	5' 8 1/2"	8' 0 1/2"	9' 4 1/2"	10' 11 1/2"	10' 8"
4	10500	6' 2 1/2"	8' 3 1/2"	9' 9"	11' 8 1/2"	10' 11"
TYPE R MULTIPOWER						
1	4400	4' 0"	5' 0"	7' 7"	7' 4"	8' 3"
1 1/4	4550	4' 0"	5' 0"	7' 9"	7' 8"	8' 4"
1 1/2	4750	4' 6"	5' 0"	7' 9"	7' 8"	8' 4"
2	5000	5' 0"	5' 0"	8' 1"	8' 2"	8' 6"
2 1/4	5500	5' 7"	5' 0"	8' 1"	8' 2"	8' 6"
2 1/2	6000	5' 0"	6' 0"	8' 1"	8' 2"	8' 6"
*3	9500	4' 10"	7' 10"	9' 10"	10' 0"	11' 6"
*3 1/2	10000	5' 8"	7' 10"	9' 10"	10' 0"	11' 6"

*3-line buckets.
§4-line buckets.



TYPE R CLAMSHELL BUCKET



TYPE R MULTIPOWER CLAMSHELL BUCKET

ice with less repairs. They insure maximum digging power and absolutely no loss of power at any stage of the closing action.

The standard types of buckets described herein are recommended only for the conditions to which they are adapted. Each inquiry receives special attention, and if the standard types are not suitable, special types will be recommended.

Type R Clamshell Bucket.

This bucket is the result of many years of development, the first bucket of its type being built over 20 years ago. Improvements in details of design as well as in workmanship and material have constantly been made, which ac-



SPECIAL 8-TON COAL AND LIMESTONE BUCKET RECENTLY BUILT BY THE McMYLER INTERSTATE COMPANY

broken stone if the pieces are over 1 in. cube, for clay, iron ore and other heavy or hard materials.

Built with or without teeth.

Special Buckets.

This company is in a position to design and build special buckets of any capacity for handling ore, coal and other materials. These buckets are usually of the rope reeved type, round scoops usually being furnished for handling coal and other materials which will roll toward center of bucket when the latter closes, also flat scoops for such materials as ore, sand, etc.

Consult this company's engineers when confronted with bucket problems. They will render the fullest co-operation in this work.

G. L. STUEBNER

Manufacturer of Hoisting Buckets, Dump Cars and Melting Furnaces for
Contractors' Service

TELEPHONE:
HUNTER'S POINT 59

201-221 Vernon Avenue
LONG ISLAND CITY, N. Y.

Products.

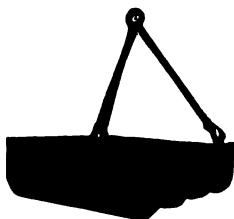
TURNOVER and BOTTOM DISCHARGE BUCKETS;
STEEL SKIPS; SMALL PLATFORM, END, SIDE and BOT-
TOM DUMP CARS.

PUSH CARTS, ASPHALT MELTERS, PIPE LINE LEAD
MELTING FURNACES, etc.

Standard Self-dumping and Self-righting Contractors' Buckets.

Made in classes "A" and "B." Designed for use
with stone, sand, clay, concrete, etc.

Class "A"—Top of bucket
is from 8 to 10 in. wider
than the bottom, permitting
the bucket to be quickly
filled and rapidly dumped in a
clean manner. Easily handled
and well adapted for sinking
shafts, sewer work and similar
operations.



STEEL SKIP



"Invincible"
Bottom Dump
(Patented)



Self-dumping
and Self-righting
Turnover Type



"Excelsior" Bottom
Dump
(Patented)



"Pin-controllable"
Central Discharge
Pier Bucket
(Patented)



"Controllable"
Central Discharge
(Patented)



Two-line Bottom
Dump
(Patented)



Round Type



Side- and Back-lever Catch for Coal Hoisting
STUEBNER HOISTING BUCKETS



Class "B"—Similar to class "A," except that the
sides are straight, of equal width at top and bottom.
This bucket is nicely balanced, has double bottom,
strong bail, trunnions, reliable latch; also, weighs and
costs less than class "A." See illustrations of various
types of buckets made by G. L. STEUBNER.

"Controllable" Central Discharge Bucket—
Used for depositing concrete into smallest as well as
largest forms. Provided with patent pin-controlling
device, to regulate width of discharge opening; and with
powerful levers for controlling quantity of concrete
running out.

**"Excelsior" and "Invincible" Bottom Dump
Buckets**—Particularly adapted to handle concrete, mud,
clay, sand, rock, etc. Quick acting, clean, dumping and
labor saving buckets.

Dump Cars, Push Carts and Melting Furnaces.

Strongly
built of best
materials, in
various types
and sizes, for
severe service.
See illustra-
tions.



End Dump



Side Dump

DUMP CARS



PUSH CARTS



BOILER ROOM
CHARGING
WAGON



STATIONARY
LEAD MELTING
FURNACE



PORTABLE TAR MELTING BOILERS



STATIONARY
TAR MELTING
FURNACE

Capacities, Dimensions and Prices.

Quoted on application.

Catalogue.

Write for catalogue and further information.

THE G. H. WILLIAMS CO.

Manufacturers of Clamshell Buckets and Material Handling Machinery

ERIE, PA.

Products.

WILLIAMS CLAMSHELL BUCKETS, for digging and rehandling purposes.

Description.

The Williams buckets are the result of years of experience and will stand up under the most severe duty. Many different types and improvements are embodied in the present line.

A bucket for every purpose and operated on any type of machine.

Buckets for special purposes built on short notice.

Built entirely of steel and in sizes ranging from $\frac{1}{4}$ to 10 cu. yds. capacity.

Castings are best grade of open hearth steel, properly annealed; corner bars, forged steel; teeth 40 to 50 point carbon steel forgings; lips 40 to 50 point carbon steel except where manganese is used; scoops and plates open hearth steel; bushings phosphor bronze.

No cast iron is used.

Special Features.

The special features of Williams buckets are:

DIGGING ABILITY—The combination of lever (or power arm) and block and tackle principle exert great digging force to the cutting edge of the scoops and insure a full load. *Built to dig, and last while digging.*

LONG LIFE—The triangular construction, the large bearings and massive construction throughout insure long life.

LOW COST OF UPKEEP—Strength of materials employed, the perfect alignment and rigidity and the proper proportioning of its few number of parts.

ECONOMY OF OPERATION—Perfect lubrication, small

number of working parts, and straight leads over large sheaves insure long cable life and speed.

WORKMANSHIP—Is of the best and performed by high grade mechanics. Accurate replacements are insured by the use of the duplicate part system.

ROPE REEVING—A modification of the block and tackle principle which provides straight leads in perfect alignment.

LUBRICATION—All running parts lubricated from center which forces dirt out of bearings at each application.

GUARANTEE—Any parts proving defective will be replaced without charge, f. o. b. factory, on receipt of defective part, prepaid.

Favorite Bucket.

Designed especially for the economical handling of sand, gravel, crushed stone, ore, coal and like bulk material and is the proper weight for effective operation, making it particularly adaptable for use on locomotive cranes, derricks, monorail trolley and like installations.

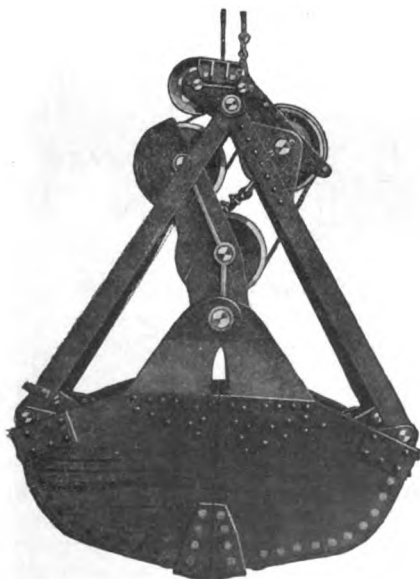
The reinforced cutting lips are of manganese or high carbon steel plate, and designed to cover the bottom of scoops and to come up past the wearing point on the sides. They are designed to be easily removed in case of excessive wear.

Hercules Bucket.

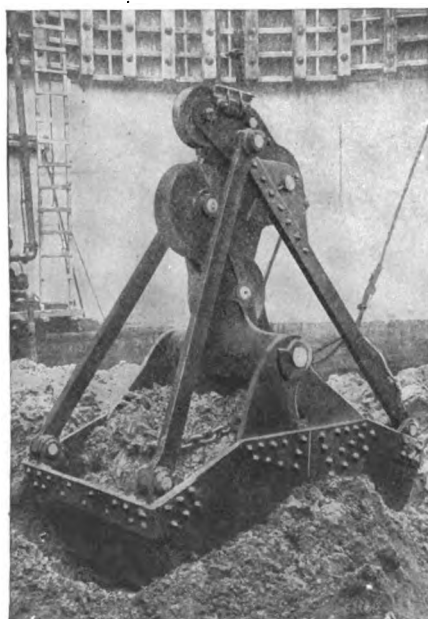
The most rugged and powerful bucket built, and is replacing orange peel buckets in the handling of the most difficult excavating and dredging work.

Hercules bucket handles hardpan, cemented gravel, clay, boulders, rock and iron ore.

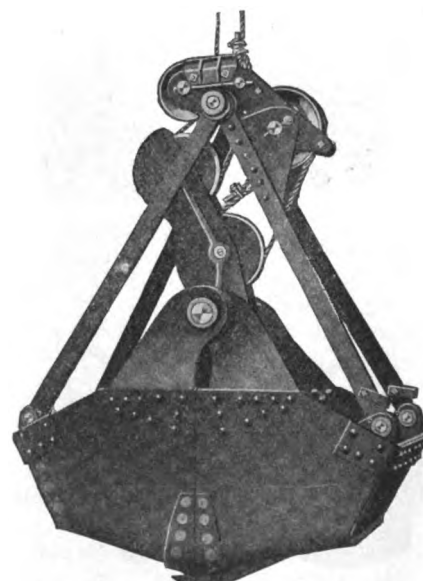
The scoops are formed of one continuous extra heavy plate, bent to shape, and fitted with high carbon



"FAVORITE" REHANDLING BUCKET



CLAMSHELL BUCKET IN OPERATION



HERCULES EXCAVATING BUCKET

SWEET'S CATALOGUE

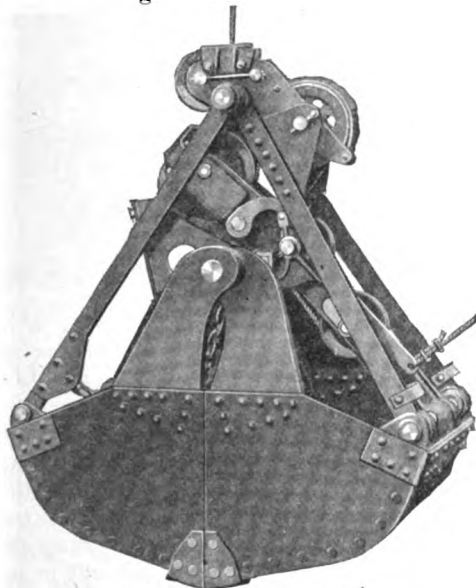
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steel cutting lips with chamfered cutting edge. Bucket is furnished with steel forged digging teeth.

No. 2 Single Rope Bucket.

Designed especially to operate in connection with hoisting machinery having only one drum available for bucket operation. It can be applied to any type of crane or derrick without added equipment. Practice has proved it to be of great help to general contractors, as it will handle all classes of work and material, and no special skilled or high priced labor is required for its operation.

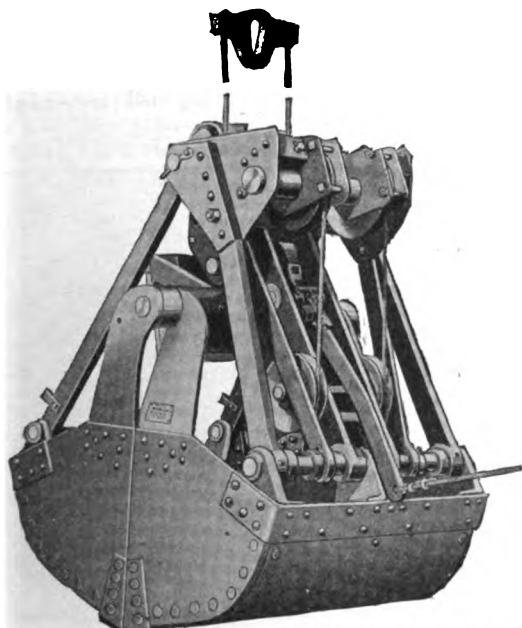
Standard buckets are designed for handling coal, sand, gravel, etc.; and buckets of special weight for handling iron ore, furnace cinders, crushed stone, and for excavating.



No. 2. SINGLE ROPE BUCKET

No. 3 Single Rope Foundry Buckets.

Built to meet the need of some means of handling sand, coal, etc., in large foundries and plants, and to be operated by crane of ordinary type without special hoisting apparatus, which will leave the crane free for other service when bucket is not in use. This



No. 3. SINGLE ROPE FOUNDRY BUCKET

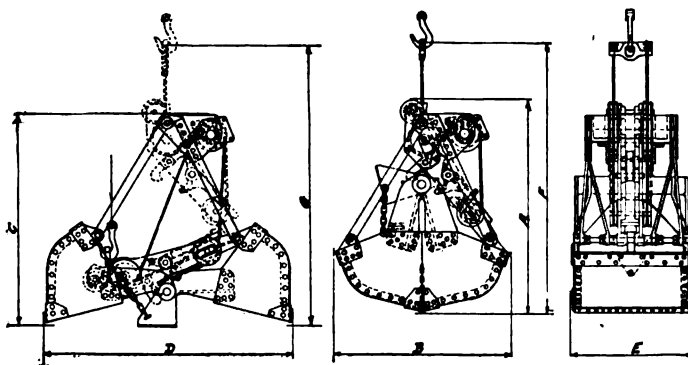
bucket can be attached or detached from crane hook in a few minutes and is designed for use where distance between crane hook and ground is limited.

A Bucket for Every Purpose and Installation.

For coal, sand, gravel and loose bulk material: Standard, Favorite, Scraper Type and No. 2 Single Rope buckets. For railroad, dredging and bridge contractor or general material handler: Standard X, Hercules and Special Dredging, Deep Water Dredging and No. 2 Single Rope buckets.

For manufacturers and users of overhead cranes, fast plants, monorail cranes and coal and ore bridges: No. 1 Single Rope and the Three and Four Rope buckets. For foundry service: No. 3 Single Rope bucket. For other types of buckets refer to the general catalogue issued by this company.

Standard buckets kept in stock for prompt shipment. Buckets for special purposes built on short notice. Put your bucket problems up to us for solution.



DIAGRAMS AND DIMENSIONS, WILLIAMS CLAMSHELL BUCKETS

Capacity, cu. yds.	Approx. weight, lbs.	Over all dimensions					Code words
		A	B	C	D	E	

FAVORITE BUCKET

1/2	2200	6'-10"	4'-10"	8'-0"	6'-0"	2'-10"	Factor
3/4	2500	7'-2"	5'-3 1/2"	8'-1"	6'-0"	2'-10"	Falcon
1	3100	7'-4"	5'-9"	8'-7"	6'-11"	3'-3"	Fellow
1 1/4	3400	7'-5"	6'-4"	9'-1"	7'-7"	3'-6"	Ferment
1 1/2	4500	8'-11"	6'-8 1/2"	10'-5"	8'-6 1/2"	3'-10"	Fisher
1 3/4	4750	9'-0"	7'-0 1/2"	10'-6"	8'-9"	3'-10"	Flock
2	5000	8'-10"	6'-10"	10'-5"	8'-5"	4'-3"	Flutter
2 1/2	5700	9'-2"	6'-9"	10'-6"	8'-10"	4'-10"	Forest
3	6500	9'-3"	7'-6"	11'-0"	9'-9"	5'-4"	Founder

HERCULES BUCKET

1/2	2600	7'-0"	4'-9"	8'-3"	6'-6"	2'-10"	Hansom
3/4	3100	7'-3"	5'-3"	8'-6"	7'-2"	2'-10"	Hardy
1	3800	7'-6"	5'-7"	9'-0"	7'-3"	3'-4"	Hermit
1 1/4	4200	7'-7"	6'-3"	9'-6"	7'-5"	3'-7"	Hindoo
1 1/2	5700	9'-0"	6'-9"	10'-10"	9'-0"	3'-11"	Hobble
1 3/4	6000	9'-3"	6'-9"	10'-10"	9'-0"	3'-11"	Honey
2	7000	9'-2"	6'-9"	10'-10"	8'-10"	4'-4"	Homage
2 1/2	9000	9'-5"	6'-10"	11'-0"	9'-4"	4'-10"	Hornet
3	10500	9'-6"	7'-6"	11'-6"	9'-6"	5'-6"	Hurdle

No. 2 SINGLE ROPE BUCKET

1/2	2400	6'-3"	4'-6"	6'-9"	6'-9"	2'-9"	Secretary
3/4	2650	6'-6"	5'-0"	6'-10"	7'-3"	2'-9"	Stratagem
1	3250	7'-0"	5'-8"	8'-0"	7'-8"	3'-3"	Succeed
1 1/4	3500	7'-3"	5'-8"	8'-0"	8'-2"	3'-6"	Satisfy
1 1/2	4500	8'-6"	6'-10"	9'-3"	9'-3"	3'-9"	Steno pher

No. 3 SINGLE ROPE FOUNDRY BUCKET (SHOWN ABOVE)

1/2	3100	5'-8"	4'-8"	6'-0"	6'-5"	3'-0"	Treasure
3/4	3300	6'-1"	5'-0"	6'-2"	7'-4"	3'-0"	Trust
1	3500	6'-1"	5'-2"	6'-2"	7'-1"	3'-6"	Trustee
1 1/4	3800	6'-4"	5'-0"	6'-3"	7'-3"	3'-9"	Treaty
1 1/2	4800	6'-1"	5'-8"	6'-10"	7'-3"	4'-0"	Truly
2	5300	6'-1"	5'-8"	6'-10"	7'-3"	4'-6"	Trumpet

F G

1/2	3100			9'-8"	10'-0"	Treasure
3/4	3300			10'-1"	10'-2"	Trust
1	3500			10'-1"	10'-2"	Trustee
1 1/4	3800			10'-4"	10'-3"	Treaty
1 1/2	4800			10'-7"	11'-4"	Truly
2	5300			10'-7"	11'-4"	Trumpet

THE KINNEY MANUFACTURING CO.

Manufacturers of Road Oiling Equipment

3529-3541 Washington Street
BOSTON, MASS.

NEW YORK, N. Y. PHILADELPHIA, PA.
SAN FRANCISCO, CAL.

CHICAGO, ILL. KANSAS CITY, MO.
HOUSTON, TEX.

Products.

ROAD OILING EQUIPMENT: AUTO HEATERS, DISTRIBUTORS and SPRAYERS.

For Friction Clutch Pulleys and Cut-off Couplings, see page 1144; for Pumps and Strainers, see pages 896-97.

The Kinney Auto Heater and Distributor.

A machine for heating and spraying by direct pressure all varieties of bituminous materials, hot or cold, for road construction, maintenance or dust laying.

The Kinney auto distributor (Fig. 61) consists of a horizontal steel tank of stated capacity, furnished with the Kinney heating and circulating system and equipped with the Kinney pressure pump, spraying nozzles, valves and controlling levers complete. The outfit is mounted upon a specially designed motor truck chassis. The equipment is furnished in three sizes, 600-, 800- and 1,000-gal. tank capacity. The machine is so constructed that the entire equipment may be removed from the chassis and the truck used for other purposes (Fig. 67).

The heat is derived from kerosene oil burners arranged to convey heated gases through heating tubes placed horizontally through the tank interior similar to the construction of a water tube boiler. Pressure for spraying is supplied by the Kinney pump. The pressure is under direct control of the operator.

The spraying nozzles are adapted to produce a uniform spray in any desired volume (Fig. 61). Both width and volume of spray are under direct control of operator. The spray pipes are provided with spraying hoods to prevent dripping of oil on cross walks. Full and complete description in Bulletin "A" furnished on request.

The Kinney Handy Heater and Sprayer.

This machine (Fig. 144) is specially designed for road or highway repairing and maintenance. It is made

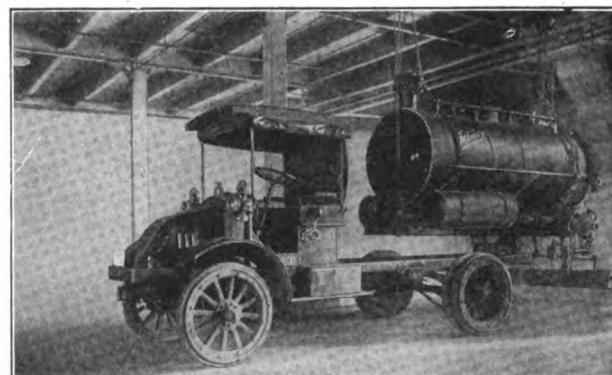


Fig. 67. TANK AND SPRAYING EQUIPMENT REMOVED FROM CHASSIS

Spraying equipment is mounted on separate subframe attached by bolts to frame of chassis. Bolts may be removed and entire oiling outfit lifted off, without detaching parts or disconnecting any piping of tank equipment

in 2 sizes, 300- and 500-gal. tank capacity. The tank is of steel, constructed with welded seams to prevent the possibility of leakage, and is mounted upon a steel truck furnished with steel wheels fitted with broad tires. The machine is equipped with the Kinney pump driven by a gasoline engine. The pump is enclosed in a heating chamber, which prevents the hardening of cooled material and affords the necessary pressure for spraying through flexible metal hose and spraying nozzle. The facilities for heating may be wood, coke, coal or kerosene oil burners. The apparatus is self-loading from heating kettles or tank cars. The Kinney circulating system insures uniform temperature and prevents the coking or burning of material. The machine will heat and spray under pressure all kinds of bituminous material, including the heaviest asphalt or tar products of any desired degree of temperature, and in any required volume of application.

Write for Bulletin "B" giving full particulars and prices.



Fig. 61. THE KINNEY AUTO HEATER AND DISTRIBUTOR IN OPERATION

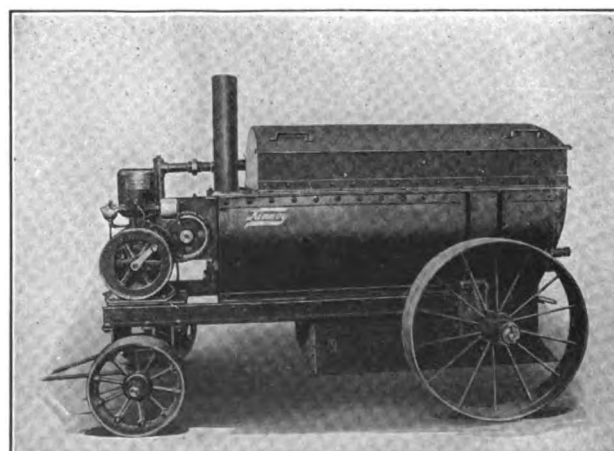


Fig. 144. THE KINNEY HANDY HEATER AND SPRAYER

MacARTHUR CONCRETE PILE & FOUNDATION CO.

Foundation Engineers and Contractors

12 John Street
NEW YORK, N. Y.

BRANCH OFFICES

CHICAGO, ILL.

BOSTON, MASS.

CLEVELAND, OHIO

PITTSBURGH, PA.

MONTREAL, CAN.
NEW ORLEANS, LA.

PHILADELPHIA, PA.

Products and Services.

MACARTHUR PEDESTAL CONCRETE PILES.

This company contracts to install MacArthur Pedestal Concrete Pile Foundations for buildings and other structures in any part of North America, and also install Pre-moulded Reinforced Concrete Piles and Steel Pipe Concrete Filled Piles where conditions make these types desirable. In fact it is equipped to handle the complete foundations ready for column bases and brick walls.

Co-operative Engineering Services.

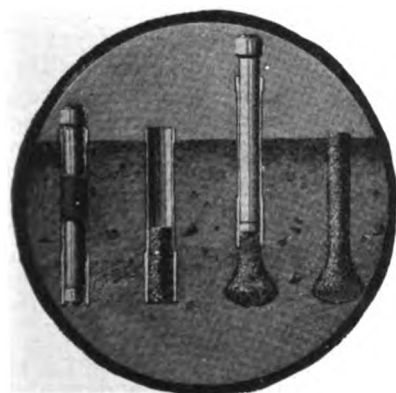
This company is prepared to send engineers to any part of the country to investigate conditions and for consultation, at its own expense. On receipt of data on soil conditions and blue prints of any proposed structures, together with loads to be carried, plans for MacArthur Pedestal Pile Foundations suitable for the requirements, with estimates of cost, will be submitted promptly.

MacArthur Pedestal Concrete Piles.

The great carrying capacity of this pile is made possible because of the bulb or spread base, which derives direct bearing power by resting on the firm and compressed subsoil. In addition, the greatest possible friction resistance is received on the rough concrete shaft of the pile.

Advantages and Economy.

This company has volumes of proofs that this pile will carry from 50% to 100% greater loads than any other type of pile of the same length and under the same soil conditions. The company can show by actual experience that under many soil conditions, a given load can be carried by fewer and shorter MacArthur Pedestal Piles than would be required with other types.



METHOD OF INSTALLING MAC-
ARTHUR PEDESTAL PILES



TYPICAL MACARTHUR
PEDESTAL PILE

How MacArthur Pedestal Piles are Made.

Pile-forming apparatus, consisting of a cylindrical core and casing, is driven into the ground under compression, using pile driving methods, until required penetration is obtained. The core is then withdrawn and a charge of concrete dumped to bottom of casing. Core is then placed on this concrete and casing raised to permit formation of pedestal. The core being used as a rammer, is driven down by a steam hammer, compressing the surrounding soil until a large base or pedestal is formed. This pedestal completed, the casing is filled with concrete, and, weight of core and hammer resting on the newly formed pile, the casing is pulled steadily and evenly out of the ground, leaving monolithic column 16 in. in diameter, surmounting the broad spread base or pedestal.

The method is safe, certain, simple and fast. See illustration of the formation.

Representative MacArthur Clients.

United States Government; Standard Oil Co.; Willys-Overland Co.; General Electric Co.; Corn Products Refining Co.; The White Co.; Watson Engineering Co.; Habirshaw Electric Cable Co.; Canadian Government; Boston & Maine R. R.; Southern Pacific R. R.; Pittsburgh Plate Glass Co.; Westinghouse Electric & Manufacturing Co.; Firestone Tire & Rubber Co., Delaware & Hudson Co.

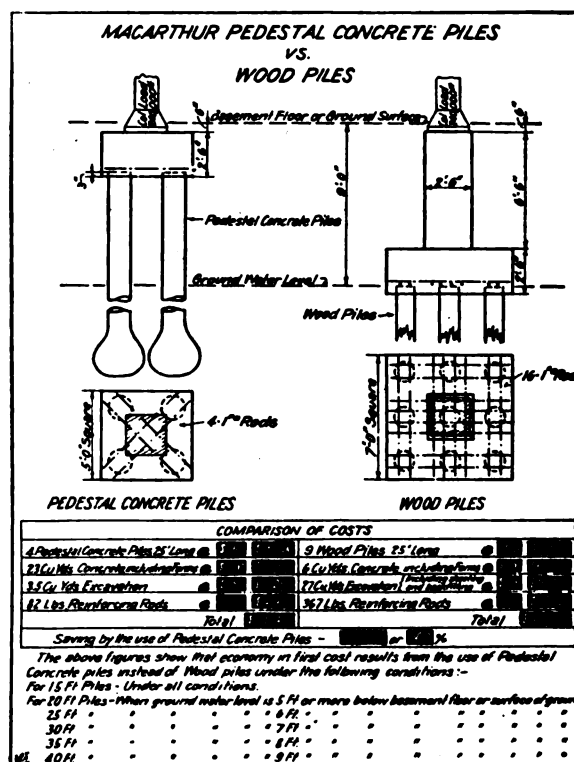


TABLE OF COMPARISON OF COST BETWEEN MACARTHUR
CONCRETE PILES AND WOOD PILES

RAYMOND CONCRETE PILE COMPANY

Concrete Piles and Special Concrete Work

140 Cedar Street
NEW YORK, N. Y.

111 West Monroe Street
CHICAGO, ILL.

BRANCH OFFICES IN ALL PRINCIPAL CITIES
RAYMOND CONCRETE PILE CO. OF CANADA, LTD., MONTREAL, CANADA

Products.

RAYMOND CAST-IN-PLACE CONCRETE PILES.
RAYMOND PRE-MOULDED CONCRETE PILES.
RAYMOND COMPOSITE (WOOD-CONCRETE) PILES.
PLAIN BEARING and SHEET PILES OF CONCRETE.
CONCRETE WORK of a Special Nature.

Slogan.

"A form for every pile; a pile for every purpose."

Raymond Method.

A collapsible steel core, 8 in. in diameter at the point and increasing in diameter at the rate of .4 in. per lin. ft. of length, is incased in a spirally reinforced steel metal shell. The core thus incased is driven to a proper penetration and then is collapsed and withdrawn from

the shell; the shell remaining in the ground and maintaining the resistance encountered during the driving. The shell is then inspected and filled with concrete. This makes a complete Raymond concrete pile.

Concrete Pile Loads.

Usually Raymond concrete piles are driven to carry a working load of 30 tons each. Where it is impossible to secure proper resistance, it is necessary to reduce this to 25 or even 20 tons.

In other cases, loads of 35 and 40 tons are safely carried.

In view of the wide variation in soil conditions, a conference is suggested with the nearest Raymond office, that the site may be investigated and recommendations made.

Spacing.

Raymond concrete piles, of a length not exceeding 30 ft., may be spaced as close as 2 ft. 6 in. on centers and driven as close as 18 in. from center of pile to building wall. When extremely long piles are used, it is necessary to increase this spacing to 3 ft.

Certainty.

The Raymond method of pouring concrete into a spirally reinforced steel shell, and leaving this form in place, follows the accepted method of all good concrete construction. This steel form makes *certain* that underground conditions will not adversely affect the structure of the pile.

Speed Records.

This company always endeavors to make good a promise.

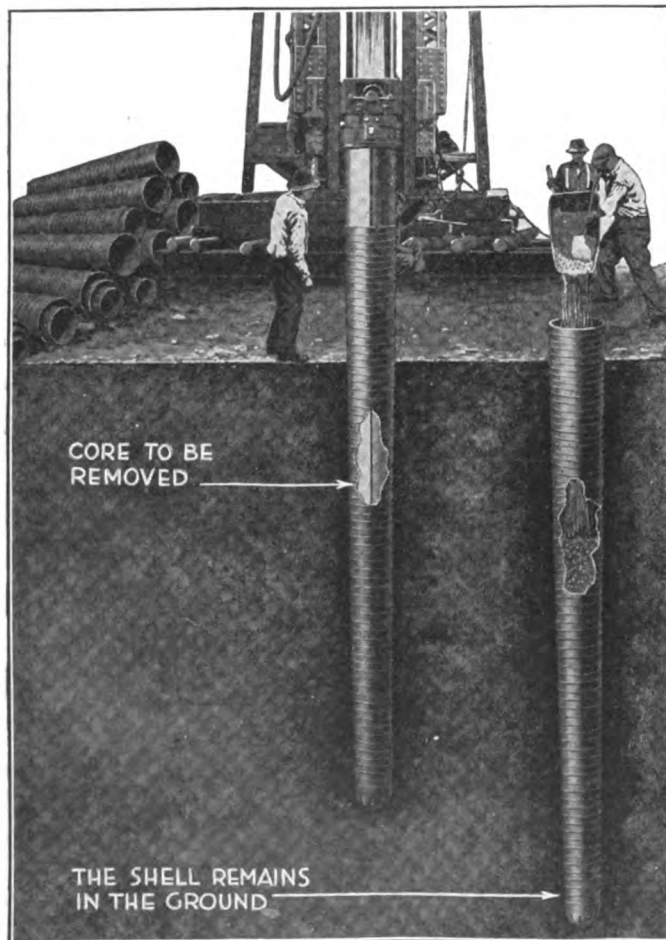
On April 26th, 1917, it promised to place 3600 piles for the United States Government at the Brooklyn Navy Yard by June 10th, or in 46 calendar days; 3800 piles were actually placed by May 26th—30 calendar days after the contract was signed.

On April 19th, 1917, a contract was signed with the Chevrolet Motor Co.; the first pile was driven April 27th, and 1535 piles were completed in 32 driving days.

On August 11th, 1917, this company promised the Austin Company to place 140 piles for a Government contract within 9 days. The contract was completed six hours ahead of schedule.

On April 27, 1915, this company signed a contract with the Crucible Steel Company of Harrison, N. J., for 5533 piles, driving the first pile on the sixth day thereafter and completing the job in 135 working days at the rate of 40 piles per day.

Many other speed records can be shown.



ESSENTIAL STEPS IN THE MAKING OF A RAYMOND CONCRETE PILE

Cost of Raymond Piles.

As Raymond concrete piles are made in place and not sold by the foot, f.o.b. cars, it is impossible to quote prices without knowing the conditions under which the work is to be done, the probable number of piles required, and penetration expected. The spacing of the piles, soil conditions, accessibility to the site, cost of concrete materials and labor are governing factors.

Saving of Raymond Piles.

The Raymond method practically eliminates excavation, sheeting, shoring and pumping, together with the attendant costs in time and labor.

Specifications.

If "Raymond Concrete Piles" are called for, it is of course sufficient; on the other hand, if for any reason it is not advisable to name them specifically, the following will cover:

"The concrete piles shall be of a type specially approved by the architect and shall be placed in the following manner: "A collapsible steel core, 8 in. in diameter at the small end, increasing .4 in. per lin. ft. of length, shall be incased in a spirally reinforced metal shell and driven to proper penetration. The core shall then be collapsed and withdrawn from the shell, which remains permanently in the ground. Each shell shall be carefully inspected and being found perfect shall thereupon be filled with concrete placed in accordance with good engineering practice."

Concrete in the piles will be composed of 1 part approved portland cement, 3 parts of clean, sharp sand and 5 parts of crushed stone or gravel which will pass a 1½-in. ring.

Special Concrete Work.

This company also designs, manufactures and places premoulded reinforced concrete bearing piles; concrete sheet piles, both plain and interlocking, and concrete work of a special nature such as difficult foundations, docks, piers, bulkheads, sea walls, retaining walls, ore bins, trestles, and such structures as require a special knowledge of concrete construction.

This company has on its staff, at the service of architects and contractors, experts in the designing and installation of concrete piling for all purposes.

The engineering department will gladly submit recommendations, designs and estimates.

Representative Architects.

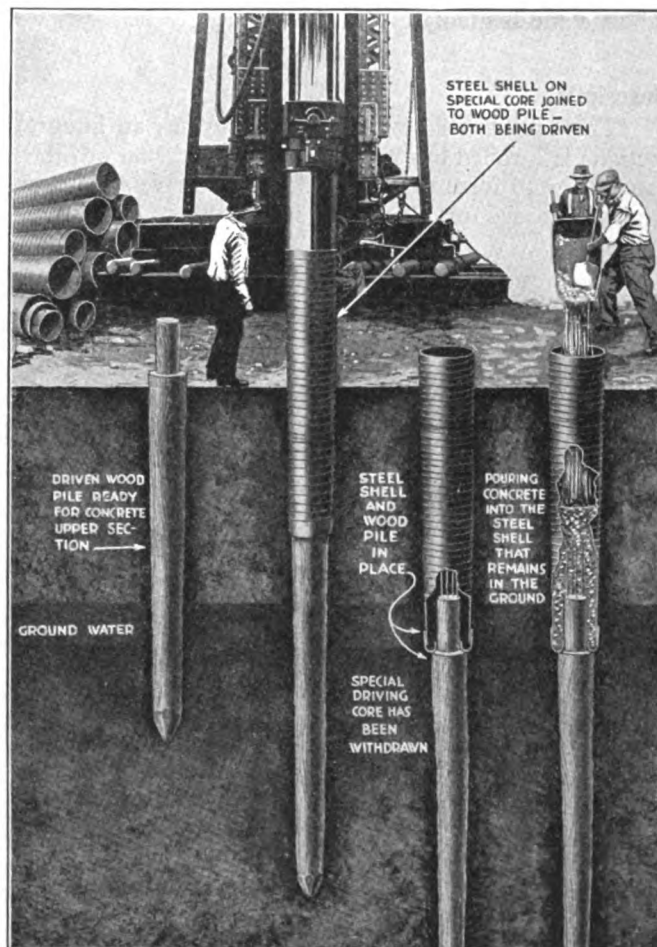
The following architects have used and are using Raymond concrete piles:

Ernest Flagg, New York, N. Y.
Wm. Higginson, New York, N. Y.
James Gamble Rogers, New York, N. Y.
Cass Gilbert, New York, N. Y.
Ernest Greene, New York, N. Y.
Herbert Kelsey & Paul Cret, Philadelphia, Pa.
Ballinger & Perrot, Philadelphia, Pa.
Simon & Bassett, Philadelphia, Pa.
Alden & Harlow, Pittsburgh, Pa.
Henry Boettcher, Armstrong Cork Company, Pittsburgh, Pa.
Sturgis & Barton, Chicago, Ill.
Jenny, Mundie & Jensen, Chicago, Ill.
Geo. C. Nimmons, Chicago, Ill.
Jarvis Hunt, Chicago, Ill.
Mauran, Russell & Crowell, St. Louis, Mo.
Barnett, Haynes & Barnett, St. Louis, Mo.
Eames & Young, St. Louis, Mo.
Albert Kahn, Detroit, Mich.
J. Knox Taylor, Supervising Architect, Washington, D. C.
Richards, McCarthy & Bulford, Columbus, Ohio

Samuel Hannaford Sons, Cincinnati, Ohio
Theodore W. Pietsch, Baltimore, Md.
John Latenser, Omaha, Nebr.
Morgan & Dillon, Atlanta, Ga.
D. X. Murphy & Bro., Louisville, Ky.
Charles Montgomery Anderson, Baltimore, Md.
Wm. H. Amory, Jr., Baltimore, Md.
B. H. Prack, Pittsburgh, Pa.
Esenwein & Johnson, Buffalo, N. Y.
Franz C. Warner, Cleveland, Ohio
Bliss & Laval, Springfield, Mass.
Robert C. Fayfield, Buffalo, N. Y.
Osborn Engineering Co., Cleveland, Ohio
John W. Cooper Co., Buffalo, N. Y.

Representative Clients.

Bethlehem Steel Company, South Bethlehem, Pa.
United States Steel Corporation, New York, N. Y.
United States Government, Washington, D. C.
Standard Oil Company, New York, N. Y.
American Can Company, New York, N. Y.
General Electric Company, Schenectady, N. Y.
Pennsylvania Railroad Co., Philadelphia, Pa.
Chicago, Rock Island & Pacific Railroad Co., Chicago, Ill.
Ford Automobile Company, Detroit, Mich.
Youngstown Sheet & Tube Co., Youngstown, Ohio
Atlantic Refining Company, Philadelphia, Pa.
Procter & Gamble Company, Ivorydale, Ohio
Tidewater Oil Company, Long Island City, N. Y.
Turner Construction Company, New York, N. Y.
Goodyear Tire & Rubber Company, Akron, Ohio
American Chic Company, Long Island City, N. Y.
Patton Paint Company, Newark, N. J.
Otis Steel Company, Cleveland, Ohio
Nashua Manufacturing Company (Jackson Mills), Nashua, N. H.
Republic Iron & Steel Company, Youngstown, Ohio



RAYMOND COMPOSITE PILE

LACKAWANNA STEEL COMPANY

Steel Sheet Piling

GENERAL SALES OFFICE AND WORKS
LACKAWANNA, ERIE CO., N. Y.

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CHICAGO CLEVELAND NEW YORK SAN FRANCISCO

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SOLE EXPORTER FOR OTHER COUNTRIES: CONSOLIDATED STEEL CORPORATION, 165 Broadway, NEW YORK, N. Y.

Products.

LACKAWANNA STEEL SHEET PILING:
Arched-web, Straight-web, Bent-web, Center-flange, Plate and Protected Types.

Also manufacturers of Structural Steel,
Merchant Bars, Plates, Concrete Reinforcing Bars,
Standard and Light Rails.



Co-operation and Service.

Our engineers, and important data collected from over 1200 successful installations for all imaginable purposes, are always at the service of engineers and contractors. The advice of the engineering staff will prove valuable and is gladly given free of charge.

Description.

The Lackawanna steel sheet piling has an integral section; is a rolled bar requiring no fabrication or other assemblage to form the interlock; has no rivets, bolts or parts to loosen or shear off in handling, driving or pulling.

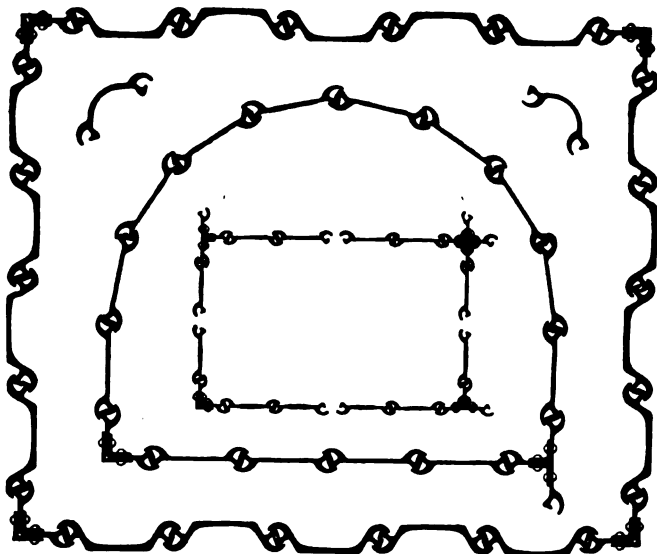


FIG. S-1. LACKAWANNA STEEL SHEET PILING
Showing typical combinations of circular and straight walls and junctions

The interlock consists of similar hooks and guards on both edges of the pile, so shaped that the interlocked

joint is flexible through an equal arc of motion on each side of the center plane of the piling section. Hooks engage to resist longitudinal displacement; while the guards overlap and engage outer surface of hooks on adjacent sections, thus preventing lateral displacement. Between the interlocked members of each joint there are three lines of contact—a double, firm, and close interlock, with a minimum of friction in driving or withdrawing, and a free entry for displaced material to assist in sealing the joint.

Sections are shaped to attain flexibility at joints, for passing around obstructions, forming irregular enclosures, square or circular caissons, etc. Small sections permit change of direction of 16° (other sections, 20°) to either side of piling line. A right angle may be made with six 7-in. and with five of any other interlocked piling sections. Corners and junction members for walls meeting or crossing each other are fabricated by fitting edges of half sections to complete sections as required, and holding same in place by structural steel angles and rivets.

Note: The mathematical properties of any of the Lackawanna steel sheet piling sections will be promptly furnished on request.

Circular Structures.

The minimum diameters of circular structures made with *standard* sections of Lackawanna steel sheet piling are shown by the following table:

MINIMUM DIAMETERS
An Even Number of Piles is Required to Permit Interlocking of the Final or Closure Joint

Standard sections	Number of piles required	Deflection angle between piles	Diam. c. to c. of piling wall	Working diam. inside of piling wall
7" x 3/4" (S. P. C-7).....	20	18°	3' 8 1/4"	3' 6"
8 1/2" x 1 1/4" (S. P. G-8 1/2).....	20	18°	4' 6 1/4"	4' 3 1/2"
12 3/4" x 1 1/2" (S. P. B-12).....	18	20°	6' 1 1/4"	5' 9"
12 3/4" x 1 1/2" (S. P. B-12-A).....	18	20°	6' 1 1/4"	5' 9"
12 3/4" x 1 1/2" (S. P. A-12).....	18	20°	6' 1 1/4"	5' 9"
14" x 1 1/2" (S. P. E-14).....	18	20°	6' 8 1/4"	6' 4"
14" x 1 1/2" (S. P. E-14-A).....	18	20°	6' 8 1/4"	6' 4"
15" x 1 1/2" (S. P. H-15).....	18	20°	7' 1 1/4"	6' 9 1/2"
15" x 1 1/2" (S. P. F-15).....	18	20°	7' 1 1/4"	6' 7 1/2"

Circular structures having a wide variety of still smaller diameters may be constructed from sections of the straight-web type, of which the web has been *special bent*.

Bent-web type for circular construction can be furnished to form diameters, as per the following table:

Bent-web piling	Number of piles forming cylinder						
	18	16	14	12	10	8	6
	Diam. of cylinder, center line to center line of piling						
7" x 1/4" (C-7).....	3' 4 1/8"	2' 11 3/8"	2' 7 1/8"	2' 2 3/4"	1' 10 1/4"	1' 5 1/4"	1' 1 3/8"
8 1/2" x 1 1/4" (G-85)....	4' 0 1/4"	3' 7 1/8"	3' 1 7/8"	2' 8 1/8"	2' 3 1/8"	1' 9 3/8"	1' 4 1/4"
12 3/4" x 5/8" (B-12)....		5' 4 1/8"	4' 8 1/8"	4' 0 1/4"	3' 4 1/8"	2' 8 1/8"	2' 0 3/8"
12 3/4" x 1/2" (B-12-A)...							
12 3/4" x 1/2" (A-12)....							

Note: For larger diameters use standard sections.

Strength.

The great tensional strength of the Lackawanna joint is due to the 3 line contact, distribution of the metal in interlocking joint members and their relation to longitudinal axis of piling section.

Competitive tension tests conducted in an entirely disinterested manner and under government supervision were made on five different makes of piling, using on each methods best adapted to bring out the best results. These tests are described in Bulletin No. 109, which will be mailed on request.

Length of Piling.

Usual length of piling is from 50 to 30 ft. or shorter. Longer lengths can be rolled if required, but it is usually desirable, for convenience in handling or shipping, to use a built-up pile, composed of two or more lengths spliced together. In such cases horizontal joints between adjacent piles should be staggered and abutting lengths fastened with splice plates and bolts to form the joint. The use of 65-ft. lengths in a single bar is not uncommon.

Types and Sizes.

The following sections offer at least one type and size to meet economically any sheet pile construction problem:

Straight-web Type—Suitable for general work, and especially constructions requiring high tensional and compressive resistance of the pile section, as in self-contained cofferdams made of rectangular or circular filled pockets. The smallest size is much superior to wooden sheeting in sewer and trench work.

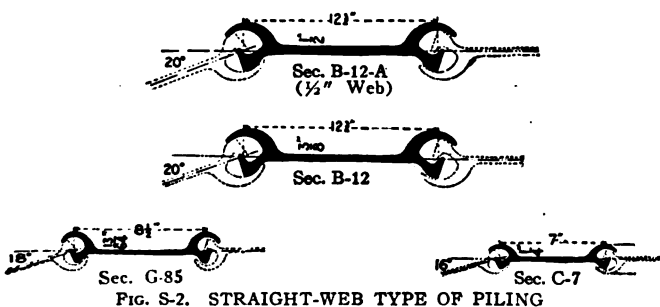


FIG. S-2. STRAIGHT-WEB TYPE OF PILING

Center-flange Type—For constructions requiring high tensional and compressive strength in connection with a fairly high transverse strength. The center-

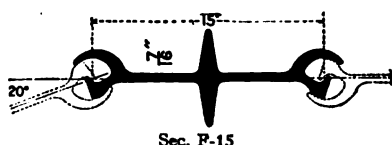


FIG. S-3. CENTER-FLANGE TYPE OF PILING

flange acts as a stiffener, increases the section modulus and furnishes means for attaching transverse ties, braces, etc., needed in special work, and for the mechanical bond of the concrete facing in protected piling.

Arched-web Type—Preferable where transverse strength of the pile is of primary importance, as in braced or tied constructions. Where the pile is used as a simple, continuous or cantilever beam the high modulus of the single section per inch of width of pile gives a high moment of resistance to sustain the maximum bending moment produced by the load. A wall of this piling is very thin in proportion to its transverse strength, having no greater thickness over all at the centers of the arches than the over all thickness of the interlocked joints.

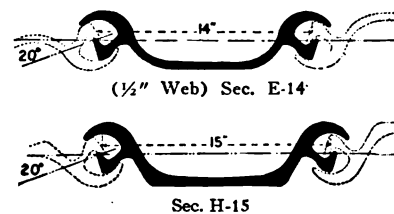


FIG. S-4. ARCHED-WEB TYPE OF PILING

SIZES LACKAWANNA SHEET PILES

Number of section	Size and type of section	Weight per lineal unit of bar		Weight per unit area of wall	
		Per lineal foot in pounds	Per lineal meter in kilograms	Per square foot in pounds	Per square meter in kilograms
C-7.....	7" x 1/4" Straight-web	12.54	18.66	21.5	104.97
G-85.....	8 1/2" x 1 1/4" Straight-web	14.698	21.873	20.75	101.314
B-12.....	12 3/4" x 5/8" Straight-web	37.187	55.36	35.00	170.90
B-12-A.....	12 3/4" x 1/2" Straight-web	40.906	60.88	38.50	187.98
A-12.....	12 3/4" x 1/2" Straight-web	42.50	63.25	40.00	195.32
E-14.....	14" x 1/2" Arched-web	40.83	60.76	35.00	170.90
E-14-A.....	14" x 1/2" Arched-web	45.50	67.71	39.00	190.42
H-15.....	15" x 1/2" Arched-web	58.12	86.49	46.50	227.02
F-15.....	15" x 1/2" Center-flange	60.00	89.29	48.00	234.34
D-8.....	8" x 1/4" Plate	7.66	11.40	11.50	56.15

Plate Type of Piling—This piling is cold rolled from steel plate into a type of section designed for use principally where great economy demands a very low weight and cost per square foot of wall—lower than obtainable with the heavier sections of steel sheet piling.

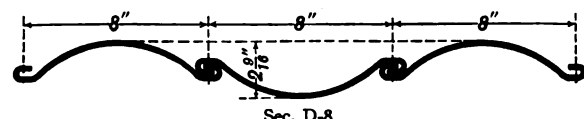


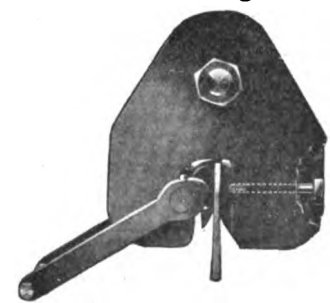
FIG. S-5. PLATE TYPE OF PILING

Theory of Watertightness.

Every alternate pile has direct contact of both locks with wales. Intermediate piles acted upon by unbalanced pressures are forced into contact on two lines in each interlock.

Grip for Pulling Lackawanna Steel Sheet Piling.

Consistent with our policy of helping customers after as well as before a sale, we are prepared to loan a pulling grip like that shown. One of these grips will be allotted for a length of time consistent with the work to be done, the customer to pay charges to and from our plant, and cost of repairs.



GRIP FOR PULLING LACKAWANNA STEEL SHEET PILING

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Concrete Mixers, Bar Benders and Cutters

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NORFOLK, VA., LEWTER F. HOBBS, Seaboard National Bank Building
PHILADELPHIA, PA., LEE T. WARD Co., 617-619 Filbert Street
PITTSBURGH, PA., GEO. W. ZIEGLER MACHINERY Co., 528 First Avenue
PORTLAND, ORE., KOEHRING MACHINE Co., K. I. SNOW, Representative, 254 Hawthorne Avenue
ST. LOUIS, MO., KOEHRING MACHINE Co., C. F. Rabbeitt, District Manager, A-20 Railway Exchange Building
SALT LAKE CITY, UTAH, HARRIS BROS., 512 Continental Building
SAN FRANCISCO, CAL., HARRON, RICKARD & McCONE, 139 Townsend Street
SEATTLE, WASH., KOEHRING MACHINE Co., L. A. SNOW, District Manager, 1525 Tenth Avenue

Products.

HEAVY DUTY CONSTRUCTION MIXERS; HEAVY DUTY PAVING MIXERS; HOT MIXERS, CONSTRUCTION and PAVING TYPES; DANDIE LIGHT MIXERS.

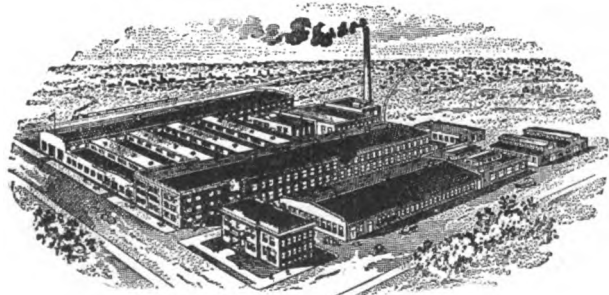
ROTARY GRADERS; BAR CUTTERS and BAR BENDERS.

Also manufacturers of Mixer Loaders; Steam Water Pumps.

Organization for Service.

The KOEHRING MACHINE Co. was founded in 1907, and is today the largest manufacturer of concrete mixers in the world.

Koehring Sales and Service branches and warehouses in all principal cities insure prompt, complete service to Koehring owners.



FACTORY OF KOEHRING MACHINE CO.

Koehring Construction Concrete Mixers.

Standardized Concrete—The Koehring re-mixing action, together with automatic water measuring tank and Koehring batch meter, make it easy to standardize mix for uniformity and consistency.

The re-mixing action, exclusive to the Koehring, is secured by means of the discharge chute pivoted well inside the drum, sloping inward in mixing position, and out through the opening when discharging. Diagonal throwover blades cut through the mixture, carrying it up the drum shell

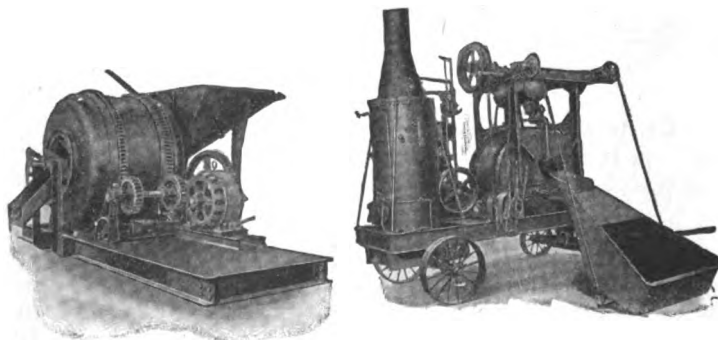
to a point where it spills backward, in a kneading action. Pick-up buckets then carry mixture to the top of the drum, spilling it down on the insloping discharge chute in a cascade action which prevents aggregate gathering according to size. From the discharge chute it is hurled back to the diagonal blade on the charging side of the drum for repeated trips through the mixing action.

This re-mixing action is only possible because of the Koehring patent, which pivots the discharge chute inside the drum far enough to return aggregate to the charging side of the drum. Design of the pick-up buckets gives fast discharge.

Fast Operation—High speed operation is due to automatic actions which permit operator to maintain top capacity operation every minute of the day; and to heavy duty construction which permits continuous high speed operation without breakdowns and delays.

Fast, clean charging is due to high speed elevation of charging skip, which goes to extreme angle by passing between the skip cable sheaves, chuting charge into drum in one swift, clean slide.

Charging skip automatically stops in discharge position until released. Size and design of pick-up buckets insure fast discharge of drum during the time the skip with the new charge rises to charging position.



KOEHRING CONCRETE MIXERS

Drum—Drumheads and runways are single castings of special close grained metal. Flanges are turned true, to secure watertight joint with heavy boiler plate center shell. Double gear drive minimizes vibration, and furnishes reserve drive.

Trunnion Rollers—Trunnion rollers are fixed to shaft, and shaft revolves in big babbitted bearings easily accessible on frame, and constructed so wear may be taken up. This construction eliminates wobbly drums and preserves perfect alignment of driving mechanism.

Frame and Trucks—Trucks have 3-point suspension, and with superstructure are built of extra heavy pressed steel members, riveted and gusseted at joints.

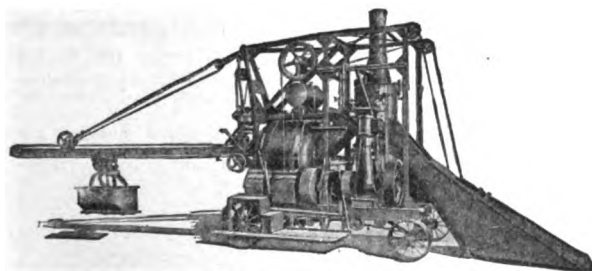
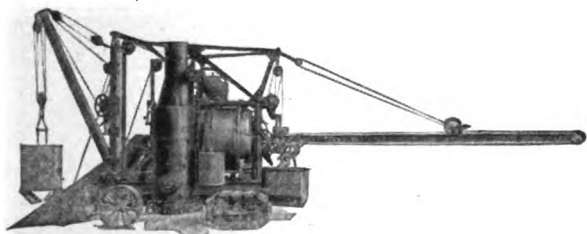
Friction Clutch—Consists of housing with sleeve for gear, in which are front plate and master disk, separated by friction disk. Maple block frictions inserted through opening in disk receive wear on end of grain. Winding drums have bronze bushing with graphite embedded for lubrication.

Power—Gasoline, steam, or electric motor of standard high grade manufacture. Boilers to conform with laws of any state. Surplus power on all sizes.

Equipment—Power charging skip, automatic water measuring tank, batch meter, low charging platform, batch or standard hopper; also on pavers—power discharge, boom and bucket concrete distributing system, gravity spouts.

Koehring Paver.

The fastest paving unit with boom and bucket distribution. Narrow design, giving liberal working room around the mixer. Low center of gravity. Boom swings in arc of 180°.



KOEHRING STREET PAVERS

May be had with loading derrick for lifting batch boxes over charging skip. Multiplane traction or round road wheels. The biggest paver line—5 sizes.

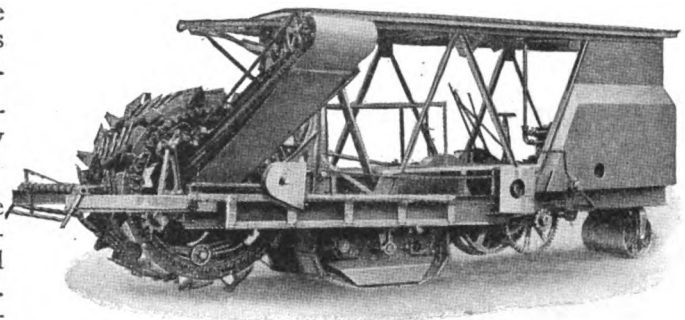
Koehring Rotary Grader.

The Koehring rotary grader is a powerful machine moving forward under its own power, which cuts out the road bed and elevates and loads materials into trucks or wagons in position alongside.

The digging function is accomplished by a rotating cylinder on which are mounted twelve herringbone-

shaped buckets, carrying rooting teeth on their cutting edges. The excavated material is discharged directly into wagons, trucks, or cars by a belt conveyor, extending out from the side at right angles to the grader.

The digging wheel is adjustable vertically to make a cut of any depth from 1 in. to 2 ft.; cuts are 5 ft. 7 in. wide.



KOEHRING ROTARY GRADER

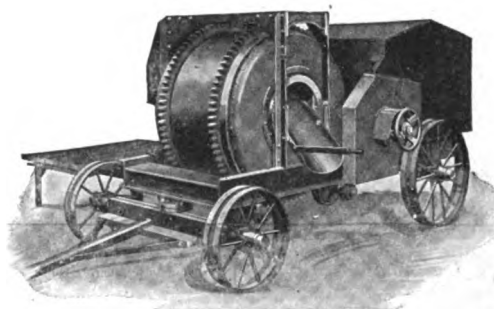
Koehring Hot Mixer.

This consists of standard Koehring mixers No. 14E and No. 14S, equipped with blower and oil burning furnace.

Used for bituminous road mixtures, sheet asphalt, rock asphalt, mastic floor, and for cement concrete. To use with cement concrete, disconnect asphalt tank and blower and connect water tank.

Dandie Light Mixer.

A light mixer for general work, such as culverts, footings, foundations, sidewalks, etc. Double drum drive, single section discharge chute, steel engine house, ball and socket bearings. A strong, dependable light mixer, built in big volume, every part standardized, 4- and 7-cu. ft. capacities, mixed concrete. May be equipped with low charging platform, batch hopper, or power charging skip, automatic water measuring tank, and light duty hoist.



DANDIE LIGHT MIXER

Bar Cutters and Bar Benders.

Koehring bar cutter is a machine light in weight, convenient to handle, effective in operation and simple in construction.

Built entirely of steel. With No. 1 size, one man can cut off $\frac{3}{4}$ -in. square twisted or round, and with No. 2-A two men can cut off $1\frac{1}{4}$ -in. round or $1\frac{1}{8}$ -in. square twisted.

Bar benders built in two sizes, entirely of steel. No. 5 will bend bars cold up to 1-in. square or square twisted. No. 6-A will bend up to $1\frac{1}{2}$ -in. round, or $1\frac{1}{4}$ -in. square twisted bars.

RANSOME CONCRETE MACHINERY CO.

Concrete Mixers, Chutes and Equipment
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REPRESENTATIVES OR BRANCH OFFICES IN ALL PRINCIPAL CITIES

Products.

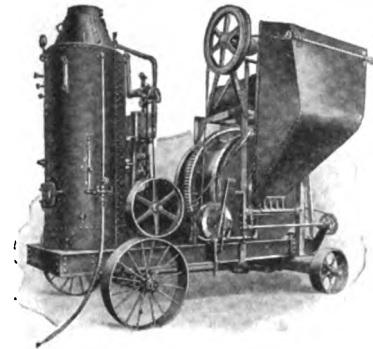
CONCRETE MIXERS, PAVING MIXERS, GROUT MIXERS and PLACERS, PNEUMATIC CONCRETE MIXERS and PLACERS, HOIST BUCKETS, BIN GATES, COMPLETE CHUTING PLANTS including



TRADE-MARK

STEEL TOWERS and all ACCESSORIES, CONCRETE CARTS and CARS, PORTABLE WOODWORKING MILLS.

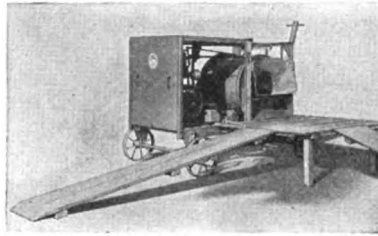
Also manufacturers of Dry Mixers, Concrete Charging Barrows, Concrete Tampers and Axes, Bar Cutters and Benders.



RANSOME STANDARD BUILDING MIXER, SIZE 14-S

CAPACITY—14 cu. ft. mixed concrete per batch; 22 cu. ft. unmixed loose material per batch.

EQUIPMENT—Charging chute, batch hopper, power loader with automatic water tank. On trucks or skids. Steam, electric or gasoline operated, or belt drive



IMPROVED RANSOME BANTAM MIXER

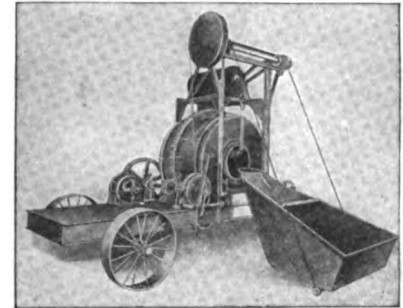
On trucks, with gasoline engine, platform and runways.

Made in two sizes, 7-S and 10-S.

7-S CAPACITY—7 cu. ft. mixed concrete per batch; 10 cu. ft. unmixed loose material per batch.

10-S CAPACITY—10 cu. ft. mixed concrete per batch; 14 cu. ft. unmixed loose material per batch.

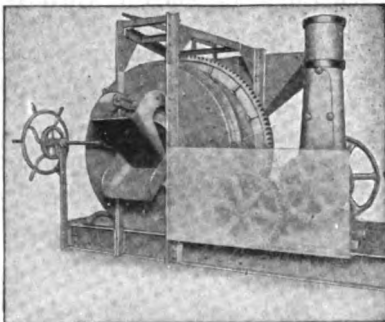
EQUIPMENT—Both mixers are furnished with charging chute; with or without platform and runways; batch hopper; power loader and with automatic water tank. On trucks or skids. Steam, electric or gasoline operated



RANSOME STANDARD BUILDING MIXER, SIZE 21-S

CAPACITY—21 cu. ft. mixed concrete per batch. 30 cu. ft. unmixed loose material per batch.

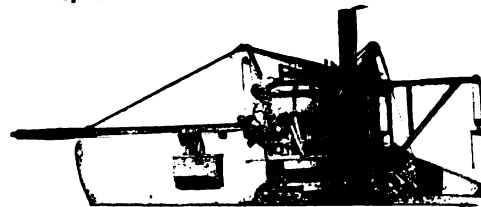
EQUIPMENT—Charging chute, batch hopper, power loader, with or without automatic water tank. On trucks or skids. Steam, electric or gasoline operated, or belt drive



RANSOME STANDARD BUILDING MIXER, SIZE 28-S

CAPACITY—28 cu. ft. mixed concrete per batch; 45 cu. ft. unmixed loose material per batch.

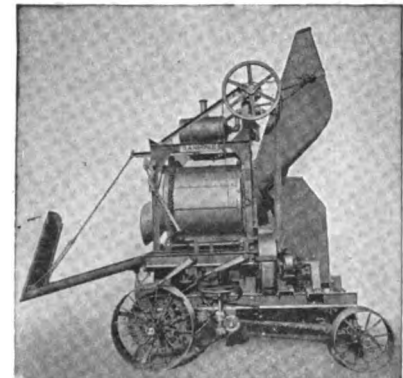
EQUIPMENT—Charging chute, batch hopper, automatic water tank. On skids only. Steam or electric operated or belt drive



RANSOME 21-E PAVER

CAPACITY—21 cu. ft. mixed concrete per batch; 30 cu. ft. unmixed loose material per batch.

EQUIPMENT—Steam engine and boiler, power loader, automatic water tank, 20-ft. distributing boom and bottom dumping bucket or distributing chute with 3-point discharge. Mounted crawling traction



RANSOME 7-E HIGH DRUM PAVER

CAPACITY—7 cu. ft. mixed concrete per batch; 10 cu. ft. unmixed loose material per batch.

EQUIPMENT—Gasoline engine, power loader, automatic water tank, 10-ft. 3-point discharge distributing chute, slope 21°. Mounted on self-traction trucks



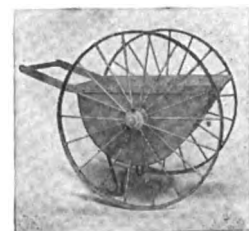
RANSOME-CANNIFF PNEUMATIC GROUT MIXER AND PLACER

Designed to mix and place grout under pressure by means of compressed air. Particularly adapted to sealing fissures, closing voids in concrete where absolutely watertight work is essential, etc. Size of batch is 2 sacks of cement and 2 cu. ft. of sand with whatever amount of water is required. Will place on an average of 40 batches per hour under ordinary conditions against a head of 175 ft. or less. 3 types: Standard, adapted to pressure up to 150 lbs.; High Pressure, to 300 lbs.; Extra High Pressure, to 600 lbs.



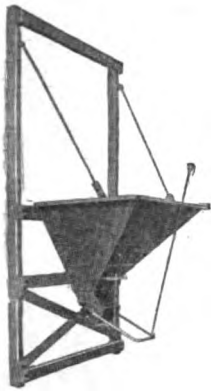
RANSOME-CANNIFF PNEUMATIC CONCRETE MIXER AND PLACER

Will mix and place concrete in tunnel jobs at 40% of the cost for hand-work. Stock sizes handle a batch of 14 cu. ft. of loose aggregates or 10 cu. ft. of mixed concrete. Other sizes made to order. Will successfully convey concrete half a mile. Up to 500 ft., will place 50 batches per hour; to 750 ft. 40 and up to 1000 ft., 28 batches per hour under average conditions



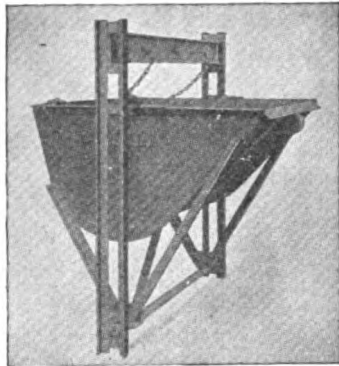
RANSOME CONCRETE CARTS

More economical than wheelbarrows because of greater capacity—6 cu. ft. Handles may be quickly changed to either end. Contour of body facilitates quick, clean dumping. Furnished with or without legs



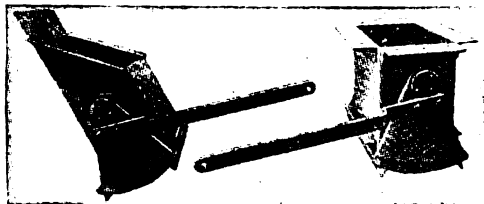
RANSOME STRAIGHT BACK BIN

Designed for open boom and boom chute plants. The straight back reduces all strains on the tower.
CAPACITY—From 10 cu. ft. to 80 cu. ft.



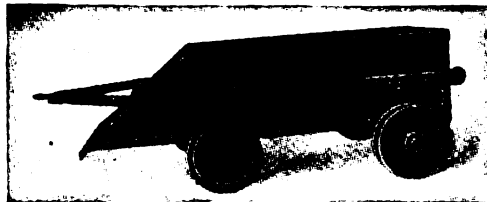
RANSOME HOIST BUCKET

Operates quickly in direct vertical lift and equally well in wooden or steel towers. Automatic discharge at any desired point in tower.
CAPACITY—8, 12, 18, 27, 36 and 66 cu. ft.



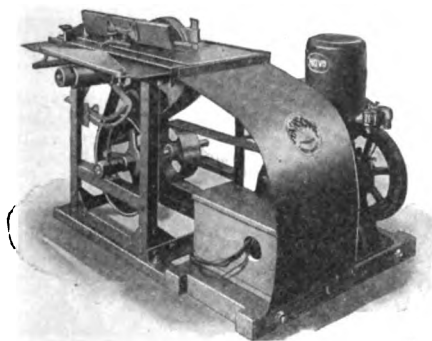
RANSOME BIN GATES

Both vertical and bottom type built with radial cut-off. Work easily and positively in all materials. When ordering, specify whether for steel or wooden bins. Made in 2 sizes, 12 by 15 in., and 20 by 20 in.



RANSOME SKIP CARS

These cars dump automatically and return to the loading position by gravity. May be used economically on the larger installations.
CAPACITY—1, 1½, and 2 cu. yds.



RANSOME SOLID TOP PORTABLE WOOD WORKING MILL

Designed and built for contractor's use. Table top is solid casting, machined true on top and sides. Operated by gasoline engine. Saw is mounted on movable arbor and is raised and lowered so that lumber always runs horizontally. A wood turning lathe may be attached. Send for Bulletin 300 for details

Ransome Concrete Chutes and Accessories.

The design of Ransome concrete chutes is the result of years of experience and experiments in the handling of concrete. This practical knowledge finds expression in the size and shape of the trough, the slope or angle, and the over-size hopper heads which compensate for the momentary check in flow caused by a change in direction.

Standardization and interchangeable unit construction facilitate replacement of parts, dismantling, shipping and setting up of Ransome chutes. The body of the chute is made of No. 14 gage, high carbon steel, insuring rigidity, strength and long service.

Ransome Swivel Head Chutes, Plain and Trussed.

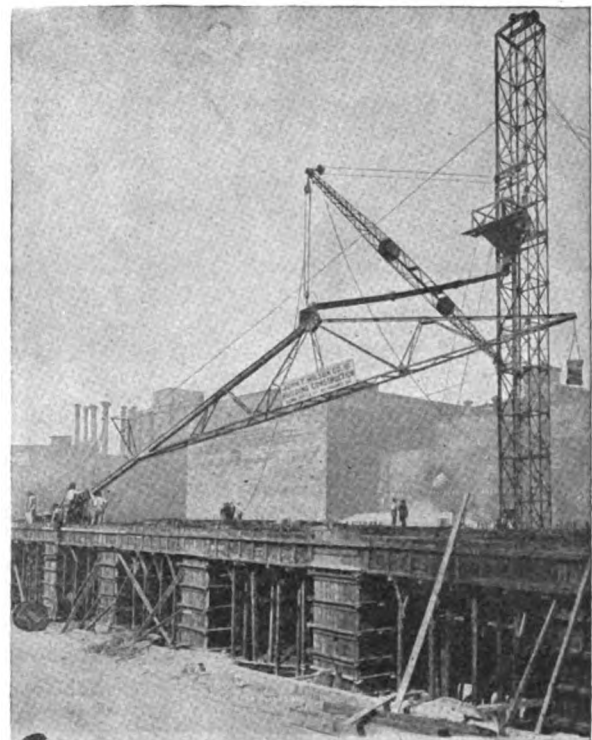
The simplicity of construction of Ransome chutes is shown by the ease with which the various items may be combined to make various units. To make a 16-ft. swivel head chute, bolt a hopper head on the upper end, and a splash hood with a swivel hook on the lower end of a 16-ft. trough unit. A 32-ft. swivel head chute is made by joining two 16-ft. trough units together and strengthening the joint by bolting a splice plate and attaching a hopper head, splash hood and swivel hook. A 48-ft. swivel head trussed chute is made up by joining three 16-ft. trough units together with two splice plates, and at each joint, bolting through the standard holes in the connecting flanges, one truss strut, and putting in place two truss rods by passing these through standard holes in the flanges. The hopper head, splash hood and swivel hook are then added as before.

Ransome Continuous Line Chute.

A 32-ft. continuous line chute is made the same as a 32-ft. swivel head chute, except that the hopper head, splash hood and swivel hook are omitted, and a flexible joint is attached at the lower end.

Ransome Counterweight Chutes.

Made in two lengths, 32 ft. and 48 ft. The 32-ft. section will carry a 32-ft. swivel head section and the 48-ft. section is strong enough to carry a 48-ft. swivel head trussed section at its lower end. This means that a Ransome counterweight chute is stronger and naturally heavier than a chute which will carry only the load of concrete within itself. On practically every job, instances arise where it is advantageous to carry another section of chute on the lower end of the counterweight section. It will always be an economy to buy a counterweight chute strong enough to do this.



RANSOME STEEL TOWER AND BOOM CHUTE IN OPERATION

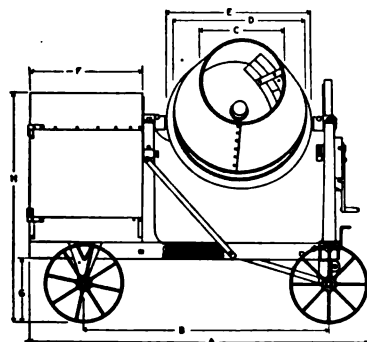
THE JAEGER MACHINE CO.

Manufacturers of Concrete Mixers

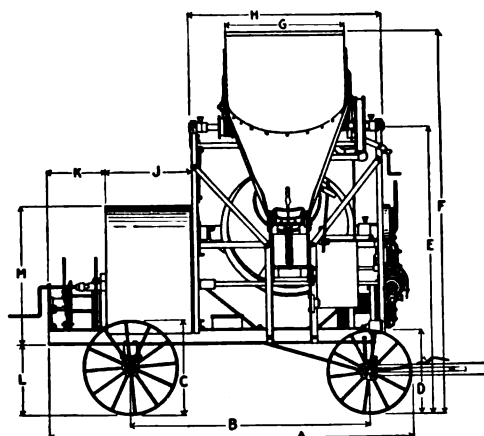
COLUMBUS, OHIO

Products.

JAEGER CONCRETE MIXERS,
PAVERS and PLACING PLANTS.



Without Loader



With Loader

DIMENSION DIAGRAMS OF JAEGER MIXERS

	A	B	C	D	E	F	G	H	J	K	L	M	N	P	S	T
WITHOUT LOADER																
No. 4-E	82	60	20	34	38	25	14	52	41	66	46	26	45	...	...	...
No. 3-E	70	49	16	27	30	22	15	52	40	57	40	26	41	...	...	...
WITH LOADER																
No. 7-L	...	65	28	24	88	114	37	60	28	...	18	40	16	64	118	30
No. 7-H	120	73	28	24	88	114	37	60	28	23	18	40	16	64	118	30
No. 4-L	...	54	24	20	80	96	32	50	25	...	15	38	...	59	96	28
No. 4-H	109	64	24	20	80	96	32	50	28	21	15	38	...	59	96	28

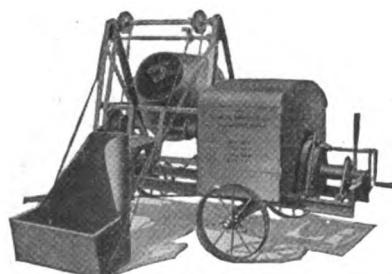


JAEGER PLACING PLANT

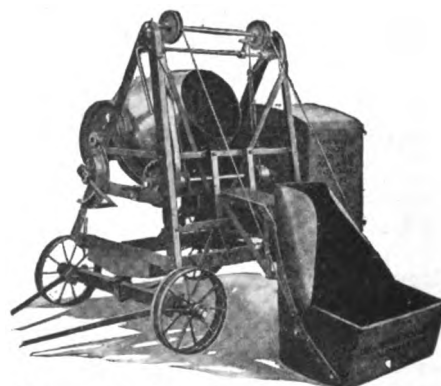
Consists of incline track made of 5 sections, each 10 ft. Skip car ample size for full batch. Hopper at end of track to receive batch. Spouts are 25 ft. long. Additional track and spout furnished extra. Built in two sizes



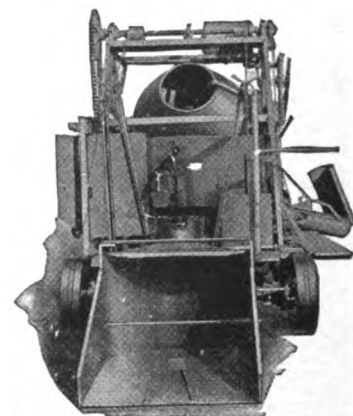
NO. 7 JAEGER TILTING DRUM MIXER
WITH POWER LOADER AND HOIST
Capacity, 12 cu. ft. unmixed materials
per batch, or about 8 cu. ft. mixed concrete



NO. 4-H JAEGER TILTING DRUM
MIXER WITH POWER LOADER
AND HOIST
Capacity, 7 cu. ft. unmixed materials per
batch, or about 4½ cu. ft. mixed concrete



NO. 4-L JAEGER TILTING DRUM MIXER
WITH POWER LOADER
Capacity, 7 cu. ft. unmixed materials per
batch, or about 4½ cu. ft. mixed concrete



NO. 7-P JAEGER PAVER
Capacity, 12 cu. ft. unmixed materials per batch, or up to 8 cu. ft. mixed concrete



NO. 7-L JAEGER MIXER WITH
POWER LOADER
Capacity, 12 cu. ft. unmixed materials
per batch, or about 8 cu. ft. mixed concrete

THE STANDARD SCALE & SUPPLY CO.

Manufacturers of Concrete Mixers

1631 Liberty Avenue
PITTSBURGH, PA.

STORES AND WAREHOUSES

CHICAGO, ILL., 169 North May Street
PHILADELPHIA, PA., 523 Arch Street

NEW YORK, N. Y., 145 Chambers Street
CLEVELAND, OHIO, 1541 Columbus Road
DALLAS, TEX., 3027 Elm Street

Products.

"THE STANDARD" LOW CHARGING CONCRETE MIXERS, and "THE STANDARD" SPECIAL ROAD and STREET PAVING MIXERS.

Also manufacturers of Contractors' Equipment.
For Scales, see page 844.

Concrete Mixers.

The most important feature in "The Standard" concrete mixer is the patented low charging design which enables the drum to be charged from the low platform that is attached to the machine, and portable with the outfit.

In the new model, no deflector blades or plows are used around the charging opening. Lifting pockets running from end to end provide greater agitation. In fact, a single revolution of the drum causes the bunched contents to rise and fall cataractlike six or seven times.

The large opening in the drum permits the mixing operation to be easily watched; and high grade, uniform concrete is secured without depending on guesswork.

The drums have been shortened as to length and considerably increased in diameter. In these short drums of large diameter, the mixing operation is much simplified and for that reason quicker in action. There is only one mixing zone. The materials are from the start bunched together so that no special means are required to cause end-to-end movements. No separate mixing blades are required. The lifting pockets, reaching from end to end of the drum, set up a vigorous mixing action and the whole mass of the contents, not merely one single mixing zone, rises and falls from six to seven times at each turn of the drum.

The folding platform affords larger space for charging, and enables cement and water to be supplied without interfering with the wheelers. It is folded up for moving, and the complete outfit can be loaded in an ordinary box car without removing any parts.

The result is that poor mixing is impossible and that perfectly mixed concrete can be had in shorter time than ever before. In the thorough blending of materials, the improved drum design of "The Standard" guarantees a grade of concrete that is perfectly mixed and always uniform in quality.

Advantages of Low Charging Mixers—The low, compact design of "The Standard" avoids the necessity of any kind of mechanical charging device; there is practically nothing to get out of order, and no skilled attendant is necessary.

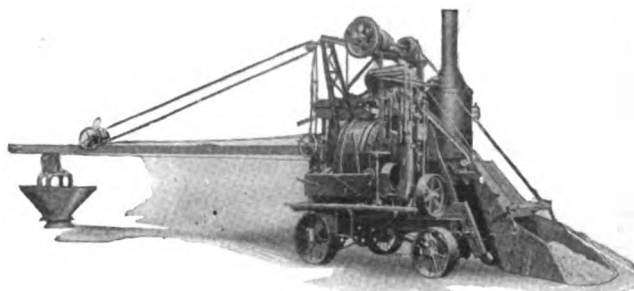
It can be moved rapidly from one point to another, takes up but small space, and the folding platform is always ready for immediate use.

For some classes of concrete work, a mixer equipped with side loader is preferred. This feature is incorporated in a new mixer, complete information on which is contained in Catalogue No. 60 that will be sent on request.

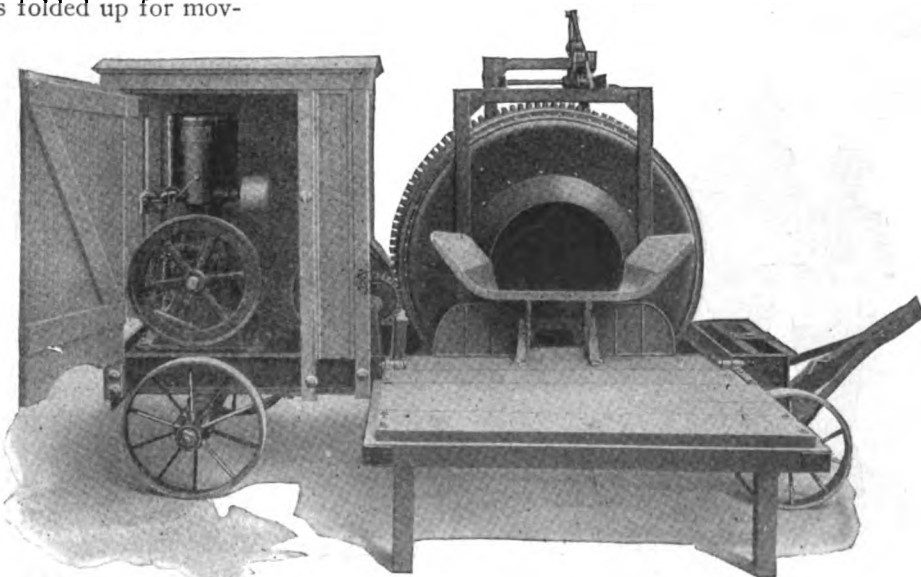
Machines for Street and Road Work.

"The Standard" street paving concrete mixer is mounted on steel truck with steam engine and boiler. Equipped with wide mouth, open end, skip charging hopper; automatic measuring water bucket, and forward and reverse traction. Carefully designed to equalize the weight on four ground wheels. Made throughout of heavy steel construction to meet severe requirements of street work. Front end of charging skip is covered to prevent material from spilling. Unique construction of the open end drum with wide drum chute permits elevating the charging skip to a steep discharge angle.

Complete information in Catalogue No. 60 which will be furnished on request.



ROAD PAVING MIXER WITH DISTRIBUTING BOOM, STEAM POWER AND TRACTION



LOW CHARGING CONCRETE MIXER WITH FOLDING PLATFORM

NORTHFIELD IRON COMPANY

Manufacturers of Washer-mixers and Culvert Forms

GENERAL OFFICES AND FACTORY

300 Iron Street

NORTHFIELD, MINN.

Products.

NORTHFIELD BATCH MIXERS, combination Sand and Gravel Washer-mixers for washing dirt out of the aggregate and mixing mortar, plaster and concrete all in one operation.

NORTHFIELD COLLAPSIBLE CULVERT FORMS.

Also manufacturers of Adjustable Cement Measuring Scoops for accurately measuring bulk cement; Steel Bridges, Reinforcing Steel; Corrugated Culvert Pipe; Road Drags, Minnesota Road Planers and all kinds of Road Machinery and Equipment.

Northfield Batch Mixer.

The mixer that hoes, plows and stirs. It washes and mixes all in one operation. Makes better and stronger concrete with less cement because this hoeing, plowing and stirring process breaks up and thoroughly dissolves every tiny globule of cement, thus giving the full value from every particle of cement used. Gives

a quick and dependable mix; 30 to 60 cu. yds. of finished concrete per 10-hour day is easily possible when hand operated. With these mixers, when hand operated, fully 90% to 95% of the mud or dirt and fine sand can be quickly washed out of the sand and then without removing same from the drum can be quickly mixed into the finest concrete. From 15 to 30 cu. yds. of finished concrete can be run through every 10 hours in this way. No outfit is complete without one or more of these dependable little mixers for use on the small jobs. It is remarkably low in price.

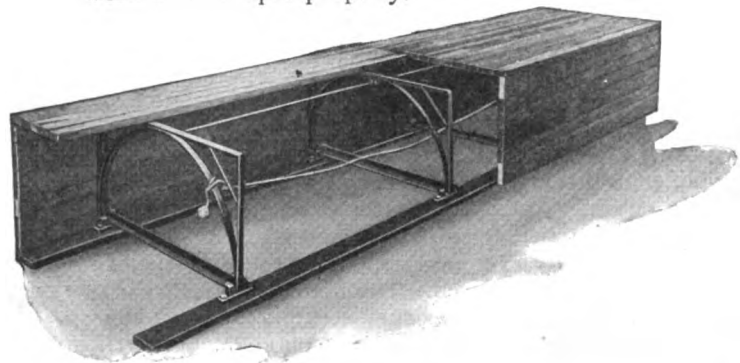
Northfield Collapsible Culvert Forms.

These forms cut the cost of building concrete culverts over one-third by saving lumber and time. They will save over \$50.00 on one 4 by 24-ft. culvert. They build any size of culvert up to 12 ft. in width and in any length. Either arch or square top culverts can be built with the same set of forms. They are guaranteed to work and collapse properly.



NORTHFIELD BATCH MIXER FOR HAND OPERATION

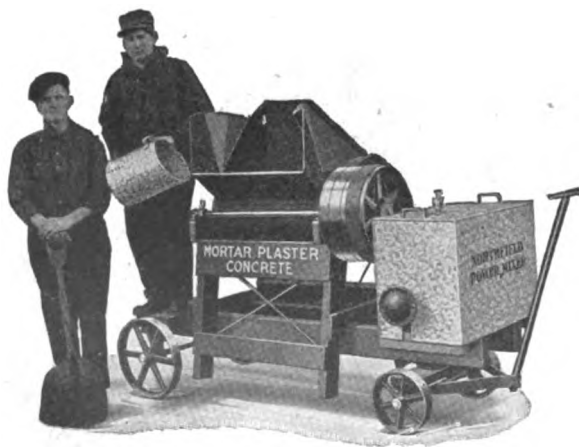
Light in weight. Substantial. Mixes quickly and thoroughly. Will easily average a large wheelbarrow batch every minute. Can always be set to discharge direct into forms. For hand or power operation



NORTHFIELD COLLAPSIBLE CULVERT FORM



FINISHED CULVERT READY FOR THE FILL



NORTHFIELD BATCH MIXER WITH ENGINE, HOUSED, ON DETACHABLE TRUCK

Mixer on its stand is detachable from truck or skids so as to be operated by hand when desired

No expert labor is required. One man in 30 minutes can set up a Northfield collapsible form and in a few minutes take it down. Saves all the waste of form lumber. Furnished with either 2-in. beveled wood sheeting or with pressed steel sheeting, or, if desired, purchaser may furnish his own wooden sheeting. Many now in use for over two years and all are giving fine satisfaction.

Catalogue.

Catalogue and further particulars sent on request. Please specify the products you are interested in.

WERT MANUFACTURING CO.

Builders of Concrete Brick and Block Manufacturing Machines

TELEPHONE:
HARRISON 7811

Railway Exchange Building
CHICAGO, ILL.

Products.

"PERFECT" CONCRETE MACHINERY comprising "PERFECT" BRICK MACHINES and "PERFECT" BLOCK MACHINES, power or hand driven.

Also manufacturers of Well, Cistern and Silo Moulds.

"Perfect" Concrete Machinery.

"Perfect" concrete machinery is the result of twenty years of experimenting, designing and building machines for the making of concrete products, by C. S. Wert, the inventor. Thousands are now in use. These machines also can be used as well in the manufacture of lime-sand brick or lime-cement-sand brick. If sufficient cement is not available, it is practicable to use a large proportion of lime as a binder. The product stands fire far better than clay brick and gives superior results under all mechanical tests.

Construction and Mechanical Advantages—

"Perfect" concrete machines are made of the best grade iron and steel, wrought and cast, machined and assembled with the highest degree of accuracy. The quality of concrete products is dependent, to a great extent, on the precision of the machine in which they are made. "Perfect" machines are built to stand the "gaff" and severe strain imposed on them.

One of the advantages over machines of other manufacture is the absence of all gears and chains. In a concrete machine, where sand, gravel or crushed stone is employed, the use of gears means trouble, in that these materials cause wear and replaced parts. Chains also invite difficulty by breakage.

All products are made face down. This permits the use of a richer or decorative material on the face of the product. Variations in texture and color can be

obtained by various combinations of differently colored aggregates. Architecturally beautiful results are possible in this way. Although brick are made face down, they are delivered face up, ten at once. The advantages of this method can readily be seen.

Power machines are equipped with a movable hopper that functions in two ways. It trowels the brick or block as it moves back, after the tamping and moves the surplus material back on the rear platform to be used in the next operation.

Each unit is of uniform quality and is individually tamped with force of 380 lbs.

"Perfect" machines are economically operated. Other elaborate and complicated machines require at least 5 h.p., whereas these machines can be operated with a 1 h.p. motor, a 2½ h.p. gas engine, or direct from line shaft. Also, are extremely light and portable. They can be assembled and ready for operation almost as soon as they arrive. Thus, products can be made on the job as well as in the plant.

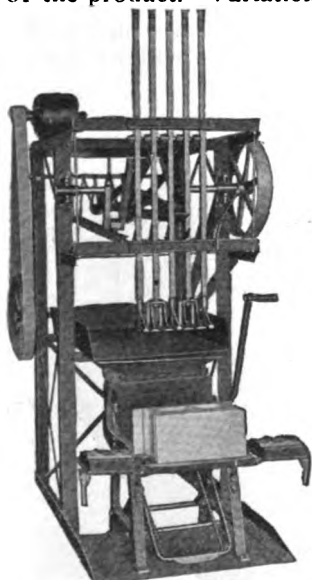
Production—In actual tests, model "B" brick machine and power tamper with four men have manufactured 16,000 to 20,000 brick in 10 hours. Block machines with power tampers have turned out 1,000 to 1,200 blocks in the same length of time.

The brick moulds cast brick of U. S. Standard size 2¾ by 3¾ by 8 in.; also a special size 2¾ by 5¾ by 10¾ in. Block moulds cast blocks, 8 by 8 by 16 in. and numerous variations.

Guarantee and Service—All parts proving defective within one year will be replaced free of charge. All parts guaranteed against wear for five years.

To contractors, building material companies, structural and concrete concerns, "Perfect" concrete machinery offers an industry that pays immediate returns, and is especially interesting to gravel and stone companies.

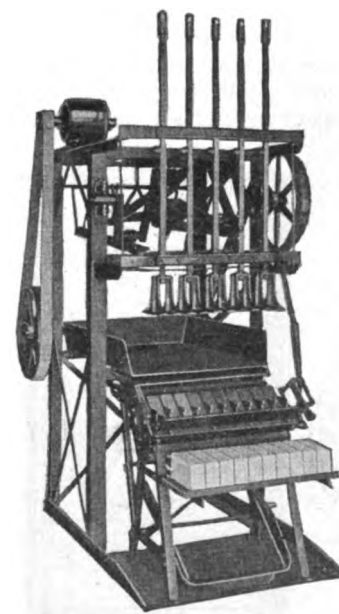
This company is in a position to give sketches showing the most efficient layout for a plant, allowing for growth and additional machinery. It can advise on technical difficulties and recommend suitable materials, correct proportioning and processes that have proved good in practice.



NEW MODEL "A" "PERFECT" BLOCK MACHINE WITH POWER



"PERFECT" BRICK MACHINE, HAND OPERATED



MODEL "B" "PERFECT" CONCRETE BRICK MACHINE WITH POWER

METAL FORMS CORPORATION

Metal Forms for Monolithic Concrete Construction

1436-1440 Booth Street
MILWAUKEE, WIS.

Product.

METAFORM INTERLOCKING STEEL FORMS for Monolithic Concrete Construction (Straight Walls, Angular and Circular).

Adaptability.

Metaforms take the place of wood forms on all types of monolithic concrete work—large industrial plants, buildings, residences, walls, etc. Metaform circular equipment is used in the construction of tanks, grain elevators, silos, chimneys, and coal pockets.

Advantages.

Metaforms effect large savings in form costs, speed up construction and turn out better work. As they are permanent equipment and can be used year after year with practically no depreciation, they eliminate the costly wastage that results from the use of wood forms. They reduce labor costs substantially, as a few common laborers can set them up as fast as the pouring proceeds, thus taking several skilled form carpenters off the payroll. Metaform tight joints and smooth surfaces result in smooth, better looking walls.

For circular-walled structures (silos, water tanks, grain elevators, etc.), Metaform adjustable circular equipment offers the only practical construction methods. On this class of work, continuous built-up forms are wholly impractical, while the common substitutes (clumsy slip-forms) are too slow, unwieldly and inflexible to meet the present day necessity for speed and economy.

Description.

Metaforms are built on the interchangeable unit idea. Each individual unit is built of a steel plate, heavily reinforced, and equipped with all necessary interlocking and clamping devices. Each unit is self-contained, there are no clamps, bolts, wedges or other separate parts to be applied. By combining a few of

the fractional and adjustable units to courses of the standard units, the form is made readily adjustable to varying lengths and specifications of concrete walls. Metaform equipment is unapproached in simplicity and versatility.

Metaform circular construction outfits are built on the same principles of standardization, with the added equipment necessary through the peculiar nature of circular work.

Operation.

Erecting Metaform units into a form set-up is almost automatic in its simplicity. The workman takes the units successively off the bottom course (three courses of plate being ordinarily used) and places them in position on the top course, the aligning pins automatically insuring accurate alignment. The two hand clamps with which each unit is equipped are then closed, and the unit becomes an integral part of the form.

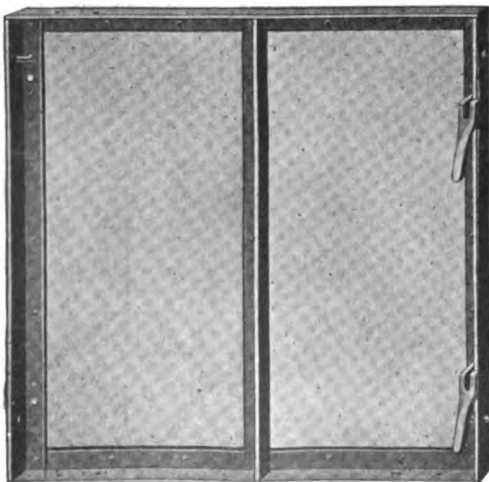
Investment Value.

No other equipment that a contractor buys can be considered so permanent as Metaforms. Units which were built fifteen years ago are still in constant use, and are apparently good for an indefinite number of years to come. So highly standardized is Metaform equipment that these old units fit perfectly among the standard units of today.

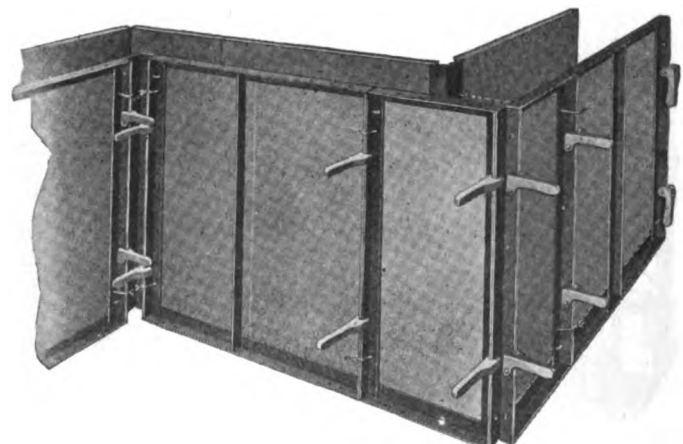
Metaforms are in use in every state in the Union, and every country in the world. The acceptance of Metaform methods is becoming universal.

Service Department.

All contractors are offered the assistance of this company's Engineering Service Department, in helping to determine the amount of Metaform equipment necessary to do the work most efficiently and economically. Any desired estimates will be furnished without obligation.



STANDARD METAFORM UNIT. SHOWING CLAMPS

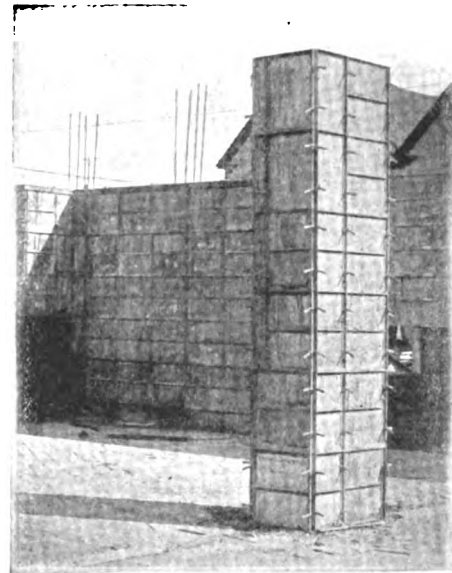


ILLUSTRATING METAFORM SET-UP

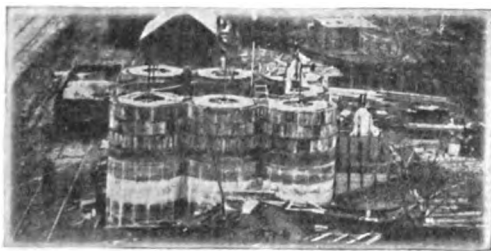
Many jobs of peculiar nature, such as the construction of sewer manholes, can be executed at a great reduction of cost through the use of standard Metaform equipment specially designed and adapted to the work. Suggestions and plans on such work will be furnished by the Engineering Department without obligation.

Literature.

Metaform equipment and methods are described clearly and graphically in two informative books. One book describes and illustrates the Metaform idea as applied to straight monolithic concrete construction; its companion edition is a valuable handbook on the most efficient and cost saving methods for building concrete silos, grain elevators, water tanks, chimneys, coal pockets, etc. Either or both books will be sent free on request.



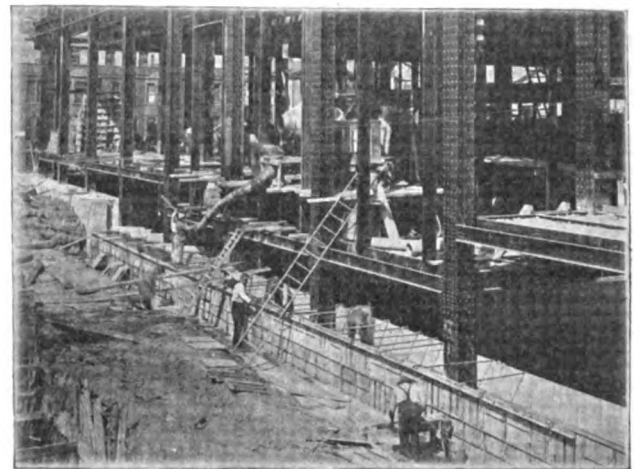
COMBINATION OF METAFORM STANDARD AND FRACTIONAL UNITS



METAFORMS ON GRAIN ELEVATOR



METAFORMS ON BASEMENT FOUNDATION



METAFORMS ON LARGE OFFICE BUILDING



METAFORM SILO BUILDING OUTFIT



METAFORM BUILT HOUSES



METAFORMS ON FACTORY STRUCTURE

THE LEHIGH PORTLAND CEMENT CO.

ALLENTOWN, PA.

CHICAGO, ILL.

SPOKANE, WASH.

BRANCH OFFICES

NEW YORK, N. Y.
JACKSONVILLE, FLA.
MINNEAPOLIS, MINN.

PHILADELPHIA, PA.
OMAHA, NEBR.
MASON CITY, IOWA

BOSTON, MASS.
NEW CASTLE, PA.
BUFFALO, N. Y.

PITTSBURGH, PA.
RICHMOND, VA.
KANSAS CITY, MO.

MILLS

FOGELSVILLE, PA.
IOLA, KANS.

WEST COPLAY, PA.
MITCHELL, IND.
FORDWICK, VA.

METALINE FALLS, WASH.
NEW CASTLE, PA.

MASON CITY, IOWA
OGLESBY, ILL.
ORMROD, PA.

Product.

LEHIGH CEMENT — Guaranteed to conform in every respect to the Standard Specifications for Portland Cement as adopted by the American Society for Testing Materials when tested by methods recommended by the American Society of Civil Engineers.



TRADE-MARK

Marketing and Shipping Facilities.

Lehigh mills are located at strategic points from the Atlantic to the Pacific. In principal marketing centers, branch offices have been established for the convenience of our customers.

Lehigh Cement is marketed in cloth or paper bags, or in bulk for domestic trade, and in barrels for export trade.

The bags contain 94 lbs. net (4 bags to the barrel), and the export barrel contains 376 lbs. net. These barrels are made in our own cooperage plant and are tongued and grooved to withstand the rough handling necessary in export trade.

Use.

In practically every type of modern construction the use of cement is required. In great engineering works, concrete is an essential material.

The careful selection of the ingredients for concrete is an important factor in the success of the finished

work. The selection of Lehigh Cement is a warranty for the most important material used in concrete.

Perhaps the best guarantee on future promise is past performance. The great New York Connecting Railroad; the Municipal Building, New York; the Girard Point Elevators, the League Island Dry Docks, Philadelphia; the Boston Braves' Ball Park; the Chicago and North-

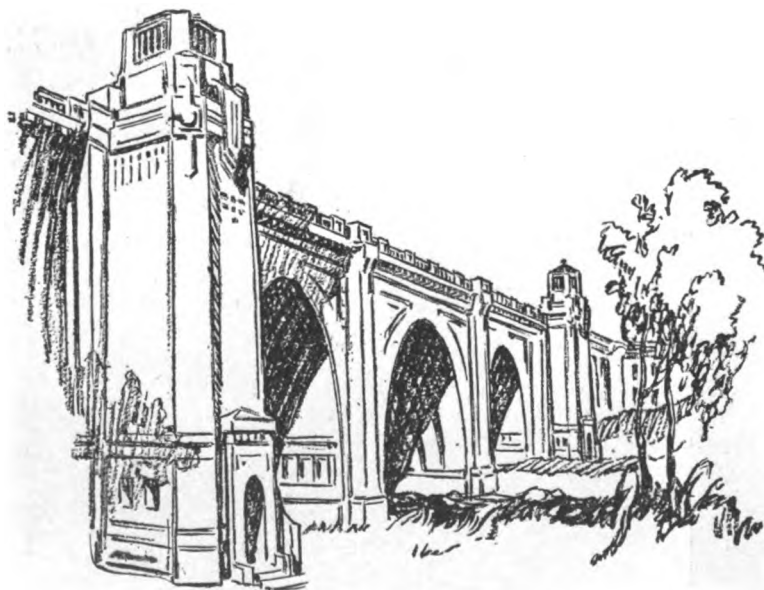
western Railway Terminal; the Quay and Sea Walls, Charleston, S. C.; the Galveston Causeway—these are a few of the structures where Lehigh was used.

The most noteworthy conflagrations, quakes and storms have proved the strength and permanence of concrete. Another feature of concrete that recommends its consideration to engineers is its adaptability to every form and class of engineering.

For Engineers' Convenience.

To any engineer writing us on the stationery of his firm and mentioning SWEET'S ENGINEERING CATALOGUE, we will send our celluloid computing scale, giving the amounts of cement, sand and stone required per cubic yard of rammed concrete of different proportions.

Further discussion of items of particular interest to any engineer may be entered into by communication with any of our offices.



THE BENSALEM AVENUE BRIDGE

It carries the Lincoln Highway over Pennypack Creek in the northern outskirts of Philadelphia.

THE SANDUSKY CEMENT CO.

Manufacturers of Concrete Waterproofing and Waterproofed Cement
CLEVELAND, OHIO

BAY BRIDGE, OHIO

FACTORIES
SYRACUSE, IND.

DIXON, ILL.

YORK, PA.

Products.

MEDUSA WATERPROOFING, in either Paste or Powder form—the original *integral* concrete waterproofing.

MEDUSA PORTLAND CEMENTS: Gray and White Portland Cements; Waterproofed Gray and Waterproofed White Portland Cements.

Also manufacturers of Medusa Stone Backing.

How Medusa Waterproofing Makes Concrete Impervious.

Ordinary concrete consists of from 20% to 40% of microscopic pores or capillary tubes, thus making it a porous material. Medusa Waterproofing forms a thin film, capable, when properly supported, of holding back, by surface tension and its own cohesion, the layer of water to which it is exposed.

It causes concrete work to dry off immediately after a rain, avoiding the unsightly dark appearance which water-soaked concrete retains for hours.

It makes concrete basement walls, tanks, cisterns, mortar and all concrete work positively waterproof and dampproof.

It does not affect color, strength, or setting of concrete work and prevents the white efflorescence which renders cement work unsightly. Minimizes shrinkage cracks. Being sealed within the pores of concrete, and not being subject to depreciation, the waterproofing effect is permanent. It adds very little to the cost of the concrete and needs no renewal.

What Medusa Waterproofing Is.

Medusa Waterproofing (paste) is a white emulsion which can be dissolved in gauging water for mortar or concrete. Especially recommended for machine mixed concrete. Use 1 gal. to a barrel of portland cement.

Medusa Waterproofing (powder) is a water-repellent compound of fatty acids chemically combined with lime, to be mixed with dry cement before sand and water are added. From 1½% to 2% of weight of cement (6 to 8 lbs. to 1 bbl. cement) is the right quantity to be used.

The paste is identical with the powder in resulting composition, and is as everlasting as concrete itself. It forms in concrete a water-repellent compound, thoroughly and effectually rendering the mass impervious.

Medusa Waterproofing will give positive watertight and dampproof results in construction of concrete reservoirs, water towers and tanks, bathing

pools, tunnels, disposal plants, pumping stations, elevator pits, stucco, basement walls and floors, cisterns, cement blocks, etc. Specify "According to manufacturers' directions." Write for specification booklet.

Medusa White Portland Cements.

Medusa White Portland Cement is especially suited for exterior or interior work, stucco work, and all kinds of construction where a beautiful white color is desired. Unexcelled for stucco, concrete bridges, floors, building trim and ornamentation.

Medusa Waterproofed White Portland Cement

consists of Medusa Waterproofing ground with Medusa White Portland Cement in process of manufacture, insuring a thorough mixture in exactly the right proportions. The most reliable waterproofed cement manufactured.

Medusa Waterproofed Cement—Noted for Fineness and Strength.

Medusa Waterproofed Cements are slow setting and quick hardening, remarkably uniform and especially noted for fineness and strength. They are the regular white and gray brands waterproofed, ready for use, with Medusa Waterproofing. Highly recommended for basement walls and floors, swimming pools, reservoirs, elevator pits, and wherever resistance to water percolation is required.



TRADE-MARK

Medusa Waterproofed Portland Cement Insures Absolute Waterproofing.

Medusa Waterproofed Portland Cement makes mortar or concrete absolutely waterproof, and prevents the slightest penetration of moisture or dampness. It prevents discoloration of concrete blocks or stucco after heavy rains, and does not affect strength, setting or hardening qualities of concrete.

Intended for use the same as ordinary portland cement. Also used in stucco or exterior plaster. Its use prevents corrosion of metal lath, which may occur if cement plaster allows moisture to penetrate.

Concrete blocks are now being used in construction of a great variety of buildings, in which waterproofing is absolutely necessary. Concrete blocks faced with Medusa Waterproofed White or Gray Portland Cement will be absolutely proof against water and moisture and permit plastering directly on blocks, thus saving expense of furring and lathing.

Medusa Waterproofed Gray Portland Cement is a standard portland cement containing the correct amount of Medusa Waterproofing ground in during process of manufacture, thereby saving mixing changes and preventing errors in mixing. Medusa Waterproofed Cement should be used wherever waterproof and damp-proof concrete is required.

Medusa Gray Portland Cement is best suited for concrete work in which a white finish is not required. Used extensively throughout Ohio, Illinois, Indiana, Iowa and Wisconsin. Annual production 3,000,000 barrels in roads and farm, factory and general industrial construction.

Guaranteed to Pass U. S. Government Specifications.

Medusa Portland Cements are guaranteed to pass standard and United States Government specifications. Every carload is tested before being shipped. A record of laboratory tests furnished on request.

Specify "According to manufacturers' specifications." Write for specification booklet.

Literature describing any of the above furnished on request.



TRADE-MARK

AMERICAN STEEL & WIRE COMPANY

Manufacturers of Triangle Mesh Concrete Reinforcement

SALES OFFICES

CHICAGO, 208 South La Salle Street
 WORCESTER, 94 Grove Street
 BOSTON, 120 Franklin Street
 PHILADELPHIA, Widener Building
 PITTSBURGH, Frick Building
 BUFFALO, 337 Washington Street
 DETROIT, Foot of First Street
 CINCINNATI, Union Trust Building
 CLEVELAND, Western Reserve Building

NEW YORK, 30 Church Street
 BALTIMORE, 32 South Charles Street
 WILKES-BARRE, PA., Miners Bank Building
 ST. LOUIS, Third National Bank Building
 ST. PAUL-MINNEAPOLIS, Pioneer Building, St. Paul
 OKLAHOMA CITY, First National Bank Building
 BIRMINGHAM, ALA., Brown-Marx Building
 DENVER, First National Bank Building
 SALT LAKE CITY, Walker Bank Building

EXPORT REPRESENTATIVES, UNITED STATES STEEL PRODUCTS Co., 30 Church Street, New York

PACIFIC COAST REPRESENTATIVES, UNITED STATES STEEL PRODUCTS Co., San Francisco, Los Angeles, Portland, Seattle

Product.

TRIANGLE MESH CONCRETE REINFORCEMENT.

For Wire Rope, see pages 32-88; for Electric Wires and Cables, see pages 594-611.

Uses.

Triangle Mesh reinforcement is used for floor and roof slabs, arch construction, beams, columns, dams and retaining walls, water and culvert pipe, pavements and roadways, river revetment, silos, fireproofing steel framing, bridge floors, reservoirs, sewers and stucco work.

Description.

Triangle Mesh woven wire reinforcement for concrete is made with either solid or stranded longitudinal members, properly spaced by means of diagonal cross wires, so arranged as to form a series of triangles between the longitudinal or tension members; the longitudinal members being spaced 4 in., the cross wires either 2, 4, or 8 in. as desired.

The sizes of both longitudinals and cross wires are varied in order to provide the cross-sectional area of steel required to meet the conditions.

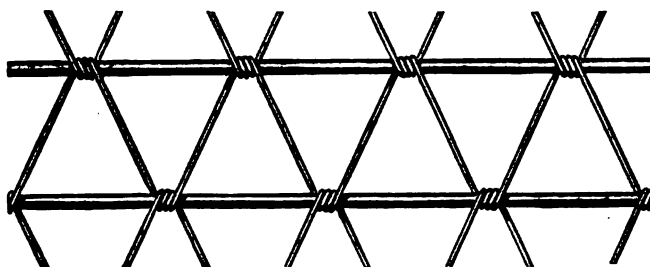


FIG. 1. TRIANGLE MESH CONCRETE REINFORCEMENT
 Solid longitudinals

Advantages.

- (1) Provides even distribution of steel.
- (2) Reinforces in every direction.
- (3) Tension or carrying members accurately spaced.
- (4) Low cost of inspection.
- (5) Properly distributes over a large area stresses due to concentrated load.

(6) Due to cold drawing, higher elastic limits and ultimate strengths with same quality of steel.

(7) Continuous action from one end of the structure to the other.

(8) Impossible to leave out or otherwise reduce the necessary steel if specific style number of fabric or area of steel is specified.

(9) Perfect mechanical bond.

(10) Easily handled and stored on the work.

(11) Minimum cost of installation.

(12) It is the only design of woven wire fabric in which the cross wires assist the longitudinal or tension members in carrying the load.

(13) By using stranded longitudinals in the heavy fabrics the necessary strength is furnished, and the finished material is more flexible and therefore more easily handled from the rolls.

Grade of Steel.

The chief advantage of high carbon, high tensile strength steel over the low carbon, low tensile strength steel is the higher allowable working stresses; a smaller sectional area of steel is required, or, with the same sectional area of steel, an added factor of safety is secured. The main disadvantage of a high carbon product is the stiff, brittle nature of the material.

By cold drawing a mild steel, the advantages of the high carbon steel are secured with an elimination of the disadvantages. Triangle Mesh reinforcement is manufactured from a cold drawn mild steel having an ultimate tensile strength of from 70,000 to 85,000 lbs. per sq. in. Higher or lower strengths can be furnished if desired.

Galvanizing.

While Triangle Mesh reinforcement can be furnished either galvanized or plain the latter is strongly recommended. It provides for the adhesion of the concrete directly to the steel; also for greater strength.

Galvanized material must of necessity cost more; and since nothing is added to the strength of the finished construction, this cost is not justified. This rule holds good for all except special cases, such as reinforcing cinder or slag concrete, or where used to reinforce stucco work.

AREAS IN SQUARE FEET PER ROLL OF TRIANGLE MESH REINFORCEMENT

Width of roll, in.	Square feet of reinforcement in roll		
	150-ft. roll	200-ft. roll	300-ft. roll
16	200	267	400
20	250	333	500
24	300	400	600
28	350	467	700
32	400	533	800
36	450	600	900
40	500	667	1000
44	550	733	1100
48	600	800	1200
52	650	867	1300
56	700	933	1400

For the lighter styles the use of 200- or 300-ft. rolls is recommended. The heavier styles are easier to handle in 150-ft. rolls.

NUMBER AND GAGE OF WIRES, AREAS PER FOOT WIDTH AND WEIGHTS PER 100 SQ. FT.

Style No.	No. and gage of wires each, longitudinal, A. S. & W. Co.'s steel wire gage	Sectional area longitudinal, sq. in. per ft. width	Total effective longitudinal sectional area, sq. in. per ft. width	Approx. weight, lbs. per 100 sq. ft.
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LONGITUDINALS SPACED 4 IN. CROSS WIRES NO. 14-GAGE, SPACED 4 IN.

032	1—No. 12 gage	.026	.032	22
040	1—No. 11 gage	.034	.040	25
049	1—No. 10 gage	.043	.049	28
058	1—No. 9 gage	.052	.058	32
068	1—No. 8 gage	.062	.068	35
080	1—No. 7 gage	.074	.080	40
093	1—No. 6 gage	.087	.093	45
107	1—No. 5 gage	.101	.107	50
126	1—No. 4 gage	.120	.126	57
146	1—No. 3 gage	.140	.146	65
153	1— $\frac{1}{4}$ in.	.147	.153	68
168	1—No. 2 gage	.162	.168	74
180	2—No. 6 gage	.174	.180	78
208	2—No. 5 gage	.202	.208	89
245	2—No. 4 gage	.239	.245	103
267	3—No. 6 gage	.261	.267	111
287	3—No. 5½ gage	.281	.287	119
309	3—No. 5 gage	.303	.309	128
336	3—No. 4½ gage	.330	.336	138
365	3—No. 4 gage	.359	.365	149
395	3—No. 3½ gage	.389	.395	160

LONGITUDINALS SPACED 4 IN. CROSS WIRES NO. 14 GAGE, SPACED 8 IN.

036P	1—No. 12 gage		.036	17
044P	1—No. 11 gage		.044	20
053P	1—No. 10 gage		.053	24
062P	1—No. 9 gage		.062	27
072P	1—No. 8 gage		.072	31
084P	1—No. 7 gage		.084	35
097P	1—No. 6 gage		.097	40

LONGITUDINALS SPACED 4 IN. CROSS WIRES NO. 12½-GAGE, SPACED 8 IN.

041R	1—No. 12 gage		.041	21
049R	1—No. 11 gage		.049	24
058R	1—No. 10 gage		.058	28
067R	1—No. 9 gage		.067	31
077R	1—No. 8 gage		.077	35
089R	1—No. 7 gage		.089	40
102R	1—No. 6 gage		.102	44

LONGITUDINALS SPACED 4 IN. CROSS WIRES NO. 14- AND 12½-GAGE, SPACED 2 IN. (This material is used principally for cement gun work)

Style No.	No. of wires each, long.	Gage of wire each, long.	Gage of cross wires	Approx. weight per 100 sq. ft.
7A	1	12	14	31
6A	1	10	14	37
5A	1	8	14	44
4A	1	6	14	53
29A	1	12	12½	42
28A	1	10	12½	48
27A	1	8	12½	55
26A	1	6	12½	64

Length of rolls: 150 ft., 200 ft. and 300 ft.

Widths: approximately 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, and 56 in.

NOTE—Material may be furnished either plain or galvanized. Unless otherwise specified, shipment will be made of material not galvanized.

STEEL WIRE GAGE AND DIFFERENT SIZES OF WIRE

Diameter, in.	A. S. & W. Co.'s steel wire gage	Diameter, in.	Area, sq. in.	Lbs., per ft.	Lbs., per mile	Pt. per lb.
$\frac{1}{8}$		.5000	.19635	.6668	3521.	1.500
$\frac{1}{4}$		.4900	.18857	.6404	3381.	1.562
$\frac{3}{8}$		.46875	.17257	.5861	3094.	1.706
$\frac{1}{2}$		.4615	.16728	.5681	2999.	1.76
$\frac{5}{8}$		.4375	.15033	.5105	2696.	1.959
$\frac{3}{4}$		.4305	.14556	.4943	2610.	2.023
$\frac{7}{8}$		.40625	.12962	.4402	2324.	2.272
$\frac{1}{2}$		.3938	.12180	.4136	2184.	2.418
$\frac{1}{2}$		.3750	.11045	.3751	1980.	2.666
$\frac{1}{2}$		.3625	.10321	.3505	1851.	2.853

STEEL WIRE GAGE AND DIFFERENT SIZES OF WIRE—CONTINUED

Diameter, in.	A. S. & W. Co.'s steel wire gage	Diameter, in.	Area, sq. in.	Lbs., per ft.	Lbs., per mile	Pt. per lb.
$\frac{1}{2}$		.34375	.092806	.3152	1664.	3.173
$\frac{1}{2}$		.3310	.086049	.2922	1543.	3.422
$\frac{1}{2}$		.3125	.076699	.2605	1375.	3.839
$\frac{1}{2}$		.3065	.073782	.2506	1323.	3.991
$\frac{1}{2}$		.2830	.062902	.2136	1128.	4.681
$\frac{1}{2}$		.28125	.062126	.2110	1114.	4.74
$\frac{1}{2}$		.2625	.054119	.1838	970.4	5.441
$\frac{1}{2}$		.2500	.049087	.1667	880.2	5.999
$\frac{1}{2}$		.2437	.046645	.1584	836.4	6.313
$\frac{1}{2}$		.2253	.039867	.1354	714.8	7.386
$\frac{1}{2}$		.21875	.037583	.1276	673.9	7.835
$\frac{1}{2}$		.2070	.033654	.1143	603.4	8.750
$\frac{1}{2}$		.1920	.028953	.09832	519.2	10.17
$\frac{1}{2}$		.1875	.027612	.09377	495.1	10.66
$\frac{1}{2}$		.1770	.024606	.08356	441.2	11.97
$\frac{1}{2}$		.1620	.020612	.07000	369.6	14.29
$\frac{1}{2}$		.15625	.019175	.06512	343.8	15.36
$\frac{1}{2}$		.1483	.017273	.05866	309.7	17.05
$\frac{1}{2}$		.1350	.014314	.04861	256.7	20.57
$\frac{1}{2}$		.125	.012272	.04168	220.0	24.00
$\frac{1}{2}$		.1205	.011404	.03873	204.5	25.82
$\frac{1}{2}$		.1055	.0087147	.02969	156.7	33.69
$\frac{1}{2}$		.09375	.0069029	.02344	123.8	42.66
$\frac{1}{2}$		.0915	.0065755	.02233	117.9	44.78
$\frac{1}{2}$		.0800	.0050266	.01707	90.13	58.58
$\frac{1}{2}$		.0720	.0046715	.01383	73.01	72.32
$\frac{1}{2}$		.0625	.0030680	.01042	55.01	95.98
$\frac{1}{2}$		.0540	.0022902	.00778	41.07	128.60

Triangle Mesh Reinforced Slabs Supported by Concrete Beams.

Design Suggestion, Cost, etc.—From an economical standpoint it is very desirable to have the same amount of reinforcement and the same thickness of slab in the end as in the intermediate slabs; the inspection requirements are less and in fact the entire installation costs are reduced. This is true whether bars or mesh constitute the slab reinforcement. The construction of the forms can seldom be made exactly uniform for the end and intermediate panels regardless of the relative lengths of spans "A" and "B"; therefore the cost of forms should not be considered.

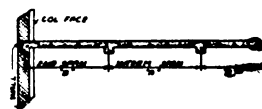


FIG. 2. UNIFORM REINFORCEMENT AND THICKNESS OF SLAB IN INTERMEDIATE AND END SLABS

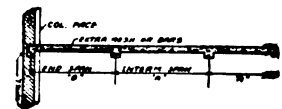


FIG. 3. SCHEME FOR INCREASING THE REINFORCEMENT IN THE END SPANS

In order for span "B" to have resisting moments equal to span "A," assuming the same reinforcement and same thickness of slab in both cases, the length of span "B" must be not more than nine-tenths time "A."

Under certain conditions it may be found advisable so to space the columns as to require a greater or less amount of reinforcement or a greater or less thickness of slab for the end spans than for the intermediate spans. If the reinforcement requirements are greater add sufficient bars or another layer of mesh to make up the difference. As the longitudinal wires in Triangle Mesh reinforcement are spaced 4 in. it will be more convenient to assume the spacing of the extra bars at multiples of 4 in. It is recommended that this spacing be not more than 24 in.

Supporting the Mesh Reinforcement—The correct location of the reinforcing mesh in the top portion of slabs over concrete beams can be easily and cheaply obtained by means of pre-cast concrete blocks as shown in Fig. 4.

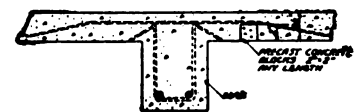


FIG. 4. SHOWING INEXPENSIVE METHOD OF SUPPORTING TRIANGLE MESH REINFORCEMENT OVER CONCRETE BEAMS

The blocks should have a height about $1\frac{1}{4}$ or $1\frac{1}{2}$ in. less than the full thickness of the slab. The length may be any convenient amount such as 1 or 2 ft. or such lengths as are readily formed by breaking long strips of the blocks. The mesh should be supported for at least one-third of its width. These blocks will stay in approximately correct position without any means of attachment to the reinforcing mesh or to the forms.

For short spans (about 8 ft. or less) these blocks will be required on one side only of the beams. For spans greater than 8 ft. use blocks on both sides.

Detailing Widths of Mesh—For estimating purposes where accuracy is unnecessary, provided the estimate is on the safe side, it is permissible to assume that the mesh required will equal in square feet the actual area of the floor slab. As a matter of fact the amount of mesh needed will be less than that, and at the same time a more efficient and more economical layout is possible.

In the first place a 2-in. lap along the sides of the sheets of Triangle Mesh reinforcement is sufficient to develop the full strength of the reinforcement; more

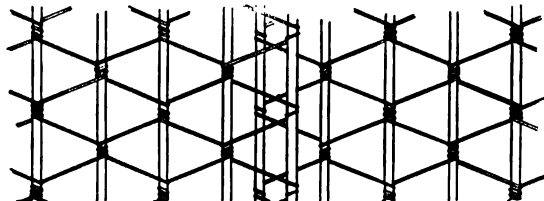


FIG. 5. SHOWING TRIANGLE MESH REINFORCEMENT AS IT ACTUALLY APPEARS WITH A SIDE LAP OF 2 IN.

than that is a waste of material. This 2-in. lap means a lap of the outside (or selvage) longitudinal wires and should not be assumed for those forms of mesh whose widths are based on a measurement greater than the out to out distance of the longitudinal wires (cross wires extending beyond the outside longitudinal wire have no value) or for mesh having a zigzag selvage edge.

A suggested detail for the amount and location of Triangle Mesh reinforcement is shown in Fig. 6. Pro-

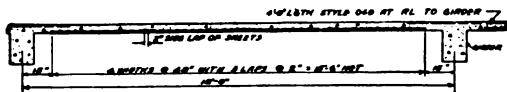


FIG. 6. DETAILING WIDTHS OF MESH AND SHOWING EXTRA STRIP OF MESH OVER THE GIRDERS

viding a short strip of light weight fabric (style 049 and 053P) is placed near the top of the slab over the girders with the main longitudinal wires at right angles to the direction of the girders, it is not only unnecessary but a waste of material to require that the main reinforcement of the slabs entirely cover the space between and over the girders.

The distance between the center line of the girder and the edge of the reinforcing fabric can be any amount up to about 20 in. without reducing the strength of the structure.

Other Uses of Triangle Mesh Reinforcement.

Concrete Joist Floors—For long spans and light loads, a floor construction consisting of closely spaced concrete ribs and connecting concrete slabs will very often prove to be economical. Fig. 7 shows a typical section of such a floor. Here is a 2-in. or 3-in. slab having a clear span between the supporting ribs of 23 in., that must not only act as part of the compression portion of the beams and resist temperature stresses, but in addition act as a support of the loads that may come upon the floor.

The most efficient type of reinforcement to take care of these various stresses is a fabricated mesh made from cold drawn high elastic limit wire. At first these thin top slabs were built without any reinforcement. Such a construction invites disaster. The next step in the development of this type of floor consisted of adding small wire or rods placed at right angles to the ribs and spaced about 24 in. apart. Such a method possibly takes care of the temperature stresses but does not definitely insure the T-beam action assumed in the design.

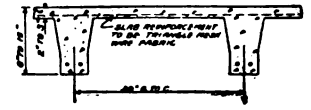


FIG. 7. TYPICAL SECTION OF CONCRETE JOIST FLOORS

A wire mesh fabric with comparatively close spacing of members is the only logical reinforcement to use.

Top Layer of Concrete Finished Floors—It is often desirable for construction reasons to leave the $\frac{3}{4}$ - or 1-in. top dressing until after the main part of the slab is completely hardened. In this case the slab should be thoroughly cleaned before applying the final course, and this course should be reinforced with Style 032 Triangle Mesh reinforcement to prevent destructive cracks.

Basement and Other Floors that Rest Upon the Ground—It is very seldom that such a concrete floor has better than filled ground for support, and it usually must carry heavy loads sometimes spread over a large area, sometimes concentrated on comparatively small space. Unless such a floor is reinforced it is liable to crack and then concrete is criticized unjustly.

As conditions vary with each job it is impossible to make any definite suggestions regarding the proper weight of fabric to use, but it can be said that millions of square feet of Style 049 have been successfully used for this purpose. Where heavy loads and questionable fill-foundations occur it will be economy to use heavier mesh, such for instance as Style 153.

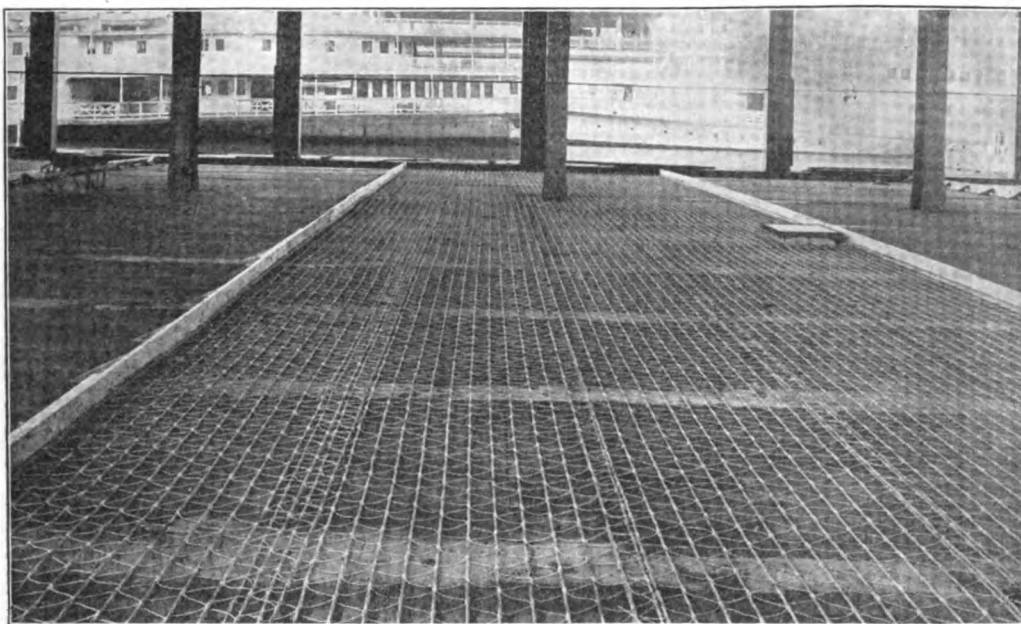
Flat Slab Beamless Floors, Special Triangle Fabric—A most successful style of construction for warehouse and other heavy load construction is the flat slab type, without any beams or girders.

For this type of floor the company furnishes an extra heavy Triangle flat slab fabric, which is made of $\frac{3}{8}$ - to $\frac{1}{2}$ -in. cold drawn wire spaced 4 in. on centers in very long lengths, rolled up sideways and bundled. When applying to the building it is only necessary to lay it on the forms and unroll it sideways; it is then ready for the concrete to be poured. This guarantees absolute spacing of wires, an immense saving on account of the small number of laps, extremely low cost of placing as compared to loose rods, and higher values in continuous action. This material is most desirable and it is highly recommended.

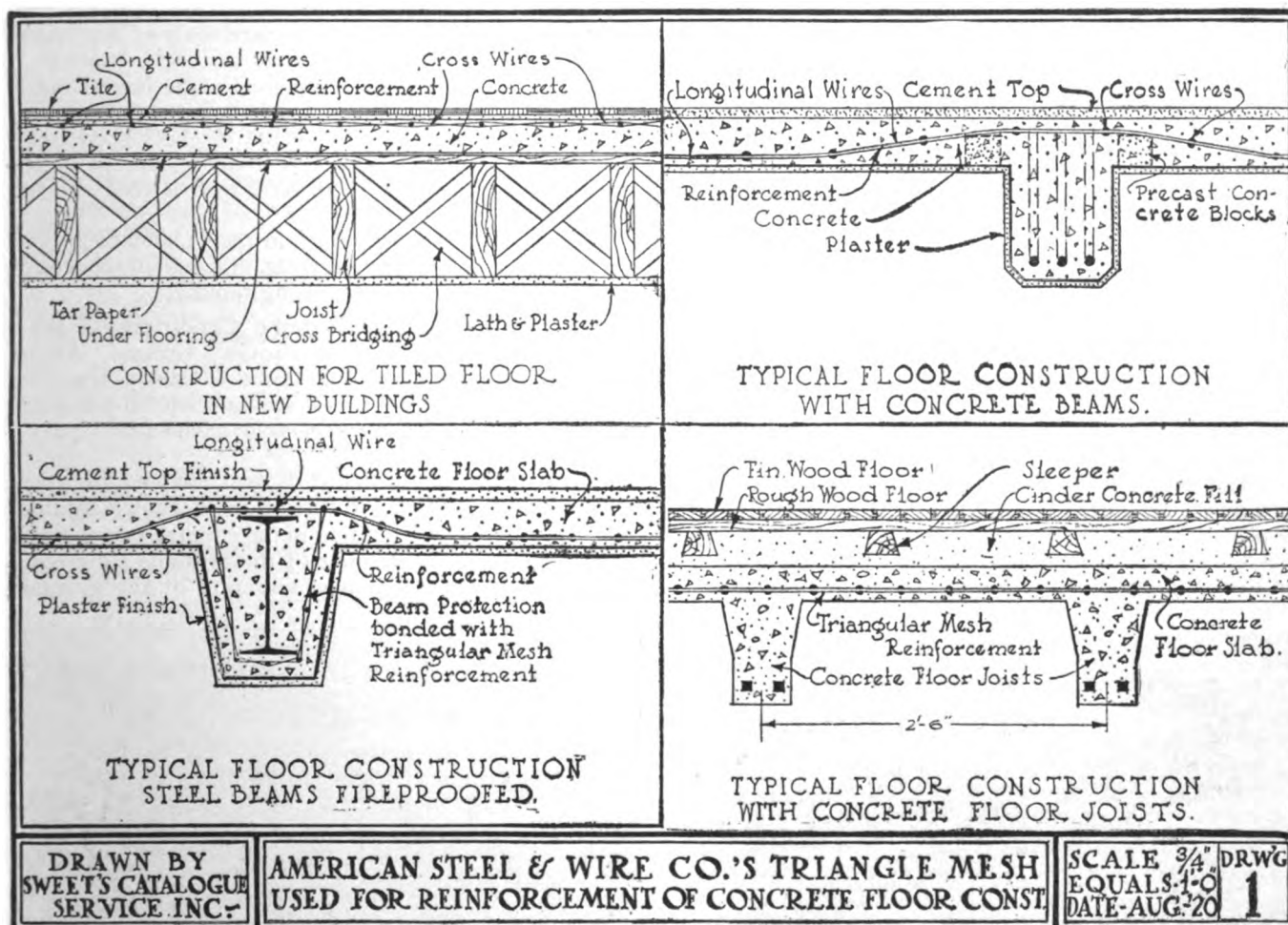
Cement Gun Work—Gunitite (trade-name) is concrete applied by the cement gun process, which produces probably the densest and therefore the most waterproof concrete available by present known methods.

Gunitite reinforced with Triangle Mesh reinforcement has repaired successfully old crumbling bridge piers, tunnel linings and sea walls; old steel bridges, tanks and trusses; leaky reservoirs and irrigation ditches; even wooden structures that have been damaged by fire have been restored to usefulness by this method.

And repair work is by no means the most important class of work produced. All kinds of new construction, especially those requiring waterproof qualities with light resulting weight, can be successfully executed.



PIER 42, NORTH RIVER, 56,000 SQUARE FEET, STYLE 40, TRIANGLE MESH REINFORCEMENT USED
Note the large area of reinforcement with its heavy stranded longitudinals. Excellent results obtained with minimum installation cost



Triangle Mesh Wire Reinforced Concrete Pavements and Roadways.

This rapidly increasing form of construction renders the following data and specifications of great value and assistance to consulting engineers, contractors and municipal authorities.

Necessity for Reinforcing Concrete Roadways

—It is demonstrated beyond doubt that to make con-

crete roads proof against heavy motor traffic, weather and time, a fabric of steel must be incorporated in the concrete. Several great states have so ruled.

Reinforced concrete is the future type of roadway construction, since it is obvious that only the most permanent and rigid form of construction will be adopted, and this being the only type that will withstand the constantly growing motor traffic. Many miles of reinforced



MONROE STREET BRIDGE, SPOKANE, WASH.

Double tracked highway bridge requiring 25,000 yds. concrete. Cost, \$500,000.00. 100,000 lbs. of AMERICAN STEEL & WIRE COMPANY'S Triangle Mesh Reinforcement used in the floor construction of this bridge

concrete roads already placed and thoroughly tried have met the test.

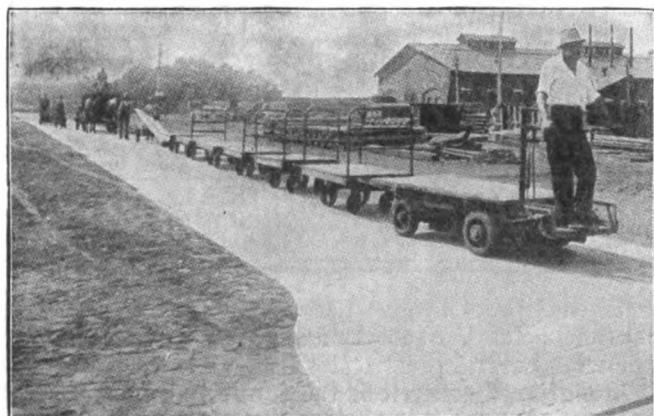
Advantages of Reinforcing With Wire Mesh

—The concrete is bound with the strength of the steel so that to the granite nature of the concrete is added the structural steel power of a bridge. The steel fabric keeps the parts of the slab from separating in case cracks are formed.

The indeterminate stresses set up in a concrete road by heat, cold and moisture conditions, produce contraction and expansion in the concrete, which in time tends to make unsightly and dangerous cracks which may eventually cause disintegration of the concrete and finally the failure of the entire road. There is also always the danger of a sinking subsoil which brings about the same cracks unless proper amount of reinforcing is used.

It has been proved that a 7-in. reinforced concrete road with the AMERICAN STEEL & WIRE COMPANY'S Triangle Mesh wire reinforcement is stronger and better in every way than an 8-in. road without reinforcing. The cost of 1 in. of additional concrete will pay for the reinforcing required.

The use of heavy bars as reinforcing for roads is very unsatisfactory and costly owing to a waste of steel by placing too large an amount in one place. The steel should be distributed as thoroughly as possible throughout the concrete in order to take care of any fine cracks which may form. Triangle Mesh does this in an ideal manner.



TRACTOR POWER AND MAINTENANCE COST SAVED BY REINFORCED CONCRETE PAVEMENTS IN AND AROUND INDUSTRIAL PLANTS

Value of this class of construction for distribution of shop materials demonstrated at Santa Fe shops, Topeka, Kans.

SWEET'S CATALOGUE

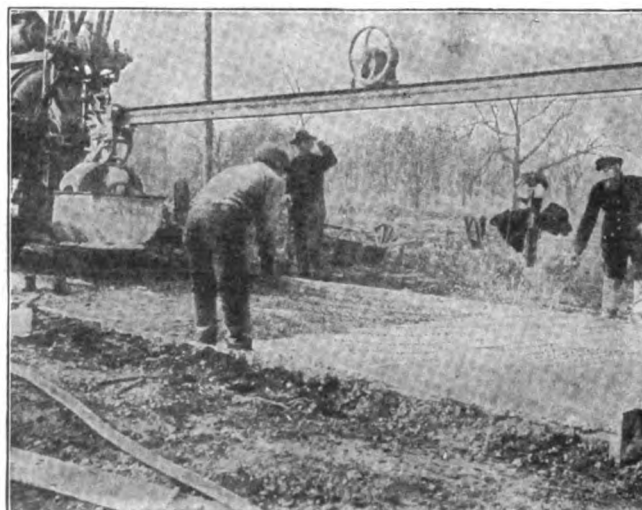
Triangle Mesh Reinforced Pavements Used Everywhere—Triangle woven wire reinforcement is in use wherever concrete roads are built. Many millions of yards of this material have been placed in roads North, South, East and West, and its use is increasing enormously. It meets all the requirements of a perfect road reinforcement.

After many years of practical experiments and careful inspection of concrete roads in every part of the country, it is now the positive belief of every good concrete engineer that no concrete road should be built without being properly reinforced with a cold drawn wire fabric.

Many state road engineers in their standard specifications require wire reinforcing in all their concrete roads, and this demand is growing rapidly.

Testimonial Under Extreme Conditions—Pavement 12 miles long, U. S. Proving Ground, Aberdeen, Md., has received the traffic of heavy tractors hauling big guns and tons of ammunition and testing materials. *The reinforcement fabric saved the pavement.*

That reinforced concrete is best adapted to meet the growing demands of future traffic is shown by this pavement, than which nothing in the country can show a heavier loading. On account of the unstable subgrade, and of the almost continuous vibration of the ground



REINFORCED CONCRETE ROADWAY, DE KALB, ILL.
A. N. JOHNSON, State Engineer

Continued on next page



KAW RIVER IMPROVEMENT, KANSAS CITY, MO.

2,000,000 sq. ft. AMERICAN STEEL & WIRE COMPANY'S Style 28 Triangle Mesh Reinforcement weighing 34 lbs. per 100 sq. ft. used in this work. Similar work is now being constructed by the Miami Conservancy District on the Ohio River. They are using Triangle Mesh Reinforcement

due to test firing of heavy cannon while the pavements were under construction, the concrete was proportioned 1: 1½: 3 and reinforced with our woven wire fabric. *On one stretch laid on a fill and always carrying the heaviest traffic, the slabs have settled ¼ of a foot without any cracks developing.*

Extracts Showing Why Wire Mesh Reinforcing Should Be Used—FROM SPECIFICATIONS OF SECOND NATIONAL CONFERENCE ON CONCRETE ROADS—

Reinforcing: The use of reinforcing in concrete pavements is increasing.

FROM REPORT ON JOPLIN, Mo., ROADS—

The pavement has been down over a year now and has fulfilled all expectations. There are no cracks, and the surface shows no wear. It is reinforced with Style 27 Triangle Fabric.

PAPER READ BY H. S. VAN SCOYOC, M. A. S. C. E., CHIEF ENGINEER, CANADIAN HIGHWAY COMMISSION—

Station Street, Oakville, was paved in 1914. In about a mile there is only one spot where a crack has developed, and it is known there is a spring there. The work is reinforced and the crack has not opened to any extent. It has required no repairs to date.

Compare above with below, by the same author in the same paper:

Several miles of concrete road were laid in 1911 and 1912 near Winnipeg. It was laid on the natural soil. It developed

transverse cracks about every 30 ft. and also a number of longitudinal cracks. The second winter opened up the longitudinal cracks until many of them were more than an inch wide. By another spring some of them looked like gullies. *This road was not reinforced.*

DISCUSSION BEFORE THE A. S. C. E., VOL. 39, No. 7. SANFORD E. THOMPSON, M. A. S. C. E.—

One of the problems to be considered in concrete pavements is that of contraction and expansion due to temperature changes. Contraction from lowering temperature causes cracks not only in concrete, if not reinforced, but also in brick and stone work.

AN ARTICLE BY A. T. GOLDBECK, ENGINEER OF TESTS, U. S. DEPT. OF AGRICULTURE ON "CAUSES OF CRACKS IN CONCRETE PAVEMENTS"—

Naturally as friction can best be developed along the length of the road, temperature changes and moisture are promotive of transverse cracks rather than longitudinal cracks.

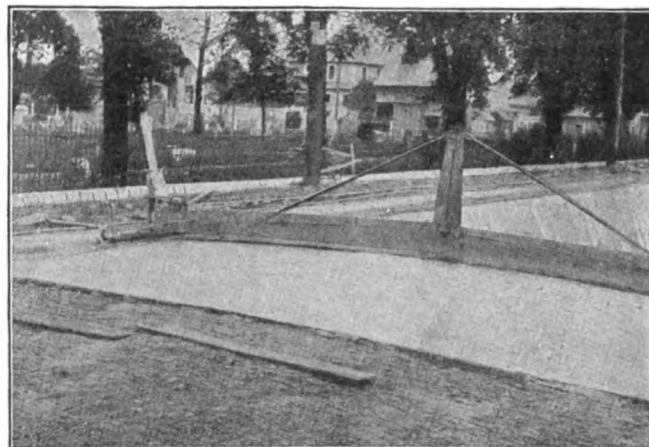
Sliding of the concrete on the subbase develops frictional resistance of considerable magnitude—when this exceeds the tensile strength of the concrete a crack must form.

EXTRACT FROM REPORT OF B. WOODYARD, CHIEF ENGINEER OF WOOD COUNTY, WEST VA.—

The 1916 work will depart from past practice in that the roads will be reinforced. The engineer decided on this change because of a conviction that the addition of reinforcement will lengthen the life of the road and reduce the maintenance cost.



REINFORCED CONCRETE PAVEMENT, CONNERSVILLE, IND.
W. F. RIDPATH, City Engineer
GREENWOOD, CONNOR, BOOTS & GANT, Contractors
585 sq. ft. Triangle Mesh Reinforcement used



RESURFACING WITH REINFORCED CONCRETE, KIRKSVILLE, MO.

The 2-in. bitulithic top was removed and over the 5-in. concrete base (11 years old) was placed 4 in. of new concrete reinforced with Triangle Mesh Reinforcement weighing 45 lbs. per 100 sq. ft.

BARTON SPIDER-WEB SYSTEM

(INCORPORATED)

Contracting Engineers; Reinforcing Steel

Kimball Building
CHICAGO, ILL.

Products.

REINFORCING STEEL, Column Spirals and Hooping for all types of concrete structures: buildings, bridges, dams, chimneys, tanks, culverts, etc.

CONCRETE INSERTS, SPACING DEVICES, and Bar Supports.

Services.

Our services are as complete as desired. Shipments from mill or warehouse, in stock lengths or cut and bent to specifications. Our shops are equipped to handle all classes of fabrication. The service includes designing and detailing where desired.

A Service Department is maintained to so co-ordinate our producing, operating and shipping facilities as to insure complete fulfillment of requirements.

Estimates promptly furnished.

Column Spirals.

The "Barton" spiral, illustrated below, is manufactured by ourselves alone under our Patent No. 1293301. It is at once the most economical and practical product of its kind on the market.

It is the only spiral which lends itself both to shop and field fabrication. The spacing element (the all important feature of a spiral) consists of a plain bar running longitudinally with the spiral to which the strands of wire are clipped by means of the spacing clips illustrated below.

It is a general practice to ship spirals fabricated but the possibility of field assembly will appeal to many engineers and contractors.

On shop fabricated spirals the standard spacing bar is a $\frac{3}{8}$ -in. round which, if desired, can be figured in with the column vertical steel. The entire spacer with clips weighs not to exceed $\frac{1}{2}$ lb. per lin. ft. for each spacer. This is the lowest possible weight consistent with proper strength.

Our recommendation is to specify two spacers on spirals up to 12-in. diameter; 3 spacers from 12-in. to 18-in., and 4 spacers above 18 in.

We fabricate in our shop or ship in the knock-down. Where field fabrication is desired, each spiral is shipped in bundled coils of correct diameter, securely tied with tie wire, and with the necessary clips, to fabricate, attached in a cloth bag. Spacer bars are shipped separately in bundles.

Concrete Inserts, Spacing Devices and Bar Supports.

Send for data on these products.

References.

Complete jobs of concrete reinforcing have been furnished on the following well-known recent projects:

Stewart Warner Speedometer Corporation, Chicago, Ill.

Iten Biscuit Co., Memphis, Tenn.

Dining Hall and Circular Cell House, New Illinois State Penitentiary, Joliet, Ill.

Utility Building, Swift & Co., Omaha, Nebr.

Creswell Garage, Cleveland, Ohio

U. S. Parcel Post Substation, Chicago, Ill.

Powerhouse Stacks, Sinclair Refining Co., Coffeyville, Kans. and New Bedford, Ohio

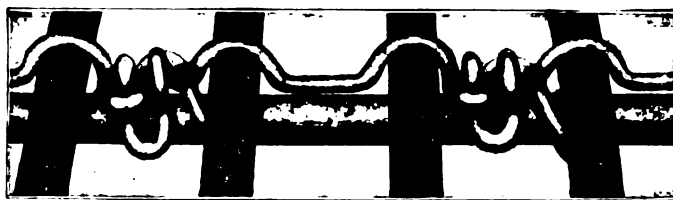
Sewer Construction, City of Flint, Mich.

Produce House, Swift & Co., Iowa Falls, Iowa

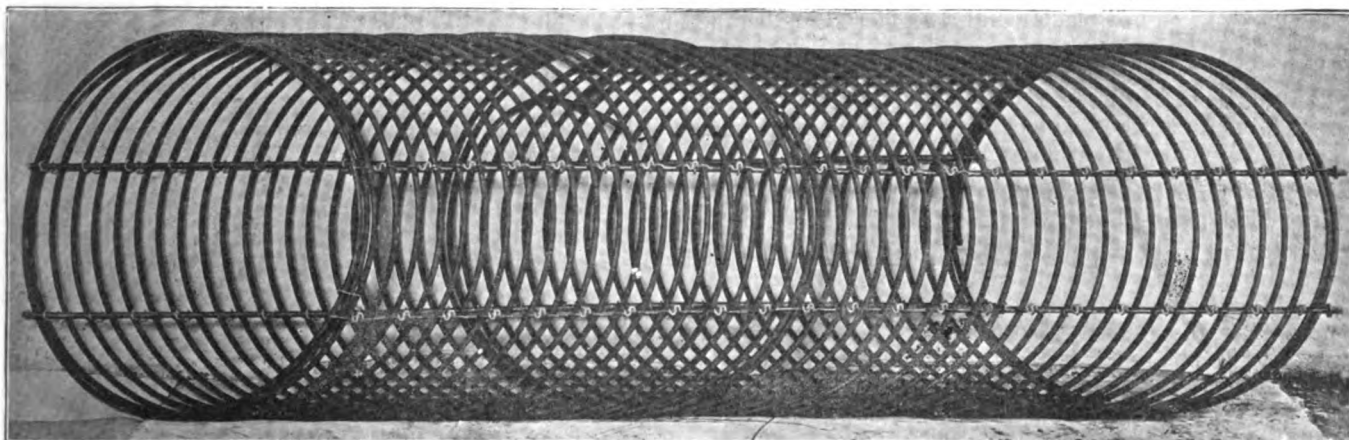


TYPICAL SPACER CLIP

Made for all sizes of wire and spacings. Special links for start, splice and terminal



SHOWING CLIPS AND SPACER BAR ATTACHED TO SPIRAL



SHOP FABRICATED SPIRAL COLLAPSED FOR SHIPMENT

CONCRETE ENGINEERING COMPANY

Fireproofing and Reinforcing Materials

Omaha National Bank Building
OMAHA, NEBR.

DISTRICT OFFICES

CHICAGO, ILL., 140 South Dearborn Street
MILWAUKEE, WIS., First Wisconsin National Bank Building
KANSAS CITY, MO., Railway Exchange Building

DETROIT, MICH., Campau Building
OKLAHOMA CITY, OKLA., Patterson Building
DES MOINES, IOWA, Iowa Building

Products.

CECO REINFORCING BARS; CECO COLUMN SPIRALS, MEYER REMOVABLE STEELFORMS; CECO ROUND COLUMN FORMS.

Also, CECO Triangle Mesh Concrete Reinforcement, Expanded Metal and Rib Reinforcing, Metal Lath, Self-furring Metal Lath, Cold Rolled Channels; Corner, Base and Rail Beads.

Ceco Service.

The Engineering Department will prepare complete designs on all types of reinforced concrete construction at a nominal charge. Preliminary estimates of cost, layouts, etc., are a part of the service and incur no obligation.

The CONCRETE ENGINEERING COMPANY'S Contract Department will erect all materials when the quantity is large enough to warrant doing so.

Meyer Removable Steelforms.



MEYER STEELFORMS WITH REINFORCEMENT IN PLACE READY FOR CONCRETING



MEYER REMOVABLE STEELFORM

through the early removal and speedy re-use possible. No. 16-gage sheet steel. Shaped exactly by heavy presses, extremely rigid, so maximum re-use is secured.

Rented to contractors, the labor of placing and removing being handled by Contract Department. Furnished

in 6-, 8-, 10- and 12-in. depths, in 20-in. widths; and 12- and 15-in. depths in 30-in. widths; as well as special widths; and with both single tapered and double tapered end forms—also an economy.

Ceco Reinforcing Bars.

Rolled in both new billet and rail steel. In either plain or deformed rounds and squares. Conform to the Manufacturers' Standard Specifications for both new billet and rail steel. Furnished cut to length, and bent to specifications, at mill or warehouse.

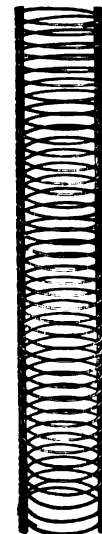


CECO REINFORCING BARS

SIZES, WEIGHTS, AREAS AND EXTRAS, CECO REINFORCING BARS

Size	ROUND BARS		SQUARE BARS		Size extras
	Area	Weight	Area	Weight	
1/4"	.049	.167	.063	.212	50¢ per cwt.
3/8"	.110	.376	.141	.478	25¢ per cwt.
1/2"	.196	.668	.250	.850	10¢ per cwt.
5/8"	.307	1.043	.391	1.328	05¢ per cwt.
3/4"	.442	1.502	.563	1.913	Base
7/8"	.601	2.044	.766	2.603	Base
1"	.785	2.670	1.000	3.400	Base
1 1/8"	.994	3.380	1.265	4.303	Base
1 1/4"	1.227	4.172	1.563	5.313	Base

Ceco Column Spirals.



CECO COLUMN SPIRALS

Accurately shaped to required diameter by machinery, and held in correct pitch by the new slotted "V" spacer, accurately spacing each wire, preventing distortion, allowing spirals to be collapsed for shipment, and then readily expanded to required diameter. Unless otherwise specified, two spacers furnished with each spiral. Hooping given an extra turn at each end and securely wired in position, so no slipping is possible.

Ceco Round Column Forms.

In standard adjustable sections, all snugly fitted together by tongue and groove joints, and held in place with both flat and tee iron clamps. All parts completely interchangeable; columns with diameters of 12 to 48 in., of any height, quickly formed. The natural rigidity of heavy gage sheet steel, with added reinforcement of tongue and groove joint between clamps, makes an absolutely stiff and rigid form. Column section always uniform throughout, and smooth surface a certainty. Used with any type floor construction, special column caps being furnished when necessary. Constant re-use effects great economy.

Contract Department will erect CECO round column forms in place ready for concrete, guaranteeing complete satisfaction. Or they will be rented to responsible parties without labor of installation.

Shipping Facilities.

Adequate stocks are always maintained in warehouses at Omaha, Chicago, Kansas City, and Youngstown. Prompt shipments of any size order made without delay.



CECO ROUND COLUMN FORMS

THE CONCRETE REINFORCING & ENGINEERING CO.

CLEVELAND, OHIO

STOCK AND FABRICATING PLANT, CLEVELAND, OHIO

Products.

RIVET GRIP FABRICATED UNITS.

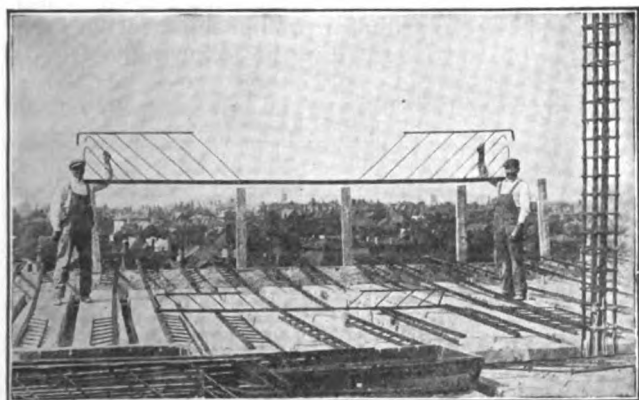
Also Plain, Deformed, Square and Round Reinforcing Bars of standard sections.

Engineering Services.

THE CONCRETE REINFORCING & ENGINEERING CO. furnish engineering services for reinforced concrete structures of all kinds. This service is co-operative. The cost of this service may be included in our estimate or may be paid for separately on the fee basis.

Rivet Grip Fabricated Units.

A compact, rigid unit reinforcement, fabricated in shop strictly according to individual design; tagged, bundled and shipped ready to place.



RIVET GRIP FABRICATED UNIT BEAM FRAMES

Note simplicity in handling

Rigidly attached shear members are generally recognized by authorities to have decided advantages over loose bent bars and stirrups wired in place.

Rivet Grip fabricated units are effectively and economically used as beam, girder or joist reinforcements in building construction. By using Rivet Grip fabricated units, all errors of field fabrication and placing of reinforcements are eliminated. Field cost of handling is reduced to a minimum.

Rivet Grip Type "A" Floor System.

In lightness, economy, and rigidity, the Rivet Grip, Type "A" floor system is the latest and most satisfactory of long span fireproof floor construction. It eliminates all useless dead load, uses the least amount of concrete, requires the simplest form work, and is the cheapest long span floor construction.

The Rivet Grip, Type "A" floor system consists of rectangular concrete joists, 24-in. on centers, reinforced with one rigid prefabricated Rivet Grip reinforcing unit per joist, and 19-in. tile fillers between joists,

with tile soffits at bottom of joists. All dead weight and excessive cost of suspended ceilings is eliminated. The Rivet Grip, Type "A" floor system has a perfectly flat all-tile ceiling, ideal for plastering. It allows maximum clearance for floor fill, pipes, and conduits, and extreme ease for extending pipes and ducts through the floor.



TYPICAL SECTION OF RIVET GRIP TYPE "A" FLOOR

Note the minimum amount of concrete required. No concrete slab on top. 85% of floor area is tile. Flat all-tile ceiling. Tile soffits or concrete joists 5 x 1/2 x 8 in. Scored tiles.

Note reinforcing, one rigid, prefabricated Rivet Grip unit per joist. Note how easily pipe sleeves, conduits, ducts, etc., can extend through the floor by cutting out any portion of the tile fillers



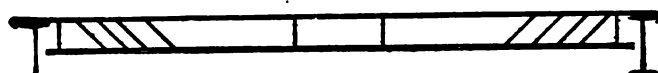
TYPICAL RIVET GRIP REINFORCING UNIT FOR MIDDLE BAYS

All shear bars are 3/8"



TYPICAL RIVET GRIP REINFORCING UNIT FOR END BAYS

Minimum field labor required for handling Rivet Grip units. Note how well shear stresses are taken care of in Rivet Grip units by rigidly attached inclined shear bars



TYPICAL RIVET GRIP REINFORCING UNIT FOR SEPARATED BAYS

TABLE OF SAFE LOADS FOR RIVET GRIP TYPE "A" FLOOR

Note—Reinforcing column gives the size of upper and lower Rivet Grip bars. $f_s=16000$ lbs. $f_c=750$ lbs.

Tile depth, in.		Wt. of slab per sq. ft. in lbs.	Reinfor. R. G.	Min. per 12" width in lbs.	Net safe superimposed load (w) per sq. ft. of floor																					Moment factor
					Span in ft.																					
					8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26			
8	45	3/4	28000	290	218	167	130	102	80	63	50	40	32	25	20	16	12	9	7	5	4	3	2	1	1/2	1/10
				325	245	190	151	122	94	75	60	47	37	29	22	17	13	10	7	5	4	3	2	1	1/2	1/10
				400	306	238	190	151	122	100	80	65	52	41	32	24	18	13	10	7	5	4	3	2	1	1/12
8	45	3/4	33000	348	266	206	162	128	102	82	66	52	41	32	24	18	13	10	7	5	4	3	2	1	1/2	1/10
				390	298	233	185	147	120	96	78	63	50	40	31	23	17	12	9	7	5	4	3	2	1	1/12
				420	365	290	230	186	152	124	102	85	67	52	41	32	24	18	13	10	7	5	4	3	2	1	1/12
8	45	1	39000	420	321	250	200	180	130	105	86	70	57	45	35	26	19	14	10	7	5	4	3	2	1	1/10
				420	362	284	227	182	148	132	100	83	70	56	44	34	25	18	13	9	7	5	4	3	2	1/12
				420	365	325	280	228	187	155	130	108	91	76	64	51	40	30	22	16	12	9	7	5	4	1/12
10	55	3/4	37000	385	291	227	177	140	110	88	70	54	42	33	25	18	13	10	7	5	4	3	2	1	1/2	1/10
				435	320	258	202	160	130	108	83	66	52	41	32	24	18	13	10	7	5	4	3	2	1	1/12
				535	407	320	254	203	165	135	110	90	74	60	48	37	28	20	14	10	7	5	4	3	2	1/12
10	55	3/4	49000	525	405	317	251	202	164	134	110	90	72	59	47	37	28	20	14	10	7	5	4	3	2	1/10
				565	446	357	285	230	188	155	127	106	87	71	59	47	37	28	20	14	10	7	5	4	3	1/12
				565	495	440	352	287	237	197	163	137	115	97	82	68	57	45	34	25	18	13	10	7	5	1/12
10	55	1	58000	565	487	385	307	249	215	168	140	115	97	80	67	54	43	32	23	17	12	9	7	5	4	1/10
				565	495	432	347	282	233	193	160	135	113	95	80	67	55	44	33	24	18	13	10	7	5	1/12
				565	495	445	400	350	290	242	206	172	145	125	107	90	77	65	52	41	31	22	16	12	9	1/12
12	65	3/4	63000			412	330	265	217	177	147	120	100	80	66	54	43	32	23	17	12	9	7	5	4	1/10
						465	372	301	248	204	170	140	117	97	81	67	55	44	33	24	18	13	10	7	5	1/12
						535	400	375	310	258	215	182	158	130	110	93	80	66	55	45	34	25	18	13	10	1/12
12	65	3/4	78000			525	421	345	285	235	196	165	137	115	98	82	68	56	46	35	26	19	14	10	7	1/10
						535	475	390	322	267	225	190	160	135	115	98	83	70	58	48	37	28	20	14	10	1/12
						535	485	435	395	335	283	240	205	175	153	130	112	96	83	71	60	50	40	30	22	1/12
12	65	1 1/4	93000				485	422	350	292	246	208	177	150	129	110	94	80	68	57	47	37	28	20	14	1/10
							485	435	395	331	280	239	203	178	150	130	110	95	82	70	60	50	40	30	22	1/12
							485	435	395	365	335	300	267	222	185	166	146	128	112	97	84	73	61	52	41	1/12
12	65	1	105000					435	395	340	287	245	210	180	154	133	115	98	85	73	61	52	41	31	22	1/10
								435	395	365	325	278	240	205	178	156	134	116	100	87	75	66	55	44	33	1/12
								435	395	365	335	310	290	260	227	200	174	158	136	118	104	90	78	68	57	1/12

CONCRETE STEEL COMPANY

42 Broadway
NEW YORK, N. Y.

SALES OFFICES

CHICAGO	BIRMINGHAM	PHILADELPHIA	BOSTON	CLEVELAND	SYRACUSE
DETROIT	ST. LOUIS	KANSAS CITY	OMAHA	ST. PAUL	EL PASO
DENVER	HARTFORD	BALTIMORE	NORFOLK	WASHINGTON	CINCINNATI

WAREHOUSES AND FABRICATING WORKS

YOUNGSTOWN	CLEVELAND	PHILADELPHIA	NEW YORK	BOSTON	CHICAGO	CINCINNATI
ST. PAUL	BIRMINGHAM	DENVER	ST. LOUIS	KANSAS CITY	DETROIT	

Products.

HAVEMEYER DEFORMED BARS (patented) for Reinforcing Concrete; COLLAPSIBLE SPIRALS for Columns; TY-CHAIRS; BAR-TYS; EASEL-CHAIRS; BAR-SPACERS; BEAM-SADDLES and SEPARATORS; HY-CHAIRS; SLOTTED, DAYTON ADJUSTABLE- and "Y" SOCKET-INSERTS; ROUND and ANGLE NOSE CURB-BARS; SECURITY-ANCHOR and TY.

Also manufacturers of Fabricated Unit Frames, X-Tension Soffit Clips, "Sanitread" Safety Treads.

Engineering.

The CONCRETE STEEL COMPANY maintains experienced and efficient Engineering Departments in its district sales offices for the use of customers. These Engineering Departments would be glad to co-operate in making up designs, estimates and plans on any type of reinforced concrete structure.

Description of Havemeyer Bars: Rounds, Squares.

Rolled deformed bars with the axes of the projections, forming the mechanical bond, parallel to the axis of the bar; designed to secure at all points constant uniform area of cross section equal to area of cross section of a plain bar of same size. Projections and depressions, being rolled longitudinally, allow all steel to be of value when bar is under tension. No sharp angles tending to start cracks when bar is bent. Full tensile strength of all metal is developed throughout length of bar, equalizing strength at all points. Havemeyer bars are rolled to same weight and area as plain bars, but a much stronger mechanical bond is obtained.

The deformations furnish a mechanical bond more than sufficient to develop strength of bar, as proved by many testing laboratories.

Advantages of Havemeyer Bars—Bending and handling costs are reduced to a minimum through the following important features: (1) Havemeyer bars bend easily, because metal in longitudinal projections follows bend as readily as metal in body of bar. (2) Both ends



SQUARE BAR



ROUND BAR

of a "double bend" lie in same plane without extra work. (3) No abrupt changes in cross section to start cracks. (4) Bars easily wired at intersections, the projections and depressions preventing wire from slipping. (5) Bars easily selected on the work, because readily gauged.

Sizes—Havemeyer bars are rolled at many mills in the various steel centers of the United States. They are carried in stock, ready for prompt shipment, in principal cities, in sizes indicated in the following table.

*WEIGHTS AND AREAS, HAVEMEYER SQUARE AND ROUND DEFORMED BARS

Sizes, in.	Area, in.	Weight per ft., lbs.	Mill extra for size per 100 lbs.
1 1/4 sq	1.5625	5.312	base
1 1/2 "	1.2656	4.303	base
1 "	1.0000	3.400	base
1 rd.	0.7854	2.670	base
3/4 "	0.6013	2.044	base
3/8 "	0.4418	1.502	base
1/2 sq.	0.3068	1.043	5c
5/8 "	0.2500	0.850	10c
1/2 rd.	0.1963	0.667	10c
3/8 "	0.1104	0.375	25c

*All Havemeyer bars are rolled to the same weight as plain bars.
NOTE—The above sizes adapted as standard for reinforcing bars.

Specifications for Steel.

Havemeyer bars can be rolled to any standard specification. Manufacturers' Standard Specifications for concrete reinforcing bars, adopted 1910, are recommended because large tonnages are regularly going through mills on these specifications, and orders complying with them will be shipped from stock from our nearest warehouse.

Havemeyer Bar Service.

Havemeyer bars can be shipped, cut to special lengths, direct from the mills when mill conditions will permit. Immediate shipments can always be made from large stocks of round and square Havemeyer bars that are carried in our own warehouses. Stocks are also maintained in other principal cities by agents.

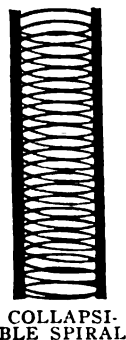
Shop Bending and Fabricating.

Warehouses are equipped with the most modern machines for bending and fabricating bars accurately and economically. Shop bending is more economical to the contractor than field bending, with no waste, so that very low prices can be quoted.

Fabricated units can be made up on the job, by using Havemeyer bar spacers, beam saddles, etc.—assuring proper placing of steel.

Havemeyer Collapsible Spiral.

Made of highest grade rods or wire to size specified, and manufactured in this company's own shops, accurately coiled to proper diameter and correctly spaced, using a rigid spacer, insuring rigidity, strength and uniformity; and unless otherwise ordered, are equipped with two spacers and shipped collapsed, ready to be placed in form. An angle spacer is used, size varying with size and weight of spiral. This type has proved the most economical and satisfactory.



COLLAPSIBLE SPIRAL

Securo Bar-Spacer.

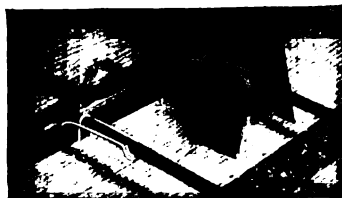
Made from hoop steel. Locking prongs and legs are self-contained. Used for supporting, spacing and locking bars in the slab. Standard height from underside of bar to form, $\frac{1}{2}$, $\frac{3}{4}$ and 1 in. Made up on order.

BAR-SPACERS
No tools required**Havemeyer Beam-Saddle.**

Made from sheet steel. Used in beams, girders, and lintels for supporting, spacing, and locking the bars. Standard height from underside of bar to forms is $1\frac{1}{2}$ and 2 in. Made $\frac{1}{2}$ in. short of beam width. Made up on order.

HAVEMEYER BEAM-SADDLE
No tools required**Havemeyer Hy-Chair.**

Made from pressed steel. Used in flat slab construction for supporting head rods over columns and bent up bars in slab. Maximum size bar, $\frac{3}{4}$ in. Made up on order.

HY-CHAIR
No tools required**Havemeyer Ty-Chair.**

Made from high grade spring steel wire. Used for tying and supporting bars in slab. Standard distance from underside of bar to forms is 1 in. Carried in stock.

HAVEMEYER TY-CHAIR
No tools required**Havemeyer Easel-Chair.**

Made from high grade spring steel wire. Used in terra cotta or steel tile construction. Standard distance from underside of bar to forms is 1 in. Made double (2 bars) and single (1 bar). Carried in stock.

EASEL-CHAIR IN STEEL TILE
No tools required**Havemeyer "Y" Socket-Insert.**

Made from highest grade malleable iron. Has a broad nailing base with 4 nailing holes and made to accommodate bolts with standard threads from $\frac{3}{8}$ to $\frac{1}{2}$ in., both inclusive. Carried in stock.



"Y" SOCKET-INSERT

Dayton Adjustable-Insert.

Made from highest grade malleable iron, cast in one piece with keyhole slot. Has 14 nailing holes.

Made in sizes from $\frac{1}{4}$ to $\frac{7}{8}$ in., both inclusive. Carried in stock.



No. 3



No. 5

DAYTON ADJUSTABLE-INSERTS

Havemeyer Slotted-Insert.

Made from high grade pressed steel. In standard lengths of 1 ft., 18 in., 2 ft. and 3 ft. to accommodate $\frac{1}{2}$ -, $\frac{5}{8}$ - and $\frac{3}{4}$ -in. bolts. Has 6 nailing holes and closed slot. Carried in stock. $\frac{7}{8}$ -in. bolt special.



SLOTTED-INSERT

Havemeyer Round Nose Curb-Bar.

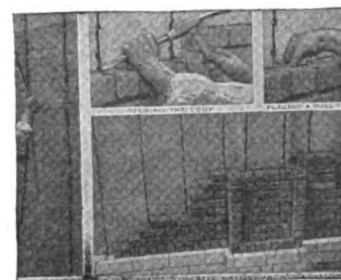
Anchors are flared from the web, occur every 6 in. and serve as a reinforcement as well as an anchorage. There is no web to split the concrete and the bar may be easily bent. Stocked in 10-ft. and 12-ft. lengths, galvanized.



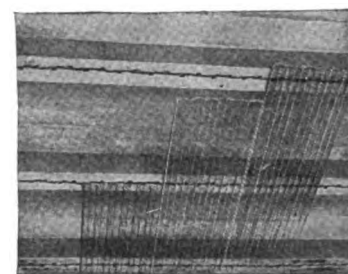
Straight Bar

Showing a Bar Bent
ROUND NOSE CURB-BAR**Security-Anchor and Ty.**

The anchor is made from hoop steel and the Ty from spring steel wire; both from rust-proof material. Nailing barbs and bonding anchors occur every 3 in. Used for bonding brick veneer, terra cotta, stone and tile wainscoting to concrete surfaces for holding metal lath ceilings, floor screeds, nailing strips, etc. Standard length of anchor is 8 ft. and if placed 12 in. in the perpendicular on centers with one Ty to every fourth course of brick a sufficient bond is guaranteed.



Holding Brick Veneer

Holding Metal Lath
SECURITY-ANCHOR AND TY

THE CONSOLIDATED EXPANDED METAL COMPANIES

GENERAL OFFICES AND WORKS

BRADDOCK, PA.

(In the Pittsburgh District)

SALES OFFICES

PHILADELPHIA, PA.

CHICAGO, ILL.

PITTSBURGH, PA.

EXCLUSIVE REPRESENTATIVES

NEW YORK, N. Y., EXPANDED METAL ENGINEERING CO.

DALLAS, TEX., SOUTHERN WIRE & IRON CO.

BOSTON, MASS., PENN METAL CO.

TORONTO, CAN., BAINES & PECKOVER

MINNEAPOLIS, MINN., C. A. P. TURNER CO.

Products.

"STEELCRETE" EXPANDED METAL for reinforcing concrete.

Also manufacturers of Beam Wrapping; Metal Lath; Channel Furring; Galvanized Metal Corner Bead; Special Meshes for Lockers, Machine Guards, etc.; Rib-mesh Expanded Metal for Lath and for Concrete Reinforcing.

Sectional Area.

A 16-ft. long sheet of expanded metal, for reinforcing concrete, can now be obtained with sectional area of 1.00 sq. in. Heretofore this long length and heavy section has been unobtainable. It will reduce cost of placing reinforcing in concrete. Reinforcing meshes range from sectional area of 1.00 sq. in. down to a light section to be used for temperature stresses.

Scope of Use.

"Steelcrete" mesh, the oldest and most widely used of concrete reinforcement, is adapted for reinforced concrete work such as floor and roof slabs, sewers, conduits, tanks, highway bridges, culverts, retaining walls, etc.

Description.

"Steelcrete" mesh possesses great unit strength and a high elastic limit. It is cold drawn to its mesh shape under enormous speed, being previously covered with oil. This process, together with the use of soft carbon steel, gives uniformity of quality and stiffness.

Tensile strength of the open hearth steel used is from 55,000 to 60,000 lbs. It has an elastic limit of not less than one-half its ultimate strength, an elongation of about 25% in 8 in., and cold bending test of 180°. Ultimate strength of finished product is raised to a value of 70,000 to 80,000 lbs. and elastic limit increased by 100%.

Severe loading tends to close the diamonds, giving fabric a ductility unencountered in any other reinforcement of high elastic limit. It causes compression in concrete in the plane of the steel, and thus reinforces the construction against sudden rupture.

Advantages.

As the structure of "Steelcrete" provides a perfect distribution of steel in a horizontal direction, so its stiffness insures a like perfect distribution in vertical direction. There are no waves or warps to be hammered out or to offer an element of weakness.

Due to mesh shape, "Steelcrete" attains a perfect bond in concrete. There is no peeling or scaling of concrete when subjected to heavy loads.

Temperature stresses are guarded against. The form of "Steelcrete" mesh provides positive reinforcement against these known but indeterminate stresses.

"Steelcrete" is cheap to install. It arrives in flat sheets of standard lengths and is easily handled, requiring very little storage room. Bending of "Steelcrete" in a circular shape or round bend is exceedingly simple.

DECIMAL STANDARDS FOR "STEELCRETE" EXPANDED METAL

Designation of mesh	Size of mesh		Sect. in sq. in. per ft. of width	Wt. per sq. ft. in lbs.	Size of standard sheets
	Width of diamond	Length of diamond			
3-13-075	3"	8"	.075	.27	6'0"x 8'0" 6'0"x 12'0" 6'0"x 16'0" 6'9"x 8'0" 6'9"x 12'0" 6'9"x 16'0"
3-13-10	3"	8"	.10	.37	5'3"x 8'0" 5'3"x 12'0" 5'3"x 16'0" 7'0"x 8'0" 7'0"x 12'0" 7'0"x 16'0"
3-13-125	3"	8"	.125	.46	6'0"x 8'0" 6'0"x 12'0" 6'0"x 16'0" 5'3"x 8'0" 5'3"x 12'0" 5'3"x 16'0"
3-9-15	3"	8"	.15	.55	7'0"x 8'0" 7'0"x 12'0" 7'0"x 16'0" 6'0"x 8'0" 6'0"x 12'0" 6'0"x 16'0"
3-9-175	3"	8"	.175	.64	5'3"x 8'0" 5'3"x 12'0" 5'3"x 16'0" 4'0"x 8'0" 4'0"x 12'0" 4'0"x 16'0"
3-9-20	3"	8"	.20	.73	7'0"x 8'0" 7'0"x 12'0" 7'0"x 16'0" 6'0"x 8'0" 6'0"x 12'0" 6'0"x 16'0"
3-9-25	3"	8"	.25	.92	5'3"x 8'0" 5'3"x 12'0" 5'3"x 16'0" 4'0"x 8'0" 4'0"x 12'0" 4'0"x 16'0"
3-9-30	3"	8"	.30	1.10	7'0"x 8'0" 7'0"x 12'0" 7'0"x 16'0" 6'0"x 8'0" 6'0"x 12'0" 6'0"x 16'0"
3-9-35	3"	8"	.35	1.28	5'3"x 8'0" 5'3"x 12'0" 5'3"x 16'0" 4'0"x 8'0" 4'0"x 12'0" 4'0"x 16'0"
3-6-40	3"	8"	.40	1.46	7'0"x 8'0" 7'0"x 12'0" 7'0"x 16'0" 6'3"x 8'0" 6'3"x 12'0" 6'3"x 16'0"
3-6-45	3"	8"	.45	1.65	5'9"x 8'0" 5'9"x 12'0" 5'9"x 16'0" 4'9"x 8'0" 4'9"x 12'0" 4'9"x 16'0"
3-6-50	3"	8"	.50	1.83	7'0"x 8'0" 7'0"x 12'0" 7'0"x 16'0" 6'0"x 8'0" 6'0"x 12'0" 6'0"x 16'0"
3-6-55	3"	8"	.55	2.01	5'3"x 8'0" 5'3"x 12'0" 5'3"x 16'0" 4'9"x 8'0" 4'9"x 12'0" 4'9"x 16'0"
3-6-60	3"	8"	.60	2.19	7'0"x 8'0" 7'0"x 12'0" 7'0"x 16'0" 6'0"x 8'0" 6'0"x 12'0" 6'0"x 16'0"
3-1-75	3"	8"	.75	2.74	5'9"x 8'0" 5'9"x 12'0" 5'9"x 16'0" 4'3"x 8'0" 4'3"x 12'0" 4'3"x 16'0"
3-1-100	3"	8"	1.00	3.63	4'3"x 8'0" 4'3"x 12'0" 4'3"x 16'0"

"STEELCRETE" SPECIAL MESHES

Designation of mesh	Size of mesh		Weight per sq. ft. in lbs.	Size of standard sheets
	Width of diamond	Length of diamond		
1/2" No. 18	.43"	1.2"	.74	3'0"x 8'8" 6'0"x 8'8" 6'0"x 8'0" 4'0"x 8'0" 5'0"x 8'0"
1/2-13-25	.95"	2"	.80	4'0"x 8'0" 5'0"x 8'0"
1/2-13-20	1.36"	3"	.60	6'0"x 8'0"
2-13-15	1.82"	4"	.50	4'0"x 8'0"
3/4" No. 9	.95"	2"	1.80	6'0"x 8'0"
1 1/4" No. 9	1.36"	3"	1.28	4'0"x 8'0"
2" No. 9	1.82"	4"	.90	6'0"x 8'0"
Floor Binder	1.82"	4"	.20	2'6"x 8'8"
Beam Wrapper	3"	8"	.20	0'6"x 8'8"

Note that in the decimal standard for "Steelcrete" expanded metal, the width is designated as the short way of the diamond and the length is designated as the long way of the diamond.

Co-operation and Literature.

We will send the "Steelcrete" Handbook to those who are interested in reinforced concrete. This is a cloth bound 250-page book containing many handy and complete tables for the designing of reinforced concrete slabs and beams.

The Universal Slab Computer is a celluloid slide rule for quick calculations in reinforced concrete. A charge of twenty-five cents is made to cover the mailing charge.

CORRUGATED BAR COMPANY

Concrete Reinforcement

Mutual Life Building
BUFFALO, N. Y.

DISTRICT OFFICES

NEW YORK, N. Y., Whitehall Building, 17 Battery Place
CHICAGO, ILL., 20 West Jackson Boulevard
PHILADELPHIA, PA., Transportation Building
BOSTON, MASS., 27 School Street
DETROIT, MICH., 400 Penobscot Building
ST. LOUIS, MO., Boatmen's Bank Building

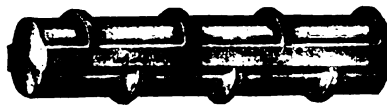
ST. PAUL, MINN., Pioneer Building
KANSAS CITY, MO., 1505 Waldheim Building
SYRACUSE, N. Y., Union Building
MILWAUKEE, WIS., 820 Wells Building
HOUSTON, TEX., 700 North San Jacinto Street
ATLANTA, GA., 1017 Grant Building

Products.

CORRUGATED BARS; CORR-BAR UNITS; SPIRALS;
CORR-PLATE FLOORS; CORR-MESH, a ribbed expanded
metal.

Corrugated Bars.

All bond is mechanical—it is the entering of cement into irregularities in surface of reinforcing material. In smooth bars, such adhesion as takes place is entering of cement into the microscopic surface pores of the metal. This is very small, particularly in small bars, which are somewhat cold rolled, and in which surface pores are of negligible value for this purpose. Furthermore, when working stress of 16,000 lbs. per sq. in. is developed in steel, diameter has been materially reduced; i.e., material when compared to depth of surface pores.



[CORRUGATED ROUNDS (PATENTED)]

Corrugated Bars are rolled both round and square in cross section and have ridges or corrugations which effect a positive mechanical bond with concrete. Made of intermediate grade steel.

Bond Tests—Many bond tests on beams under stress, made at different places, have invariably shown the Corrugated Bar to be superior in a marked degree to all other types of reinforcement.

Sizes—We carry in stock, Corrugated Bars of the standard sizes having areas equivalent to $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$ and 1 in. round; and $\frac{1}{2}$, 1, $1\frac{1}{8}$ and $1\frac{1}{4}$ in. square.

Column Spirals.

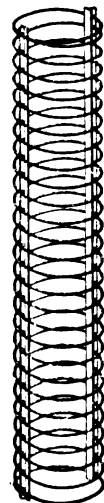
Spirals for columns are shop fabricated, made of cold drawn wire with T-section spacers and furnished in any length, in diameters of 10 to 36 in., pitch 1 to 4 in. A large stock is at all times available for immediate shipment.

Corr-Bar Units.

Insure correct reinforcement in accordance with specifications and save much labor cost because only one piece has to be handled instead of fifteen to twenty. Shop fabricated and self-positioning reinforcement for concrete beams and girders. Each unit, representing the entire reinforcement for beam, anchored rigidly together, is made collapsible for shipment, and is opened on the job and set in the form where it positions itself.



CORR-BAR UNITS (PATENTED) READY TO PLACE



SPIRALS
FOR
COLUMNS

Corr-Plate Floors.

A 2-way system of reinforcing that has been determined by the Research Department of this company to be scientifically correct and far more economical than any "umbrella" form of reinforcing for a flat slab concrete floor. This Department's extensive laboratory and field tests have proved that in over 90% of the area of the panel, the lines of principal stress are parallel to sides of panel. Corr-Plate floors satisfy these requirements.

In Corr-Plate floors, a cap about 2 in. thick is used around column to take care of stresses which are much greater there, at the same time saving much concrete. Cap can be underneath the floor or, if wood flooring is used, on top, leaving a perfectly smooth ceiling.

Corr-Plate floors save in total height of structure for given clear story heights. Forms and ease of erection are simpler; lighting and ventilation are better. Large savings are effected in cost of sprinkler, shafting, piping, elevators and other installations.

Corr-Mesh.

Corr-Mesh is an expanded metal with integral stiffening ribs connected by a diamond mesh. It is so expanded that no internal stresses are produced in the metal; it is not necessary to handle it carefully in order to avoid splitting, a condition peculiar to the over-expanded products. A protective coating of paint is applied after expansion.

Ribs obviate necessity of studs for partitions, practically eliminate centering for floor and roof construction, and materially reduce amount of light steel framing required for suspended ceilings.

Kinds—There are 2 kinds of Corr-Mesh; one with $\frac{3}{4}$ -in. ribs and the other with $\frac{5}{16}$ -in. ribs. The former is called " $\frac{3}{4}$ -in. Rib Corr-Mesh," the later " $\frac{5}{16}$ -in. Rib Corr-Mesh."

Gages—Standard sheets of both kinds are made in Nos. 24, 26 and 28 U. S. gages, painted. Other gages can be furnished if required.

General.

Catalogues, detailed information, etc., sent in response to requests on business letterheads.



$\frac{3}{4}$ -IN. RIB CORR-MESH

THE GENERAL FIREPROOFING COMPANY

Expanded Metal Lath, Expanded Metal Reinforcement, Steel Tile for
Floor Construction and Steel Lumber

YOUNGSTOWN, OHIO

BRANCH OFFICES

CHICAGO, 325 West Madison Street
NEW YORK, 257-63 E. 133rd Street
BOSTON, 125 Federal Street
BUFFALO, 40 Builders' Exchange
BALTIMORE, 5 East Fayette Street

ATLANTA, Decatur Street
PHILADELPHIA, 512 Bulletin Building
KANSAS CITY, 1009 Waldheim Building
OMAHA, 213 Kennedy Building
SYRACUSE, 110 Davis Street

MINNEAPOLIS, 754 Builders' Ex-
change
MILWAUKEE, 1018 First Wisconsin
National Bank Building
SAN FRANCISCO, 444 Market Street

EXPORT DEPARTMENT: 438 Broadway, NEW YORK

Products.

"HERRINGBONE" RIGID METAL LATH,
Painted, Galvanized or American Ingot Iron
(Armco).

"KEY" EXPANDED METAL LATH;
METAL LATH for every purpose.

COLD ROLLED CHANNELS, used as Stud-
ding for Metal Lath Partitions and as Furring for Sus-
pended Ceilings, Cornices, False Beams and Ornamental
Plaster Work.

CORNER BEAD, for supporting and protecting
exposed plaster corners.

"SELF-SENTERING," an Expanded Metal Reinforce-
ment for Concrete, acting as both Form and Reinforce-
ment or as Lath and Stud.

EXPANDED METAL ANGLES.

"TRUSSIT," a patented Reinforcement for Curtain
Walls and Partitions without studding.

EXPANDED METAL, the general purpose Reinforce-
ment for Concrete Work.

STEEL LUMBER, used similarly to wood joists and
studs in Fire Resistive Floor and Partition Construction.

PEDS, patented Spot Grounds for attaching wood
and metal trim to walls, and screeds to concrete
floors.

STEEL-TILE and END-TILE—Steel Forms for T-
beam Concrete Floors.

For Waterproofings, Dampproofings and Technical
Paints, see page 170.

Handbooks.

GF publications cover construction data completely,
and include standard specifications.

The "Herringbone" Catalogue contains full infor-
mation on "Herringbone" lath.

The Fireproofing Handbook treats fully the uses of
"Self-Sentering," "Trussit" and expanded metal.

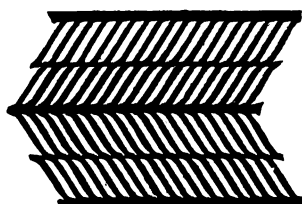
The Steel-Tile Handbook includes drawings, for-
mulas, tables and computations for the concrete designer.

The Steel Lumber Handbook gives data on floor
and partition construction without wood joists or studs.

Specific information on any of these products,
together with advice and estimates on particular appli-
cations, can be obtained from our Engineering Service
Department.

"Herringbone" Expanded Metal Lath.

"Herringbone," univer-
sally used because of its stiff-
ness, is, on account of its
heavy, longitudinal ribs, the
stiffest metal lath made. Its
use permits the widest stud
spacing. The "Herring-



"HERRINGBONE" EXPANDED
METAL LATH
STYLE BB



TRADE-MARK
Reg. U. S. Pat. Office

bone" standard is 16 in. on centers.

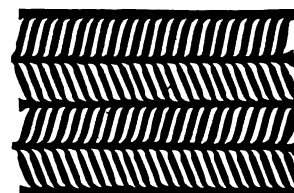
"Herringbone" offers a firm, flat sur-
face, over which it is easy to lay a level
coating of plaster. It will not buckle or
sag between supports, which means a saving
on plaster and labor. The interlocking
edges eliminate waste from lapping and
materially reduce the cost of lacing the sheets together.

The flat cross-stands spread the mortar, which
completely envelops them
and curls around the
ribs, forming a perfect key.
A coat of protective paint is
as much a part of "Herring-
bone" as the metal it is made
of. When not ordered gal-
vanized, it is furnished
painted. Suitable for all in-
terior plastering, as well as
for exterior stucco work.

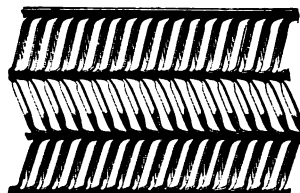
As a special precaution against corrosion, where
salt air or industrial gases are present, "Herringbone"
can be furnished galvanized
or made from "Armco"
(American Ingot) iron.

The "Herringbone" cat-
alogue, containing standard
lathing and plastering speci-
fications, mailed on request.

Refer also to the stand-
ard specifications in the
"Metal Lath Handbook" of
the Associated Metal Lath
Manufacturers.



"HERRINGBONE" EXPANDED
METAL LATH
STYLE A



"HERRINGBONE" EXPANDED
METAL LATH
STYLE AAA

HERRINGBONE EXPANDED METAL LATH, APPROXIMATE WEIGHT PER SQUARE YARD

Gage number	Weight, painted	Weight, galvanized
STYLE BB, STANDARD LATH FOR CEMENT SIDING CONSTRUCTION AND FIREPROOF PARTITION		
27 U. S. Standard	2.25 lbs.	2.82 lbs.
26 U. S. Standard	2.50 lbs.	Not made
24 U. S. Standard	3.37 lbs.	3.91 lbs.
22 U. S. Standard	4.21 lbs.	Not made
Sheets 20 1/4 x 96 in., 1 1/4 sq. yds. Size of mesh, 1 1/4 x 1 1/4 in. Packed 15 sheets (22 1/2 sq. yds.) to the bundle.		
STYLE A, STANDARD LATH		
28 U. S. Standard	3.00 lbs.	3.75 lbs.
Sheets 13 1/4 x 96 in., 1 sq. yd. Size of mesh, 1 1/4 x 1 in. Packed 20 sheets (20 sq. yds.) to the bundle.		
STYLE AAA, THE "GENERAL PURPOSE" LATH		
27 U. S. Standard	2.53 lbs.	3.17 lbs.
26 U. S. Standard	2.81 lbs.	Not made
24 U. S. Standard	3.79 lbs.	4.39 lbs.
22 U. S. Standard	4.74 lbs.	Not made
Sheets 18 x 96 in., 1 1/4 sq. yds. Size of mesh, 1 1/4 x 1 1/4 in. Packed 15 sheets (20 sq. yds.) to the bundle.		

NOTE—All styles furnished painted, galvanized or made from rust resisting
"Armco" iron.

GF Cold Rolled Channel Studding and Furring.

Rolled from No. 16-gage steel, with square corners and true right angle sides. GF channels are light, stiff and straight; therefore, easily erected. Lath goes on quickly, because the channels do not twist and turn, but stand up squarely in place.

Used for studding in solid or hollow partitions, for furring on flat or suspended ceilings, false beams, columns, cornice work and on masonry.

Plain channels furnished in widths of $\frac{3}{4}$, 1, $1\frac{1}{2}$ and 2 in., and lengths of 12, 14, 16, 18 and 20 ft.

Perforated channels (punched for easy erection of metal lath) furnished in widths $1\frac{1}{2}$ and 2 in., same lengths as plain channels.

Both styles stocked in large quantities.

GF Corner Bead.

A heavy galvanized bead with enough backbone to make erection easy, and so designed that the plaster coat is carried tight up to the nose and held firmly in place. GF corner bead with "Herringbone" lath insures a job that will not crack.

Made with or without clip. No. 26 gage. Stock lengths, 6, 7, 8, 9 and 10 ft.

"Key" Expanded Metal Lath.

"Key" expanded metal lath is adapted for all kinds of work; but is especially suitable for curved surfaces because of its uniform pliability.

"Key" lath is easy to handle and erect. A small mesh insures its complete envelopment in plaster, with the use of a minimum amount of material. The large sheets reduce the number of laps and save both labor and material.

For lathing and plastering specifications see the standard specifications in the "Metal Lath Handbook" of the Associated Metal Manufacturers.

"Self-Sentering."

"Self-Sentering" is a combined reinforcement and centering used extensively for floor and roof construction. It is also adaptable for solid and hollow walls, light partitions, etc., making possible a light weight, thin slab, built without expensive formwork, and equal to heavy reinforced concrete in fire protection.

Roofs of any design and pitch can be built with "Self-Sentering," requiring little more than the permanent purlins and trusses for centering, and no solid forms.

"Self-Sentering" is an expanded metal sheet, stiffened by heavy ribs $\frac{11}{16}$ in. high, and spaced $3\frac{5}{8}$ in. apart. The ribs carry the weight of the concrete until set; the diamond mesh forms a perfect bond for the concrete.

Sizes—Sheets are 29 in. wide and are furnished in lengths from 4 to 12 ft., in variation of 1 ft. Long sheets permit rapid erection and minimum laps. The side ribs nest snugly.



"SELF-SENTERING"
Patented March 3, 1914

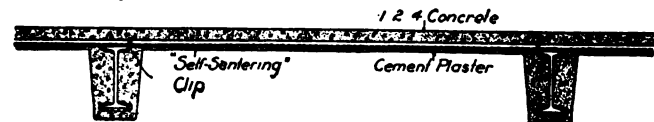
STOCK GAGES AND WEIGHTS PER SQUARE FOOT

Gage number	Weight, painted	Weight, galvanized	Sec. area per ft. of width
28	.58 lb.	.72 lb.	.173 sq. in.
26	.70 lb.	.90 lb.	.208 sq. in.
24	.93 lb.	Not made	.277 sq. in.

Other gages furnished on special order.
Galvanized "Self-Sentering" furnished on special orders only.

"Self-Sentering" Floor Designs.

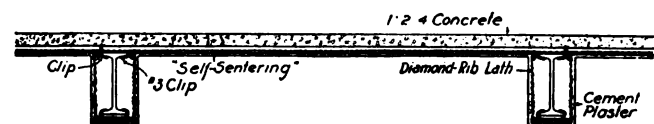
"Self-Sentering" Floor, Type No. 1—"Self-Sentering" is attached direct to steel beams by clips; concrete applied to the desired thickness and the underside plastered with cement mortar. Sides of beam boxes are wired together, to save bracing across the span. To permit pouring the beam covering at the same time, punch out the mesh between the "Self-Sentering" ribs where they come over the beam.



"SELF-SENTERING" FLOOR, TYPE NO. 1

"Self-Sentering" Floor, Type No. 2—This type is the same as No. 1, except that beams are fireproofed with metal lath and plastered.

This can be done at the same time the underside of the slab is plastered.



"SELF-SENTERING" FLOOR, TYPE NO. 2

SAFE UNIFORMLY DISTRIBUTED LIVE LOADS PER SQUARE FOOT ON "SELF-SENTERING" SLABS**Assumptions:**

Stress in steel, 16,000 lbs. per sq. in.
Ratio between the moduli of elasticity, 15.
Center of gravity, .19 in. above bottom slab.
R. M. = resisting moments per ft. width in in. lbs.; f c. = maximum extreme fiber stress in concrete.

$$\text{Bending moment} = \frac{WL}{10}$$

Gage "Self-Sentering"	Thickness of slab above mesh	R. M.	f c	Span					
				3-ft.	4-ft.	5-ft.	6-ft.	7-ft.	8-ft.
28	2"	4,360	660	310	164	98	61	...	...
26	2"	5,190	760	359	192	128	92	49	...
24	2"	6,210	800	476	258	166	110	64	30
28	2½"	5,625	560	419	233	150	93	57	...
26	2½"	6,710	650	484	279	186	118	76	50
24	2½"	8,720	680	...	377	254	165	111	76
28	3"	6,920	500	561	311	184	114	73	45
26	3"	8,240	560	...	386	231	147	97	64
24	3"	10,820	600	...	512	322	210	143	100
28	3½"	8,250	460	...	368	218	135	80	50
26	3½"	9,800	500	...	455	274	174	115	76
24	3½"	12,750	610	...	...	375	245	166	116
28	4"	9,500	425	...	439	261	164	105	68
26	4"	11,300	460	...	533	320	206	136	91
24	4"	14,800	560	...	...	436	286	196	137

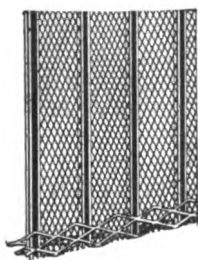
Tables for other spans, also tables and complete data for all types of "Self-Sentering" floors and roofs, are given in the "Fireproofing Handbook." A copy of the latest edition available on request.

Expanded Metal Angles.

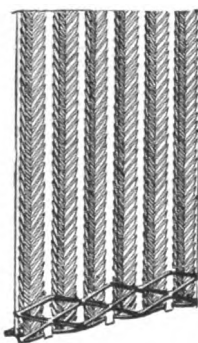
For attaching "Trussit" or "Self-Sentering" to floor and ceiling in studless partition and curtain

Continued on next page

wall construction. Made of No. 13-gage steel; furnished in lengths up to 8 ft.



EXPANDED METAL ANGLES

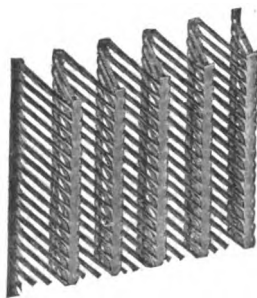


"Trussit."

"Trussit" is an expanded steel reinforcement which is particularly adaptable to the construction of light fireproof walls and partitions of 1½ in. thick and over; also, of solid and hollow walls, curtain walls, elevator enclosures, small individual structures, or offices in a larger building—wherever a fireproof, soundproof partition is required.

"Trussit" eliminates the usual studding, a few temporary braces being required only till the plaster coat on one side is set. Sheets are attached to floor and ceiling with expanded metal angles or by other methods that insure a firm support.

"Trussit" is uniformly expanded in both directions. This makes it possible to plaster upon each side exactly alike, and, when the wall is finished, steel and concrete are so uniformly distributed that expansion or contraction in any direction is prevented by the "Trussit" reinforcement.

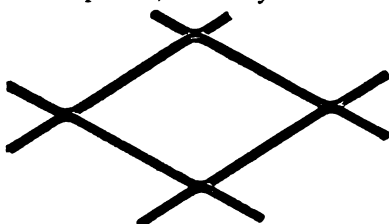
"TRUSSIT"
Patented

Stocked in gages Nos. 27, 26 and 24 and sheets 8, 10 and 12 ft. long; sheets uniformly 19 in. wide. Furnished painted, galvanized or made from "Armco" (American Ingot) iron.

Expanded Metal Reinforcement.

Expanded metal, made by expanding sheets of steel into elongated diamond shape mesh, has greater reinforcing strength, pound for pound, than any other material. It can be cut and expanded to a greater variety of sizes adapted for particular classes or sizes of work.

The larger mesh is used for concrete reinforcement in con-



EXPANDED METAL

DATA, EXPANDED METAL

Style	Size mesh, short way of diamond	Nominal gage metal	Net section area per foot width—in sq. in.	Approx. weight per sq. ft., lbs.	Standard Size Sheets	
					Lengths long way of diamond	Widths short way of diamond
1½-12-194	1½"	12	.194	.66	6', 8'	3', 4', 6'
½-18-220	½"	18	.220	.75	6', 8'	4', 6'
3-10-353	3"	10	.353	1.20	6', 8', 9' and 10'8"	3', 4', 6'
3-10-265	3"	10	.265	.90	6', 8', 9' and 10'8"	4', 5', 5'4"
3-10-176	3"	10	.176	.60	6', 8', 9' and 10'8"	3', 4', 5', 6'
3-12-150	3"	12	.150	.51	6', 8', 9' and 10'8"	3', 4', 6'
3-16-082	3"	16	.082	.278	6', 8' and 10'8"	3', 4', 5', 6'
¾-12-246	¾"	12	.246	.84	6', 8'	3', 4', 6'

A full line of expanded metal carried in stock at all times.

struction of floors, roofs, sidewalks over basements, bridge decks, retaining walls, sewers, conduits, tanks, reservoirs, etc. Smaller mesh widely used in lighter cement work and for railings, window guards, machinery guards, elevator and tool room enclosures.

Style 3-10-176 (3-in. mesh, No. 10-gage, .176 sq. in. sectional area, illustrated) is a type very commonly used for general work.

Peds.

Peds are patented spot grounds for attaching wood or metal trim to walls, and screeds to concrete floors. Wall Peds adhere permanently to metal lath, brick, concrete, gypsum block or hollow tile surfaces. They are fastened with plaster, which keys through the holes in the metal rim. Peds are easily and economically applied, and give a better nailing base for wall trim and a much lower grounding cost.

Floor Peds are set in mortar beds 16 in. on centers and 18 to 24 in. apart in rows, and pressed level with a straightedge. Screeds are then nailed to the Peds, providing a firm base for the floor.

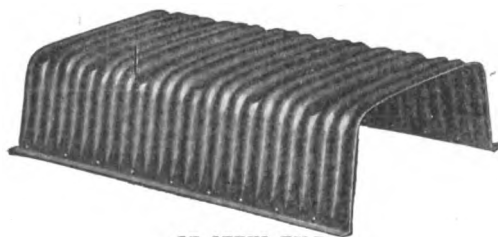
Peds will not shrink, come loose, or split when nails are driven in.

Steel-Tile and End-Tile.

GF Steel-Tile are light weight steel forms for concrete floors, designed on the well-known T-beam principle—deep reinforced joists and thin connecting slabs of concrete.

One of the advantages of Steel-Tile construction lies in the substantial reduction in weight. Lazy concrete is reduced to the minimum, saving a good percentage of the load upon girders, columns, foundations and footings, and permitting a lighter construction throughout, without sacrificing strength.

GF Steel-Tile make the old, expensive solid form work unnecessary. Centering along the line of joists, which are 25 in. apart, is sufficient. Flanges are flat and fit snugly against forms, preventing any leakage of concrete.



GF STEEL-TILE

PROPERTIES OF STEEL-TILE FLOORS

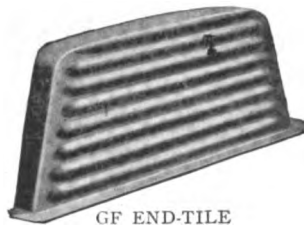
Width of joists	Center to center of joists	2" of Concrete Above					
		Size Steel-Tile....	6"	8"	10"	12"	14"
4"	24"	Average weight per sq. ft., lbs..	40.1	46.0	53.5	61.0	72.6
		Cu. ft. of concrete per sq. ft. of floor	.278	.319	.371	.423	.505
		Core area, per cent of section.....	58.3	61.7	63.0	63.8	62.2
5"	25"	Average weight per sq. ft., lbs..	42.3	49.4	57.1	65.3	78.4
		Cu. ft. of concrete per sq. ft. of floor	.293	.342	.396	.452	.537
		Core area, per cent of section.....	55.9	59.2	60.3	61.2	59.7

Send for GF Steel-Tile Handbook.

Steel-Tile are adaptable in schools, hotels, office buildings, department stores, apartments, warehouses, lofts, etc. Wherever long spans are required GF Steel-Tile construction will be found most economical.

Flat ceilings are easily constructed under Steel-Tile floors. Suspended ceilings are built upon hangers suspended through joists before pouring concrete.

GF Steel-Tile with End-Tile to match are made of corrugated steel in sizes of 4, 6, 8, 10, 12 and 14 in., also of 10, 12 and 14 in. in tapered tile and tapered ends. Steel-Tile are furnished in lengths of 30 and 35 in. Width at bottom, 20 in., exclusive of flange. Shipped nested.



GF END-TILE

GF Steel Lumber.

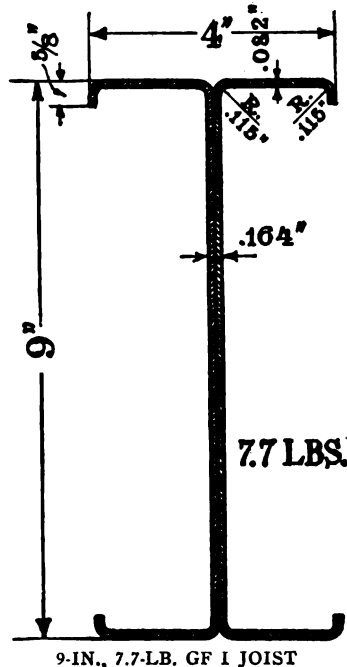
Description—GF Steel Lumber gives economical light weight construction that is permanent, durable, fireproof and soundproof. It provides a construction which eliminates combustible material entirely, with the minimum dead weight on beams and columns, and is a safe, dependable type of construction for all seasons.

Steel Lumber is cut and fabricated ready for use when it arrives on the job, and is handled and placed similar to ordinary wood construction.

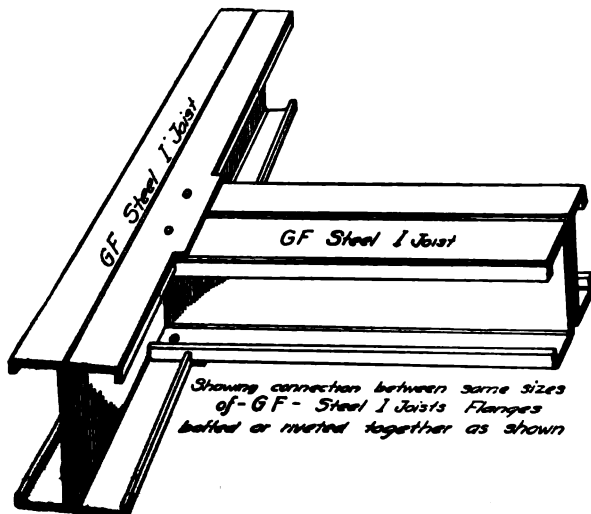
GF Steel Lumber joist sections are made of two absolutely uniform strips of special steel, formed cold into channel sections and spot-welded together in one operation. A process insuring absolute uniformity of size and strength of the finished member. All lengths continuous, no splices.

All GF Steel Lumber is given one coat of oil before fabrication, and after fabrication the sections are dipped in a special graphite paint before shipping to destination.

GF Steel Lumber floor construction consists of pressed steel joists of the proper size and spacing for the load and span. All joists to be placed parallel to each other on supporting beams or walls, and are to be secured in position by 1-in. strips of No. 20



9-IN., 7.7-LB. GF I JOIST



Showing connection between same sizes of GF-Steel I Joists. Flanges bolted or riveted together as shown

GF STEEL I JOISTS CONNECTED WITH BOLTS OR RIVETS

gage steel cross bracing, approximately 6 ft. on centers.

GF Steel Lumber is furnished in 4-, 5-, 6-, 7-, 8-, 9-, 10-, 11-, and 12-in. floor joist and 4-in. channels and I's for studding.

Specifications—**METAL LATH**—Over joist a layer of Herringbone metal lath is to be placed to support and reinforce the thin concrete insulating slab, in which wooden floor screeds are embedded. (If cement finish or tile floor is desired, screeds to be omitted; in which case a richer mix of concrete shall be used for top slab.) Herringbone lath on top of joist to be attached by driving large head 6d roofing nails through lath directly into joint between the 2 sections of joist.

For wood floor finish, screeds or nailing strips, approximately $1\frac{3}{4}$ by $1\frac{3}{4}$ in., to be set directly on top of Herringbone metal lath and along the center line of the GF steel joist and attached to joist with 12d nails at frequent intervals. Floor filling to be placed between screeds, lightly-tamped or pressed in place and neatly levelled off flush with their surface. Wood finish floor is then nailed directly to screeds. The metal lath under joists to be Herringbone rigid metal lath of sufficient weight to support $\frac{3}{4}$ to 1 in. of plaster ceiling, and retain its true position when the ground coat is applied. All metal lath to be given a dip coat of good paint by the manufacturer.

Herringbone metal lath for floor and ceiling to be lapped at ends and sides. All laps at ends of sheets to come on top of or directly under steel joists. Ceiling lath under joists to be secured by special clips.

Prongs for attaching lath to steel joists and studs may be punched in flanges of sections. Prongs in the same flange of I-section to be staggered on opposite sides of web. No prongs to be punched from top flange of floor joists. Prongs punched from lower flange of floor joists for attaching ceiling lath are not to exceed $11\frac{1}{2}$ in. center to center in channel section, and are to be staggered in the opposite half of the I-joists. Prongs to be not less than $\frac{1}{4}$ in. wide, nor more than $\frac{3}{8}$ in. wide at their base, and not less than $\frac{3}{4}$ in. long.

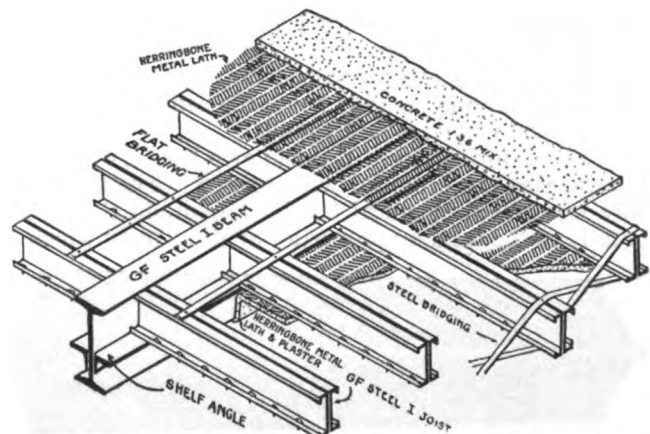
FLOOR FILLING—Top lath to be covered with floor filling as specified, and may be dry cinders or light concrete if a wood top floor is used. If cement finished floor is desired, use 1-2-4 concrete for fill.

SPACING—In no case shall joists in floor construction, or any studs in bearing partition construction, be spaced more than $23\frac{1}{2}$ in. center to center. In roof construction, where metal lath and a concrete slab are used above the steel joists, joists shall not be spaced more than 30 in. center to center. Where steel joists are used to support cement tile on flat roofs, spacing of joists may be increased to meet tile requirements, provided joists are tied together at intervals not exceeding 6 ft. on centers by $\frac{1}{2}$ -in. round steel tie rod securely fastened through joists at each end of rods. Punching of holes for rod connections to be along neutral axis of joists.

APPROXIMATE WEIGHT OF GF STEEL LUMBER FLOORS

	Weight per sq. ft.
Wood flooring.....	3 lbs.
$1\frac{3}{4}$ -in. concrete.....	21 lbs.
GF steel joists (average).....	3 lbs.
Plaster ceiling.....	7 lbs.
Total.....	34 lbs.

Above is based on a wood floor finish. For other types of finish make proper correction. Total dead weight will not exceed 40 lbs. per sq. ft. for any standard design of steel joist construction.



GF STEEL LUMBER AND METAL LATH IN PRACTICAL APPLICATION

PAUL J. KALMAN COMPANY

Reinforcing Steel and Concrete Accessories

22 West Monroe Street
CHICAGO, ILL.

DISTRICT SALES OFFICES

KANSAS CITY, MO., Security Bank Building
MILWAUKEE, WIS., First National Bank Building
WAREHOUSES AND FABRICATING SHOPS: CHICAGO, ILL., MINNESOTA TRANSFER, MINN.

ST. PAUL, MINN., Merchants National Bank Building
MINNEAPOLIS, MINN., Builders Exchange Building

Products.

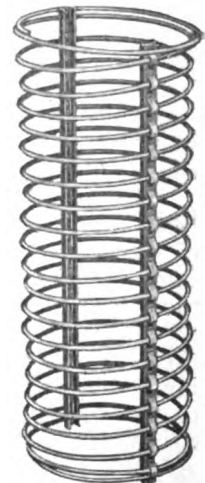
KALMAN GRIP BARS for concrete reinforcement, MACHINE MADE COLUMN SPIRALS.

KALMAN ACCESSORIES (patented): SLAB SPACERS, RIB CHAIRS, BEAM CHAIRS, BAR CLIPS, CHAIR CLIPS.

Also manufacturers of Column Clips and Spacing Clips.



not twist or wind when bent. This is particularly of advantage in the use of square sections, and makes the Kalman grip bar especially desirable for work demanding extreme accuracy of detail.



KALMAN COLUMN SPIRAL

Kalman Service and Facilities.

Kalman warehouses and fabricating shops are the nerve centers of Kalman service. Ample storage facilities permit the maintenance of large stocks from which prompt shipments are made. Mechanical handling provides for rapid movement of these stocks.

Kalman bending is done with equipment of special design, developed by long study of this class of work. Bent bars are furnished to exact detail and no deviation from this standard is permitted. All bars are tagged for size, length, and special marking with reference to position in the structure.

Exceptional resources for prompt and positive forwarding of Kalman products are basic elements of Kalman service.

Kalman engineers are available at the several offices of this Company for consultation on matters of design, estimate, and general technical features of reinforced concrete construction.

Kalman Grip Bars.

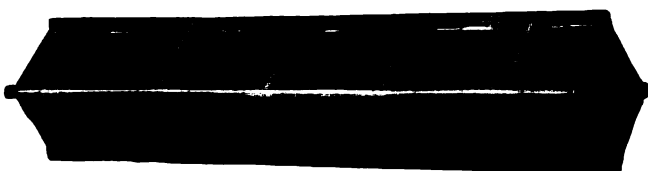
Deformed bars meeting in all essentials the stand-



KALMAN ROUND GRIP BAR

ards generally recognized and approved for reinforcing steel. These bars are rolled from new billet stock exclusively and are furnished in square and round sections, sizes and weights being the same as are standard for plain squares and rounds.

The deformation of Kalman grip bars is distinctive. Lateral ribs are provided with correct frequency to insure effective mechanical bond. Longitudinal ribs add greatly to the bending properties of these bars, which do



KALMAN SQUARE GRIP BAR

Kalman Spirals.

Kalman spirals are strongly and accurately made. They are coiled by machinery of special design, which prevents variation in diameter, and are assembled to specified pitch and length with stiff channel iron spacers which maintain alignment and allow collapsing of the spiral for convenient shipment and handling.

Kalman Accessories.

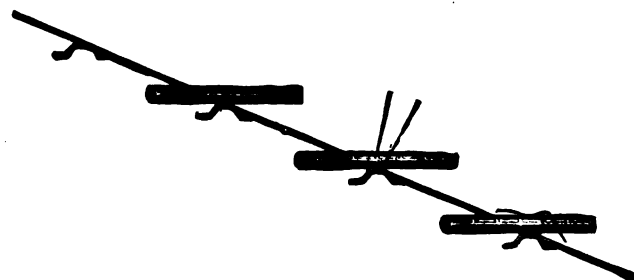
Selected for suitability for the required purposes, flexibility to meet varying conditions of use, economy of cost, ease and directness of application, permanence of results obtained by their use, and adaptability to compact and orderly packing for shipment and handling. Kalman accessories are protected by patents.

Slab Spacers—Strongly built of steel rods, with wire legs welded at every bar location. Made for service. Exceptionally light and easy to handle. Will positively hold slab steel where it belongs.

Kalman slab spacers do not tip over; do not dig into the forms; do not collapse when stepped on.

Concrete in perfectly; nest compactly for bundling. Are shipped straight and reach the job straight.

Furnished in lengths and spacings to conform with design details of each job. Bundling and tagging is carefully done to insure delivery in acceptable condition. Made in standard heights: $\frac{1}{2}$, $\frac{3}{4}$ and 1 in. Made up promptly to order.



KALMAN SLAB SPACER

Rib Chairs—Furnished for use in any and all of the many types of ribbed floor construction. Kalman rib chairs provide rod seats with ample depth and sepa-

ration, with supporting legs that give exceptional stability. No obstruction to flow of concrete.

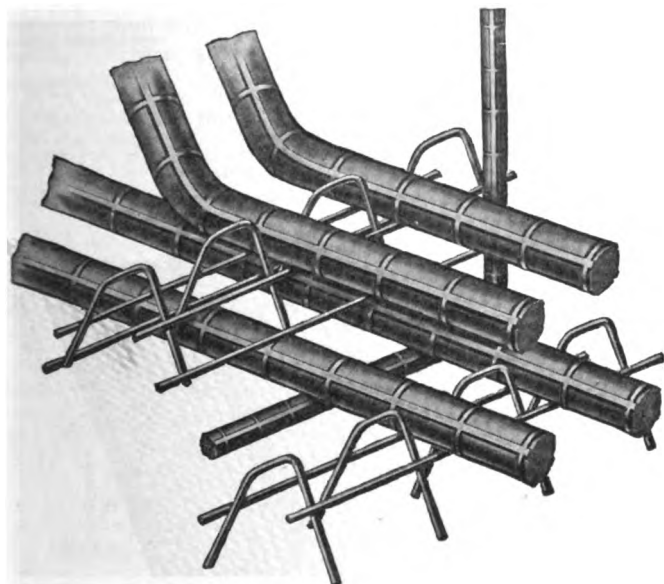
Furnished in sizes for 4-, 5- or 6-in. ribs. Standard rod elevations: $\frac{1}{2}$, $\frac{3}{4}$ and 1 in. Special sizes provided on short notice. Carried in stock, packed in fiber containers, and reach the job in perfect condition.



KALMAN RIB CHAIR

Beam Chairs—Strongly made of wire parts, electrically welded. Kalman beam chairs combine maximum stability and supporting strength with minimum interference to flow of concrete. Trussed for lateral stiffness. Solidly footed to prevent overturning. Chair, or separator, to carry a second layer of rods, rests directly on the lower layer rods and is not in any way dependent on connection with the chair beneath the lower rods.

Made to order to fit exact requirements of detailed design. Special attention given to packing, strong fiber cartons being used.



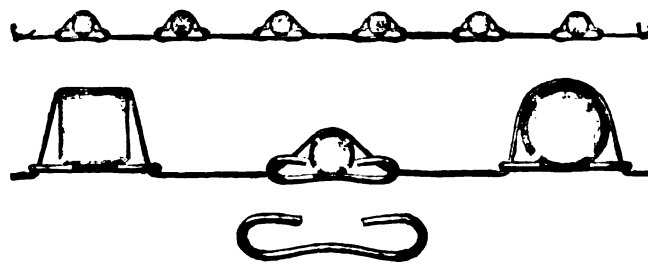
KALMAN BEAM CHAIR

Bar Clips—Universal clips for fastening a rod to a continuous wire, so that the rod can not slip or work loose. They are primarily an improved means for tying steel, but provide a very economical method of preserving spacing. One size of clip serves for all rod sizes.

This clip, with the Kalman chair clip, will greatly simplify the assembly of any and all steel arrangements commonly met with.

The application of a clip is exceedingly simple. Soft wire is used, preferably No. 16-gauge for slab steel and No. 12- or No. 14-gauge for wall rods. One end of the wire is fastened to a nail or other suitable anchorage. In applying the clip, the wire is first engaged within one hooked end. The bar is placed between the wire and the clip, the wire brought around the bar and engaged within the second hooked end. A slight pull on the wire takes up the slack and the bar is positively and permanently held in place. Men quickly become expert in this operation, and great speed is possible with uniform and positive results.

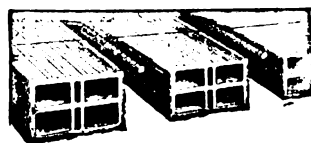
The use of this device affords wide latitude as to procedure, as it works equally well whether the bars are tied one at a time as brought to the forms or assembled



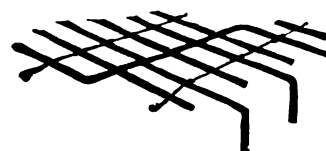
KALMAN BAR CLIP

roughly in place prior to tying. In the first instance, the wire is laid on the forms in advance of the bars, while in the latter case the wire is not placed until after the bars are laid down. This clip is a notable labor saver and adapted to be carried as a staple accessory. Spacing is provided for either by template marked on the forms, or by a simple gauging stick applied as assembly proceeds.

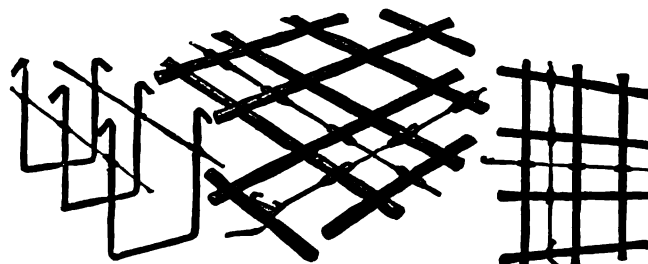
Typical details of familiar steel arrangements are shown, indicative of the wide adaptability of this device.



Rib Steel



Bent up Slab Rods



Stirrups

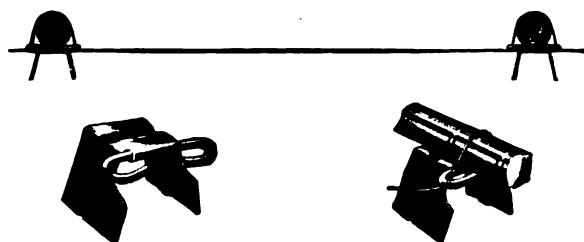
Slab Steel

Wall Steel

TYPICAL DETAILS OF STEEL PLACING TO WHICH KALMAN BAR CLIP APPLIES

Chair Clips—Combine the universal features of the Kalman bar clip with substantial bar support. Essentially labor saving devices. Regular spacing can be determined either by advance marking of the forms or by use of a gauge as assembly proceeds.

Furnished in three heights: $\frac{1}{2}$, $\frac{3}{4}$ and 1 in. Can be carried in stock as a standard accessory. Furnished in compact containers, holding 500 clips, for convenient storage and handling. In ordering, specify height desired.



KALMAN CHAIR CLIP

Catalogues, etc.

Catalogues and special information will be promptly forwarded on receipt of inquiries made on business letter heads.

ESTABLISHED 1884

NORTH WESTERN EXPANDED METAL CO.

TELEPHONES:
HARRISON 1701-2-3

GENERAL OFFICES
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CHICAGO, ILL.

CODE ADDRESS:
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CINCINNATI, OHIO, 307 Masonic Temple
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LOS ANGELES, CAL., 501 Stimson Building
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Stocks Carried in all Principal Cities—Write for name of nearest distributor

Products.

The NEMCO LINE of EXPANDED METAL PRODUCTS includes T-Rib Chanelath and the following Flat or Plastering Laths: Kno-Burn, Eureka, XX Century, Pure Iron, P.O. Special, Diamond Mesh; also these Self-furring Laths: Corrugated, and Kno-Fur.

ECONO DIAMOND MESH HEAVY EXPANDED METAL for Concrete Reinforcement, Machine Guards, etc.

NEMCO PRESTEEL LUMBER.

Also Nemco and Econo Sheathing Laths (mesh with waterproof felt backing); Metal Lath Accessories; Corner Beads, Picture Mould, Base Screed, Base Ground, Tie Wire, Cold Formed Channels.

Co-operative Service.

Specifications—Specifications in handy form and for any of our expanded metal products gladly sent.

Free Handbooks and Samples—On metal lath—"Fireproof Construction."

On concrete reinforcement—"Formless Concrete Construction," "Designing Data."

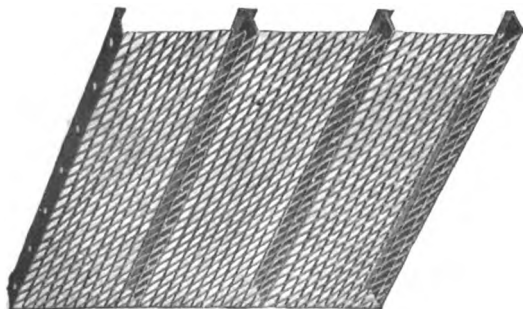
On metal lumber—"Presteel Manual."

Copies of Our Magazine—"Expanded Metal Construction" sent free on request to any engineer, architect or contractor.

Co-operation of Our Engineering Department—Our engineers will gladly advise on specific problems involving the use of any of the above products.

T-Rib Chanelath.

Description—A type of expanded metal reinforcement consisting of a parallel series of heavy cold formed T-shaped ribs $\frac{7}{8}$ in. high, spaced 4 in. center to center and connected by a $\frac{3}{4}$ - by $\frac{3}{8}$ -in. steel mesh of the small diamond shaped Kno-Burn type; mesh and ribs manufactured from a single sheet of special grade medium steel.



T-RIB CHANELATH

There are no projections in the smooth plastering surface to catch the trowel

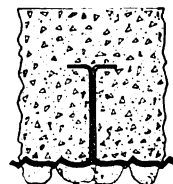
Nemco Products

TRADE-MARK

T-Rib Chanelath is furnished in lengths of 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 ft. Widths, 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44 and 48 in.

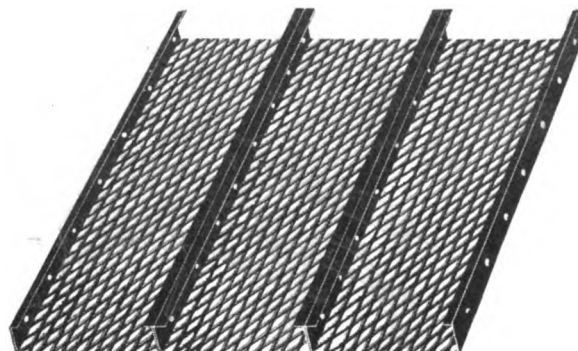
T-Rib Chanelath is always shipped painted and crated. It can be furnished curved to any radius from 24 in. up.

Uses—IN CONCRETING—A combined form and reinforcement for



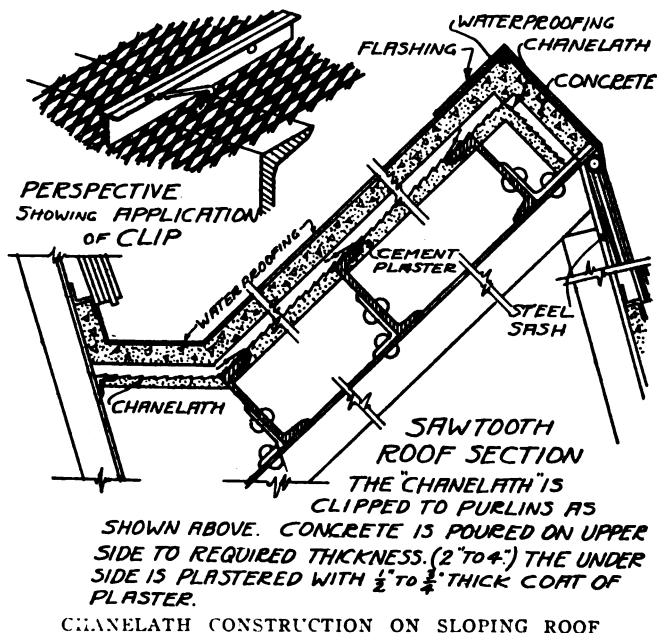
T-RIB COVERED COMPLETELY BY CONCRETE

Note knobs of concrete which have passed through mesh protecting underside of T-Rib

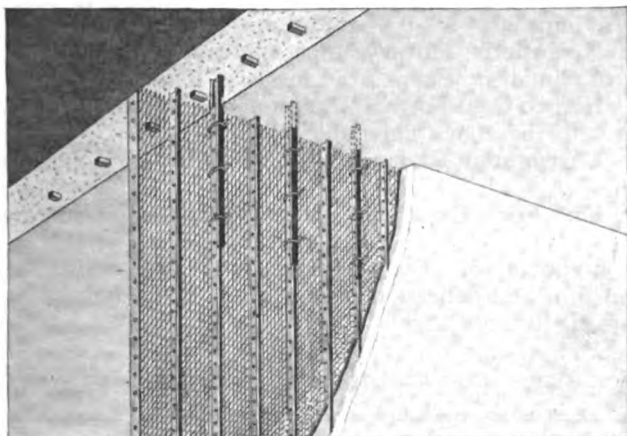


T-RIB CHANELATH

The mortar flows entirely around the T-rib, completely embedding it



CHANELATH CONSTRUCTION ON SLOPING ROOF



TWO-INCH SOLID PLASTER AND T-RIB CHANELATH PARTITION

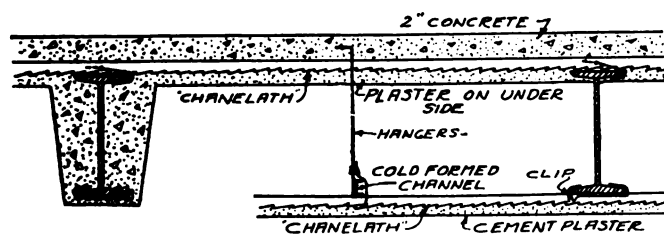
Economical, space saving, fire resisting and highly soundproof.

concrete slabs of moderate span and load, such as roofs of any style, floors, walls and on either steel frame or wood frame buildings. Its use is also indicated for tanks, culverts, small bridges, protection of steel columns, etc.

WEIGHTS AND AREAS OF T-RIB CHANELATH

Gauge	Weight, uncrated, per sq. ft., lbs.	Weight, crated, per sq. ft., lbs.	Effective sectional area per ft. of width, sq. in.
28	.56	.70	.152
26	.67	.82	.183
24	.89	1.07	.244

Chanelath is furnished painted only.

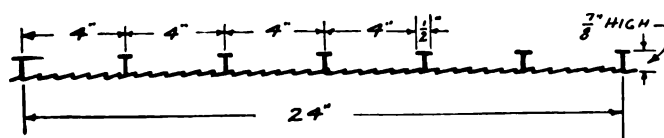


DETAILS OF VARIOUS TYPES OF CONSTRUCTION

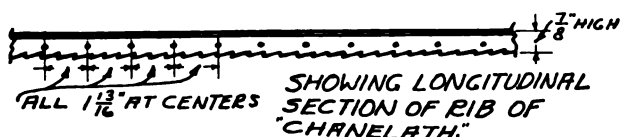
IN PLASTERING—T-Rib Chanelath acts as a combined lath and furring, saving the time and labor of



CURVED CHANELATH



SHOWING CROSS SECTION



CROSS SECTION AND LONGITUDINAL SECTION OF RIB OF CHANELATH

SWEET'S CATALOGUE

wiring on separate channels. Its use is indicated for partitions, ceilings, fireproofing of elevator shafts, beltways, etc. T-Rib Chanelath simplifies the construction of suspended ceilings. It is particularly adapted for the erection of 2-in. solid partitions which are space saving, economical, soundproof and fire resisting.

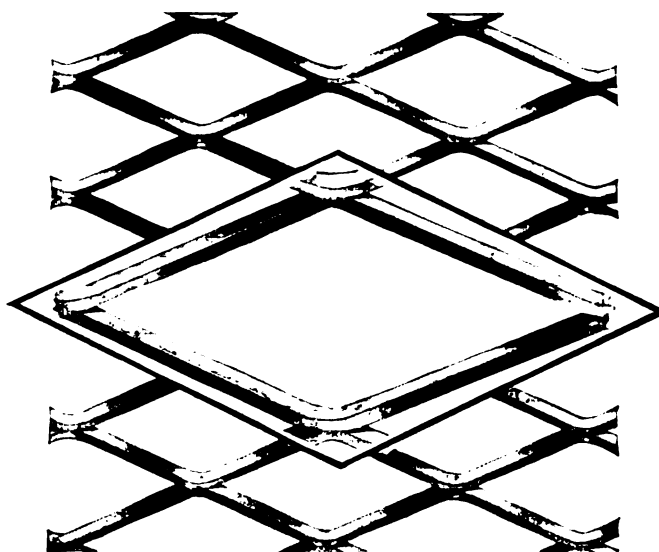
Advantages—In concreting it eliminates a big expense item—formwork. Every ounce of metal is in tension. The diamond shaped meshes diffuse strains, affording a continuous reinforcement. The heavy T-Ribs impart great rigidity. The small size of the diamond shaped openings in the connecting mesh prevent the wet concrete from seeping through and provide a smooth, unbroken plastering surface.

In plastering, the sheets are easily handled and erected, and very rapidly plastered.

Econo Expanded Metal.

Descriptions and Uses—A highly economical and satisfactory fabricated reinforcement for all types of reinforced concrete, and for fireproofing columns, etc. It is a continuous fabric of diamond shaped meshes cut and expanded from sheets of high grade medium steel.

Advantages—Does away with the cost, time and



ECONO EXPANDED METAL REINFORCING

PARTIAL LIST OF STOCK SIZES AND WEIGHTS OF ECONO EXPANDED METAL REINFORCING

Number	Area per 12 in. of width	Weight per sq. ft., lbs.	Mesh and gauge	Widths, ft.	Lengths, ft.
06-3	.06 sq. in.	.20	3"-16 gauge	3, 4, 6	6.8 and 12
10-3	.10 " "	.34	3"-12 gauge	3, 4, 6	6.8 and 10
15-3	.15 " "	.51	3"-10 gauge	3, 4, 6	6.8, 10, 12
16-3	.16 " "	.55	3"-10 gauge	3, 4, 6	6.8, 10, 12
176-3	.176 " "	.60	3"-10 gauge	3, 4, 6	6.8, 10, 12
20-3	.20 " "	.68	3"-10 gauge	3, 4, 6	6.8, 10, 12
25-3	.25 " "	.85	3"-10 gauge	3, 4, 6	6.8, 10, 12
30-3	.30 " "	1.02	3"-10 gauge	3, 4, 6	6.8, 10, 12
35-3	.35 " "	1.19	3"-10 gauge	3, 4, 6	6.8, 10, 12
40-3	.40 " "	1.36	3"-7 gauge	3 1/2, 7	6.8 and 12
10-2 1/4	.10 sq. in.	.34	2 1/4"-16 gauge	3, 4, 6	6.8 and 12
15-2 1/4	.15 " "	.51	2 1/4"-12 gauge	3, 4, 6	6.8 and 12
20-2 1/4	.20 " "	.68	2 1/4"-10 gauge	3, 4, 6	6.8, 10 and 12

For complete table of stock sizes, see the handbook "Designing Data."

Note: The steel area of each style of Econo is used as part of the number designating the style. Thus 15-3 Econo has 15/100 sq. in. of steel area for every 12 in. in width of material. The small meshes, 1/2 in. to 2 1/4 in., are in demand for making machine guards, for partitions, etc.

Continued on next page

close supervision required in the placing and tying of bars. It has, weight for weight, greater strength than any other reinforcing material.

Econo comes in sheets of a size easily handled by one man. The sheets lie flat and the builder is assured that the reinforcing is properly placed and that the correct amount of steel is used.

A concentrated load at any point is immediately taken up by the diamond meshes and distributed over the entire area.

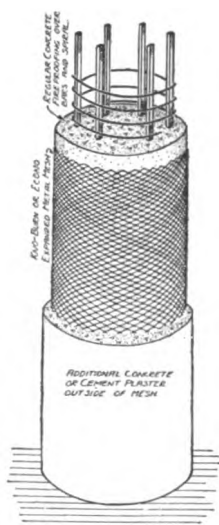
Expanded Metal Lath.

Kno-Burn—A fire resisting, permanent and economical steel base for stuccoing and interior plastering; also used for protecting columns, fireproofing elevator shafts, beltways, etc., in the construction of hollow and solid partitions, etc. In connection with Presteel Lumber it provides a highly economical type of fire resisting construction. The diamond shaped openings and meshes of Kno-Burn are $\frac{3}{8}$ by $\frac{3}{4}$ in. with strands $\frac{1}{8}$ in. wide.

Kno-Burn metal lath, with Eureka, XXth Century, Kno-Fur and the other Nemco expanded metal products come in flat sheets which do not require stretching. There is a positive bond between the adjacent strands which in handling can not be broken, exposing unprotected metal. The strands do not cut the plaster causing unnecessary waste. The plaster is reinforced in all directions.

The use of Kno-Burn is especially necessary in buildings of wood joists and studs, adequate fire protection for the combustible structural members being furnished by the protective covering of lathing and plaster.

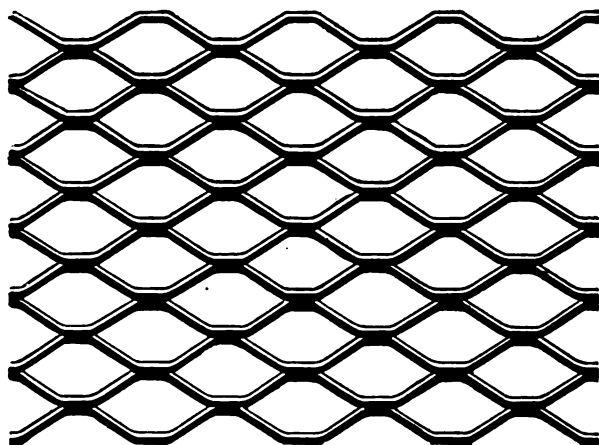
Specifications covering the use of Kno-Burn and other Nemco products gladly sent on request.



FIREPROOFING OF COLUMN USING KNO-BURN OR ECONO EXPANDED METAL



TRADE-MARK



KNO-BURN EXPANDED METAL LATH

Eureka Expanded Metal Lath—Similar to Kno-Burn, but with $\frac{7}{8}$ - by $\frac{1}{8}$ -in. mesh.

Twentieth Century—Specially adapted for damp, warm climates. Same sized mesh as Kno-Burn.

Nemco Cold Formed Channels—Recommended for use with the above flat laths.

Corrugated Expanded Metal Lath—Self-furring lath.

Kno-Fur Expanded Metal Lath—Self-furring lath.

Reports of Tests—Reports of fire resistance, acoustical and deflection tests, etc., of metal lath partitions gladly sent.

STOCK SIZES AND WEIGHTS OF KNO-BURN AND XXth CENTURY EXPANDED METAL LATH

Number	Sheets per bundle	Yards per bundle	Weight per yard, lbs.	Weight per bundle, lbs.
27-gauge	9	12	2 1/4	28
26-gauge	9	12	2 1/2	30
25-gauge	9	12	3.0	36
24-gauge	9	12	3.4	40.8

Regular size of sheets, 18 x 96 in.

Special size, 24 x 96 in., 16 yds. per bundle, can be furnished.

All gauges furnished painted.

Nemco Presteel Lumber.

Consists of channels and I-sections of cold rolled steel, 3-, 5-, 6-, 7-, 8-, 9-, and 10-in. sizes, and in lengths up to 100 ft. without splicing. Shapes cut to dimensions from mill lengths.

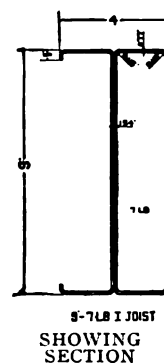
In connection with Kno-Burn or Chanellath expanded metal lath, it provides a simple, light weight and most economical type of permanent, fire resisting construction. The walls and ceilings of this type of structure are free from streaks, and the cracking of the plaster is prevented.

Untrained workmen with ordinary hand tools can erect Presteel Lumber properly and rapidly. Factory fabrication minimizes cutting or fitting on the job.

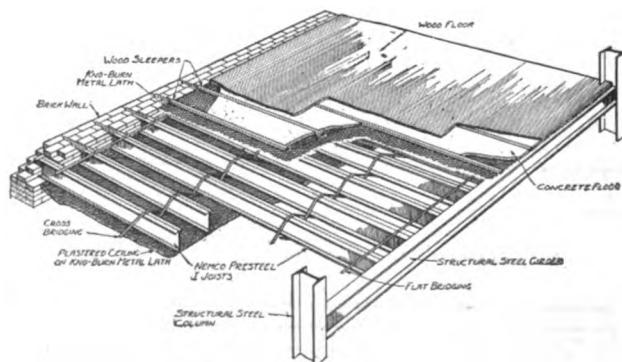
Presteel Lumber can be erected regardless of weather conditions, as finished portions of building need not be installed until after walls and roof are completed. Constant inspection is not required.

Stocks of Presteel Lumber are carried at convenient fabricating and distributing centers.

Our Engineering Department and the Sales Department of fabricators will give further information. Full information contained in The Presteel Manual.



9-7 LB I JOIST
SHOWING SECTION



PRESTEEL JOISTS USED IN CONJUNCTION WITH KNO-BURN METAL LATH

TRUSCON STEEL COMPANY

Manufacturers of Reinforcing Steel and Specialties

YOUNGSTOWN, OHIO

For list of Offices, see Page 303

Products.

REINFORCING STEEL; KAHN TRUSSED BARS; RIB BARS; RIB METAL; COLUMN HOOPING; STEEL FLORETYLES and FLOREDOMES; WIRE MESH; CONCRETE INSERTS; CONTRACTION JOINTS; CURB BARS; PRESSED STEEL LUMBER; HY-RIB REINFORCEMENT and LATH; CORNER BEADS; BASE SCREEDS.

For Steel Buildings, see page 25; for Steel Windows, see pages 303-305.

Service.

Owing to the wide range of detail of these products and the value of the technical experience of the company, it is suggested that engineers and architects avail themselves of the service offered by our corps of engineers that is at all times ready to furnish suggestions, estimates and details.

The following is necessarily only an outline of products and not an attempt to suggest their wide application and extensive use.

Kahn Trussed Bars.

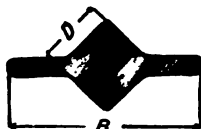
Open hearth steel, concrete beam, girder, floor and arch reinforcement. Unit bars with 45° rigid diagonals formed from flanges on the main body producing 12% to 30% stronger beams than loose stirrups; save steel in design, labor in installation; safe; strong; fireproof and shockproof.



RIGID CONNECTION

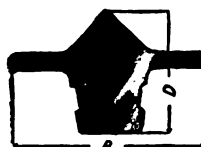


KAHN TRUSSED BAR



SECTION KAHN TRUSSED BAR

D & B in.	Wt. per lin. ft.	Area, sq. in.
$1\frac{1}{2} \times 1\frac{1}{2}$	1.4 lbs.	0.41
$2 \times 2\frac{1}{2}$	2.7 lbs.	0.79



SECTION KAHN TRUSSED BAR

D & B in.	Wt. per lin. ft.	Area, sq. in.
$1\frac{1}{2} \times 2\frac{1}{2}$	4.8 lbs.	1.41
$1\frac{1}{2} \times 2\frac{3}{4}$	6.8 lbs.	2.00
$2 \times 3\frac{1}{2}$	10.2 lbs.	3.00

*NOTE—The special lengths enclosed in parentheses are ordinarily available only for items of 5 tons or more

SWEET'S CATALOGUE

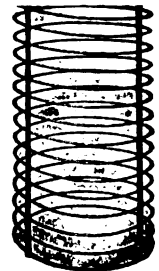


TRADE-MARK

Collapsible Column Hooping.

Accurately constructed column reinforcement, shipped flat in coils of exact diameter attached to spacing bars, ready for field erection. Sizes as follows:

Size of wires, in.	Diameter, in.	Pitch, in.
$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$	9 to 36	$1\frac{1}{4}$ to 12



COLUMN HOOPING

Rib Bars.

Special rolled steel section with series of cross ribs to secure maximum grip. Carried in stock in warehouses in various cities, furnished straight or bent as ordered.

PROPERTIES OF RIB BARS

Area, in.	Equivalent to	Wt. per ft., lbs.
.110	$\frac{3}{8}$ -in. Round	.379
.196	$\frac{1}{2}$ -in. Round	.674
.250	$\frac{1}{2}$ -in. Square	.86
.307	$\frac{3}{4}$ -in. Round	1.054
.442	$\frac{3}{4}$ -in. Round	1.517
.601	$\frac{7}{8}$ -in. Round	2.065
.785	1 -in. Round	2.697
1.000	1 -in. Square	3.46
1.266	$1\frac{1}{4}$ -in. Square	4.38
1.563	$1\frac{1}{2}$ -in. Square	5.41



SQUARE RIB BAR



ROUND RIB BAR

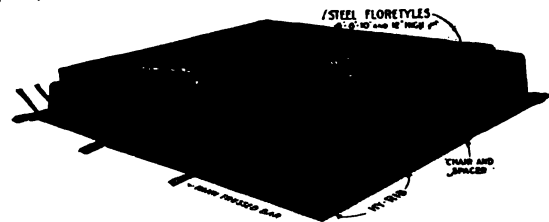
Floretiles.

Rows of specially formed steel tiles, separated by reinforced concrete joists and covered with thin layer of concrete, produce strong, deep, light weight, long span floor construction with flat ceilings; require but inexpensive centering and are soundproof. Accuracy of spacing assured by special spacer-chairs. $\frac{3}{8}$ in. Hy-Rib used for ceilings.

Furnished in 2 types: ribbed and corrugated.

(1) Ribbed Steel Floretyle—Ribbed with deep stiffening ribs across top, corrugated sides, rounded corners, corrugated flanges.

Approximate width at base, $20\frac{1}{2}$ in.; standard lengths, 3 and 4 ft.; standard heights, 6, 8, 10 and 12 in.



RIBBED STEEL FLORETYLES

(2) Corrugated Steel Floretyle—Corrugated with deep corrugations extending completely around tile, with corrugated flanges.

Approximate width at base, $20\frac{1}{2}$ in.; standard lengths, 2 ft. $4\frac{1}{2}$ in. and 3 ft. 9 in.; standard heights, 6, 8, 10 and 12 in.



CORRUGATED STEEL FLORETYLE

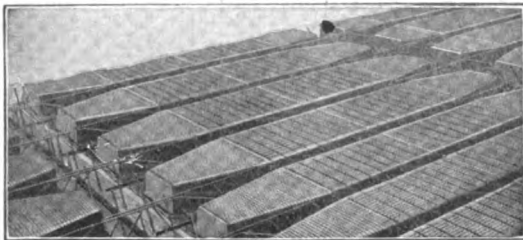
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Cantilever Florestyle—In this construction, the end Florestyles are tapered so as to provide a maximum width of joists at the supports.

The joist is reinforced to act as a cantilever for a considerable distance from the support, assuring longer span without increase or depth, as well as maximum economy of materials.

Cantilever Florestyles are used with either the ribbed or corrugated types of Florestyle.

Standard heights, 6, 8, 10 and 12 in.; approximate width at wide end: 20½ in.; at narrow end, 13¾ in.; lengths (nominal) 2, 3 and 4 ft.



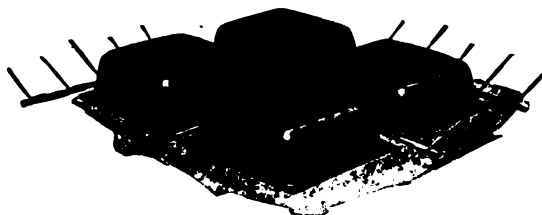
CANTILEVER FLORESTYLES

Truscon Removable Floredomes.

Truscon removable Floredomes have the advantages of Florestyle, but are adapted to two-way construction in which the loads are carried in two directions to the supports. As the Floredomes are removable they can be used repeatedly and thus reduce the cost of forms.

Truscon removable Floredomes are formed from No. 16 gauge sheets by powerful presses and are absolutely uniform and exact. Their smooth, true surfaces make them especially easy to remove after the concrete has set.

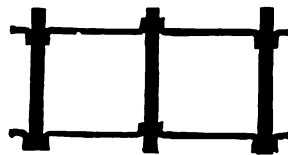
Thickness of metal, No. 16 gauge; standard heights, 6 and 8 in.; size over all, 22 by 22 in.; size at base, exclusive of 1-in. flanges on all sides, 20 by 20 in.



TRUSCON REMOVABLE FLOREDOMES

Rib Metal.

A unit reinforcement, equivalent to a large number of separate bars. Provides perfect cross reinforcement against temperature and shrinkage strains.



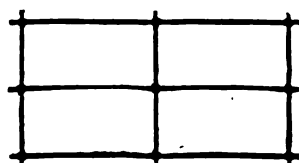
RIB METAL

PROPERTIES OF RIB METAL

Size, No.	2	3	4	5	6	7	8	12
Width of sheet, in.	16	24	32	40	48	56	64	96
Area per ft. of width (sq. in.)	.450	.300	.225	.180	.150	.128	.113	.075

Truscon Wire Mesh.

A superior reinforcement for concrete roads. Furnished either in rolls with 18-in. core or in flat sheets cut to length; various weights.



TRUSCON WIRE MESH

Truscon Inserts.

Used in concrete slabs, beams or columns for attaching shaft hangers, fixtures, sprinkler systems, etc. Obviate expensive drilling into concrete in finished building. Built into concrete during construction

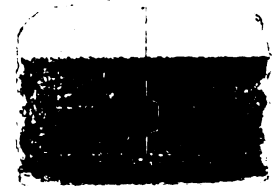
TRUSCON SLOTTED INSERT
Standard lengths 18, 24, 36 and 60 in.

by fastening to wood centering. Concrete thoroughly embeds insert and holds it rigidly in place. Only narrow slot flush with concrete is seen in completed work.

TRUSCON ADJUSTABLE INSERT
½, ¾ and 1 in.TRUSCON TAPPED INSERT
½, ¾ and 1 in.

Truscon Contraction Joint.

Used in concrete roads to form a plane of weakness for joint. Plates beveled to crown of road and doweled to provide stiffness.



TRUSCON CONTRACTION JOINT

Truscon Curb Bars and Edge Protectors.

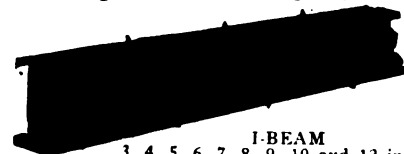
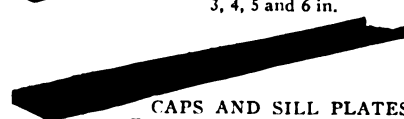
Protects corners of concrete construction. Unit of protecting plate and positive anchorage. Furnished in 2 sizes, either straight or curved.



TRUSCON CURB BAR

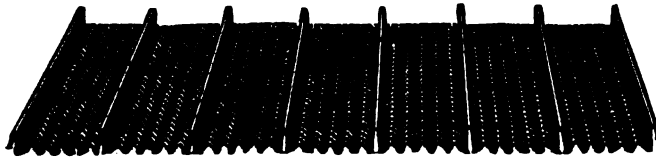
Truscon Structural Pressed Steel.

A light weight, fire resisting construction consisting of pressed steel beams and studs combined with Hy-Rib metal lath for floors and walls. Ideal for light occupancy buildings such as stores, apartments, hotels, hospitals, institutions, residences, etc. Simple to erect, soundproof, verminproof and economical in cost. Sections furnished in a large variety of shapes, sizes, and gages. Prongs on flanges for attaching Hy-Rib.

I-BEAM
3, 4, 5, 6, 7, 8, 9, 10 and 12 in.CHANNELS
3, 4, 5 and 6 in.CAPS AND SILL PLATES
For studs of 2, 3, 4, 5, and 6 in.H-STUD
3, 4, 5 and 6 in.CHANNEL STUD
2, 3, 4, 5 and 6 in.CHANNELS
¾, 1, 1½ and 2 in.HOLLOW STUD
2, 3 and 4 in.

Hy-Rib.

Hy-Rib is a reinforcement obtained by shearing and pressing sheet steel, making a unit of lath and stud. The ribs eliminate forms and save studs in concrete and plaster work, reducing cost and simplifying construction, saving labor, time and expense. Used in construction of floors, roofs, walls, sidings, partitions, ceilings, furring, tanks, sewers, culverts, conduits, etc.

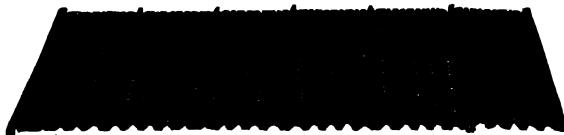


1/2-IN. HY-RIB

DIMENSIONS OF HY-RIB

Type of Hy-Rib	Height of ribs	Spacing of ribs	Width of sheets	Gauge Nos. U. S. Standard
1/2"	1/2"	4"	28"	24, 26, 28
3/4"	3/4"	4"	24"	24, 26, 28

Standard lengths, 6, 8, 10 and 12 ft. Other lengths cut without charge except for waste.



3/4-IN. HY-RIB LATH

3/4-IN. HY-RIB LATH

3/4-in. Hy-Rib Lath—
A self-furring lath, permits wide spacing of studs and saves channels and wiring.

Wt. per sq. yd., lbs.	Gauge No.	Stud spac. for walls and partitions, in.	Spac. of supports for ceilings, in.
3.0	28	24 to 30	23 to 26
3.6	26	32 to 36	30 to 33
4.8	24	36 to 42	33 to 35

Width of sheets, 24 in. Standard lengths, 6, 8, 10 and 12 ft. Shipped in bundles of 18 sheets.

MAXIMUM SPANS FOR 1/2-IN HY-RIB AS CENTERING TO SUPPORT WET CONCRETE

Maximum spans for centering	Gauge 1/2" Hy-Rib	Thickness of slabs above base of Hy-Rib	Maximum spans for centering	Gauge 3/4" Hy-Rib	Thickness of slabs above base of Hy-Rib
3'-3"	28	2" thick slab, weight 24 lbs. per sq. ft.	2'-6"	28	3 1/2" thick slab, weight 42 lbs. per sq. ft.
3'-6"	26		2'-9"	26	
4'-0"	24		3'-0"	24	
3'-0"	28	2 1/2" thick slab, weight 30 lbs. per sq. ft.	2'-4"	28	4" thick slab, weight 48 lbs. per sq. ft.
3'-3"	26		2'-6"	26	
3'-8"	24		2'-10"	24	
2'-9"	28	3" thick slab, weight 36 lbs. per sq. ft.			
3'-0"	26				
3'-4"	24				

For greater spans use temporary supports.

SAFE LOADS IN LBS. PER SQUARE FOOT FOR SLABS REINFORCED WITH 1/2-IN. HY-RIB

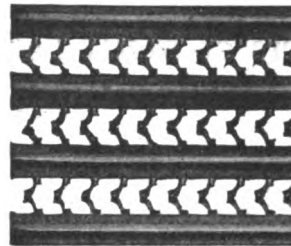
(Safe loads include weight of slab. For safe live loads, deduct weight of slab)

Thickness of slabs above base of Hy-Rib	Gauge 1/2" Hy-Rib	Moment of resistance per ft. of width	Span in feet										
			3	4	5	6	7	8	9	10	11		
2" thick slab, weight 24 lbs. per sq. ft.	28	3533	327	185	117	82							
	26	4241	392	221	141	97							
	24	5647	522	294	188	132							
2 1/2" thick slab, weight 30 lbs. per sq. ft.	28	4590	424	239	153	106	78	59					
	26	5513	510	287	183	127	93	71					
	24	7346	681	383	245	171	125	95					
3" thick slab, weight 36 lbs. per sq. ft.	28	5648	522	294	187	131	96	73					
	26	6773	627	353	225	158	115	87	69				
	24	9023	835	469	300	209	153	117	91				
3 1/2" thick slab, weight 42 lbs. per sq. ft.	28	6705	620	349	220	155	113	87					
	26	8044	742	417	268	186	137	104	82				
	24	10721	992	558	356	249	182	140	110	89			
4" thick slab, weight 48 lbs. per sq. ft.	28	7763	718	403	259	180	132	101	80				
	26	9304	864	485	310	216	158	121	97	77			
	24	12409	1044	643	413	288	212	162	128	103	86		

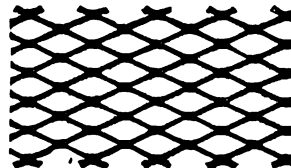
$$B. M. = \frac{1}{10} w l^2 \quad \text{For } B. M. = \frac{1}{12} w l^2, \text{ add } 20\% \text{ to above loads.}$$

$$\text{For } B. M. = \frac{1}{8} w l^2, \text{ deduct } 20\% \text{ from above loads.}$$

No. 1-A Hy-Rib Lath—Saves plaster; permits wide stud spacing; has rigid surface and perfect key.



1-A HY-RIB LATH



DIAMOND LATH

NO. 1-A HY-RIB LATH

Grade	Wt. per sq. yd., lbs.	Stud spac. for walls, in.	Joist spac. for ceilings, in.
No. 1-A	3.20	16 to 28	14 to 24

Size of sheets, 18 by 96 in. Shipped in bundles containing 15 sheets or 20 yards.

DIAMOND LATH

Gauge No.	Sheets per bundle	Yds. per bundle	Wt. per sq. yd., lbs., painted	Wt. per sq. yd., lbs., galvanized
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TRUSCON DIAMOND LATH

27	15	30	2.33	2.53
26	15	30	2.55	
25	15	30	3.00	
24	15	30	3.40	3.60
22	15	26 2/3	4.20	

Size of sheets, 27 by 96 in.

UNIVERSAL DIAMOND LATH

26	15	30	2.20	2.50
24	15	30	2.80	

SOLID PARTITIONS WITH HY-RIB LATH AND CHANNELS

Spac. channels, in.	Metal Lath
12 to 14	Diamond lath, 2.2 to 3.0 lbs. or 1-A Hy-Rib lath
14 to 16	Diamond lath, 3.00 to 3.4 lbs. or 1-A Hy-Rib lath
16 to 28	1-A Hy-Rib lath
24 to 30	3.0 lb. 3/4" Hy-Rib lath
32 to 36	3.6 lb. 3/4" Hy-Rib lath
36 to 42	4.8 lb. 3/4" Hy-Rib lath

SOLID PARTITIONS WITH HY-RIB AND WITHOUT CHANNELS

Height of partitions, ft.	Thickness, in.	Reinforcement
10	1 1/4	No. 28 1/2" Hy-Rib
12	2	No. 28 1/2" Hy-Rib
14	2 1/4	No. 28 1/2" Hy-Rib
16	2 1/2	No. 28 1/2" Hy-Rib
18	2 3/4	No. 26 1/2" Hy-Rib
20	3	No. 26 1/2" Hy-Rib

HY-RIB CEILINGS

Spac. supports, ft. in. to ft. in.	Reinforcement
1 0	Diamond lath, 2.20 to 3.00 lbs. or 1-A Hy-Rib lath
1 0	Diamond lath, 3.0 to 3.40 lbs. or 1-A Hy-Rib lath
1 2	1-A Hy-Rib lath or 3.0 lb. 3/4" Hy-Rib lath
1 11	3.0 lb. 3/4" Hy-Rib lath
2 6	3.6 lb. 3/4" Hy-Rib lath
2 9	4.8 lb. 3/4" Hy-Rib lath
3 0	No. 28 1/2" Hy-Rib
4 0	No. 26 1/2" Hy-Rib
5 0	No. 24 1/2" Hy-Rib

HY-RIB SIDE WALLS

Spac. supports, ft. in.	Thickness of wall, in.	Reinforcement
1 2	1 1/4	Diamond lath, 2.2 to 3.0 lbs.
1 6	1 1/4	Diamond lath, 3.00 to 3.4 lbs. or 1-A Hy-Rib lath
2 0	1 1/4	1-A Hy-Rib lath, or 3.0 lb. 3/4" Hy-Rib lath
2 8	1 1/4	3.6 lb. 3/4" Hy-Rib lath
3 6	1 1/4	4.8 lb. 3/4" Hy-Rib lath
6 0	1 1/4	No. 28 1/2" Hy-Rib
8 0	2	No. 26 1/2" Hy-Rib
10 0	2	No. 26 1/2" Hy-Rib
12 0	2 1/2	No. 24 1/2" Hy-Rib

Corner Beads.

Furnished in 2 styles for the protection of plastered corners: (1) Detroit T-rail with adjustable clips and (2) rib steel as illustrated.



CORNER BEAD

Metal Base Screeds.

Use between cement bases and plastered walls as ground for plaster and cement.



BASE SCREED

THE YOUNGSTOWN PRESSED STEEL COMPANY

Manufacturers of Metal Lath, Expanded Metal and Channels

WARREN, OHIO

Products.

METAL LATH; EXPANDED METAL REINFORCING; COLD FORMED CHANNELS.

Also, Corner Bead; Prong Lock Studding; Crimped Furring; Pressed Metal Stampings.

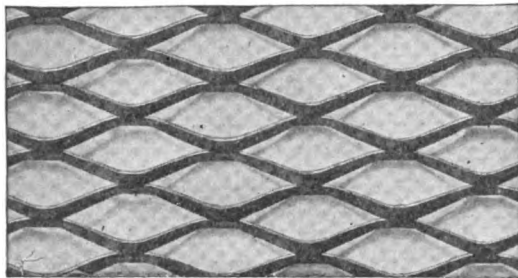
Ideal Metal Lath.

The highest grade of metal lath manufactured. Exceedingly rigid, has a wide strand, meets United States Government specifications and affords a firm and solid base for plastering.

Owing to the peculiar formation of the mesh, it does not shear the plaster and is therefore an economical lath to use.

Furnished in steel painted, iron alloy or galvanized, in the following weights and gages:

Gage	Size of sheet	Weight per sq. yd.	Sheets per bundle	Yards per bundle
No. 22	21" x 97"	5.00 lbs.	9	14
No. 24	21" x 97"	4.00 lbs.	9	14
No. 25	21" x 97"	3.50 lbs.	9	14
No. 26	21" x 97"	3.00 lbs.	9	14



IDEAL METAL LATH

Youngstown Metal Lath.

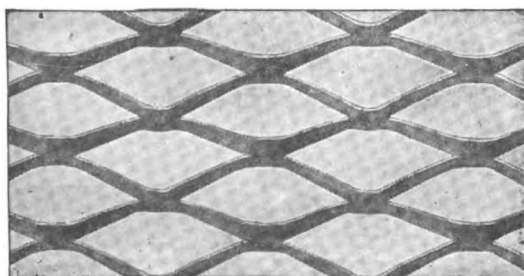
Particularly recommended for exterior stucco work.

A corrugated lath manufactured from the best grade of open hearth sheets.

The transverse corrugation, together with the extra wide strand, makes this material exceedingly rigid.

Furnished in the following weights and gages:

Gage	Size of sheet	Weight per sq. yd.	Sheets per bundle	Yards per bundle
No. 24	21" x 97"	4.00 lbs.	9	14
No. 26	21" x 97"	3.00 lbs.	9	14



YOUNGSTOWN METAL LATH

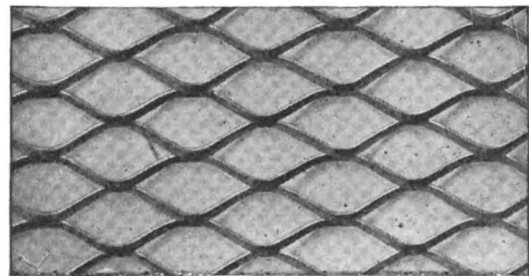
Mahoning Metal Lath.

Mahoning lath as shown in the illustration has a small mesh. This insures the use of a minimum of plaster and complete embedding of steel in plaster.

The formation of the mesh is perfect and provides an excellent key, every strand becoming thoroughly embedded in the plaster.

Furnished in steel painted, iron alloy or galvanized, in the following weights and gages:

Gage	Size of sheet	Weight per sq. yd.	Sheets per bundle	Yards per bundle
No. 22	21" x 97"	3.40 lbs.	9	14
No. 22½	21" x 97"	3.33 lbs.	9	14
No. 23	21" x 97"	3.10 lbs.	9	14
No. 24	21" x 97"	2.75 lbs.	9	14
No. 25	21" x 97"	2.40 lbs.	9	14
No. 26	21" x 97"	2.10 lbs.	9	14



MAHONING METAL LATH

Sharon Cold Formed Channel.

Formed cold of best quality open hearth steel, producing an exceptionally straight and very rigid channel. Can be bent into the most difficult shapes for furring without the steel fracturing.

Manufactured in the following sizes:

Gage	Size	Weight per 1000 lin. ft.	Size of flange
16	¾"	276 lbs.	¾"
16	1"	304 lbs.	¾"
16	1 1/8"	332 lbs.	¾"
16	1 1/4"	381 lbs.	¾"
16	1 1/2"	456 lbs.	¾"
16	1 3/4"	539 lbs.	1"
18	1 1/2"	458 lbs.	1"
16	1 3/4"	580 lbs.	1 1/4"
16	2"	635 lbs.	1 1/2"



SHARON COLD FORMED CHANNEL

Sharon channels have been accepted by the best architects.

Copy will be furnished of Robert W. Hunt & Company's test on ¾-in. channel for furring and 1-in. channel for carrying bars in suspended ceiling construction.

Stock lengths, 12, 14, 16, 18 and 20 ft.; 22-ft. lengths can be furnished on special orders.

Sharon Perforated Cold Formed Channels.

Perforation 4-in. on centers. A very substantial, as well as economical, hollow metal lath partition can be erected with Sharon perforated channels. Much lower in price than a double row of $\frac{3}{4}$ -in. channels, and can be erected for half the cost.

Perforations permit the erector to tie metal lath on either side with ease.

Manufactured in the following sizes:

Gage	Size	Weight per 1000 lin. ft.	Size of flange
16	1½"	456 lbs.	¾"
18	1½"	433 lbs.	¾"
18	2"	479 lbs.	1½"
18	2¼"	521 lbs.	1½"
18	2½"	562 lbs.	1½"
18	3"	646 lbs.	1½"
18	3½"	729 lbs.	1½"



SHARON PERFORATED COLD FORMED CHANNELS

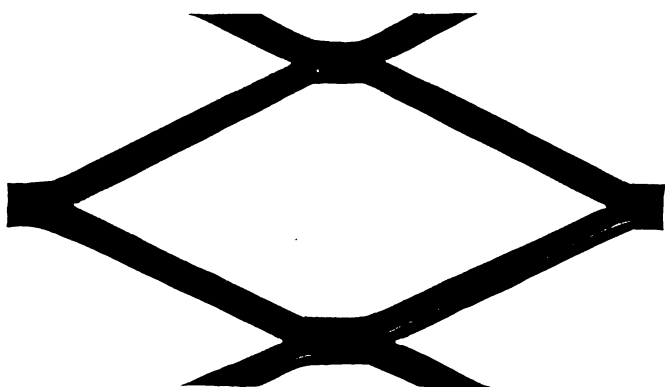
For wall and column furrings, thin partitions, carrying bars and furring strips for suspended ceiling.

Stock lengths, 12, 14, 16, 18 and 20 ft.; 22-ft. lengths can be furnished on special orders.

Shipped in bundles of convenient size.

The Youngstown Pressed Steel Company's Expanded Metal.

Expanded metal made by THE YOUNGSTOWN PRESSED STEEL COMPANY is a product of the very highest grade. This material, unlike other expanded metal, is formed at a single operation, without waste, the process lending strength and tenacity to the finished product. Particular attention is called to the "tie" of the diamonds (that part where meshes join one another) as shown in the illustration. In Youngstown expanded metal the "tie" is exceptionally wide, is not "scored"



YOUNGSTOWN EXPANDED METAL

and the material can not be broken at this point. The size of diamond, together with the thicknesses and widths of strands, can be varied to fit the purposes for which the expanded metal is intended.

The table shows the standard, most called for styles and sizes:

Style			Comparative gage	Standard sizes	
Diamond	Sectional area	Weight per sq. ft.		Widths	Lengths
3	.059	.20 lbs.	16	3', 5', 6'	6', 8', 10'
3	.082	.28 lbs.	12	3', 5', 6'	6', 8', 10'
3	.115	.39 lbs.	12	3', 5', 6'	6', 8', 10'
3	.130	.44 lbs.	12	3', 5', 6'	6', 8', 10'
3	.147	.50 lbs.	10	3', 5', 6'	6', 8', 10'
3	.162	.55 lbs.	10	3', 5', 6'	6', 8', 10'
3	.179	.61 lbs.	10	3', 4', 5', 6'	6', 8', 10'
3	.251	.85 lbs.	10	3', 5', 6'	6', 8', 10'
3	.274	.93 lbs.	10	3', 4', 5', 6'	6', 8', 10'
3	.324	1.10 lbs.	10	3', 5', 6'	6', 8', 10'
3	.377	1.28 lbs.	10	3', 4', 5', 6'	6', 8', 10'
2½	.089	.30 lbs.	16	5'-4"	6', 8', 10'
2½	.155	.52 lbs.	12	4'-4"	6', 8', 10'
1½	.108	.36 lbs.	16	5'-3"	6', 8', 10'
1½	.179	.61 lbs.	12	3', 4', 5', 5'-3", 6'	6', 8', 10'
1	.084	.29 lbs.	18	3', 6'	6', 8', 10'
1	.162	.55 lbs.	16	5'-3"	6', 8', 10'
1	.206	.70 lbs.	12	5'-3"	6', 8', 10'
1½	.226	.76 lbs.	18	3'-6"	6', 8'

There are many construction jobs which require expanded metal of a desired sectional area in square inches per lineal foot of width of finished product, or a desired weight per square foot of finished product different from the standard styles above listed.

THE YOUNGSTOWN PRESSED STEEL COMPANY has special facilities for making expanded metal in 3 by 7-in., 2¼ by 5-in., 1½ by 3-in., 1 by 2½-in. and ½ by 1½-in. meshes in practically any sectional area or weight per square foot desired for some specific purpose. The facilities are such that a minimum amount of delay is caused by such special orders, as mill connections permit the securing of steel, from which this material is expanded, on very short notice. The company will cheerfully cater to the architect's or engineer's desire for a special expanded metal for a special purpose.

Estimates of cost for the finished product will be gladly furnished; the only information necessary is the size of diamond desired, and the sectional area or weight per square foot, or both.

It may be pertinent to say that the steel used in the manufacture of Youngstown expanded metal is a special analysis soft steel of high tensile strength which enables the raw material to be expanded into the desired diamonds or meshes without danger of fracturing the strands, thus giving perfect material of full relative strength.

Youngstown expanded metal is especially adapted for reinforcing floors in buildings or bridges designed to carry heavy loads, and is largely used in reinforcing conduits, tanks, reservoirs, retaining walls, roofs, sidewalks, roads, etc.

WICKWIRE SPENCER STEEL CORPORATION

Manufacturers of Electrically Welded Wire for Concrete Reinforcing

WORCESTER, MASS.

BUFFALO, N. Y.

DISTRICT OFFICES

BOSTON, MASS., John Hancock Building
NEW YORK, N. Y., 120 Broadway
PHILADELPHIA, PA., 327 North Sixth Street
SAN FRANCISCO, CAL., 111 Townsend Street

DETROIT, MICH., Book Building, Washington Boulevard
CHICAGO, ILL., 215-217 West Ontario Street
TULSA, OKLA., 329 Mayo Building

Products.

"CLINTON" ELECTRICALLY WELDED WIRE FABRICS for Reinforcing Concrete.

Also manufacturers of "Clinton" Woven Wire Lath; "Clinton" Welded Sheathing for interior plastering and stucco work; Wire Cloth, Netting and Perforated Grilles and Metals of all kinds.

For Wire Rope, see page 93.

Electrically Welded Wire Fabric.

Scope of Use—"Clinton" welded fabric is especially adapted for roofs, floors, walls, roads, sidewalks, sewers, reservoirs, levees and all kinds of slab construction.

This material is also used to advantage in all kinds of work involving the covering or protection of steel with concrete, as in buildings, bridges, subways and tunnels.

The Material—"Clinton" electrically welded fabric is a wire mesh made up of a series of parallel longitudinal steel wires, spaced certain distances apart and held at intervals by means of transverse wires arranged at right angles to the longitudinal wires, to which they are welded by a patented electrical device. The intersecting wires are actually fused together by electricity, producing thereby an immovable connection between the wires.

This at all times assures a rigid mesh.



"CLINTON" ELECTRIC WELD

In this view the two wires have been cut through at their point of union, revealing a perfectly smooth surface. It is a perfect weld; the two wires are actually fused together.

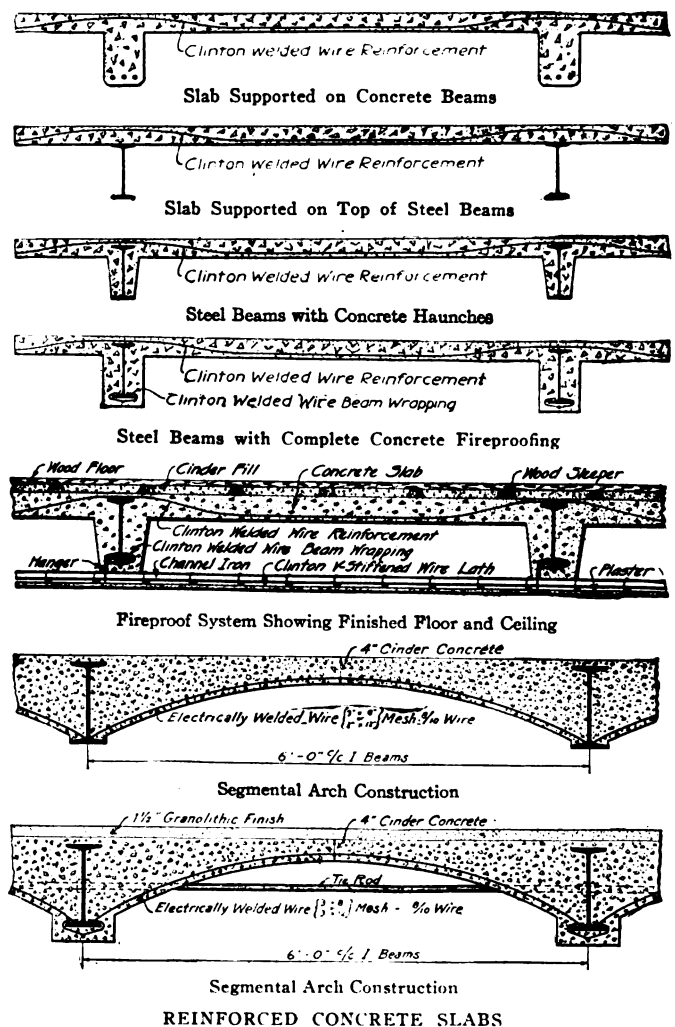
The Wire—"Clinton" electrically welded fabric is fabricated from a special grade of good quality steel wire possessing such strength, elasticity and ductility as to render it especially adapted to structural use. The wire will develop an average ultimate strength of 70,000 to 80,000 lbs. with a maximum, in some cases, of 85,000 lbs. per sq. in.

Galvanizing—Unless otherwise ordered, "Clinton" electrically welded fabrics are made from wire which has been galvanized before being welded. If galvanizing is not required, these fabrics can be made from plain steel longitudinal wires and galvanized transverse wires.

Reinforced Concrete Slabs.

Because of the unaccountable strength of short span slabs as shown by actual tests, the city of New

York, after long consideration of the subject, has finally adopted an empirical formula to be used in designing slabs of 8-ft. span and less when confined between steel beams. This formula is for the conditions of continuous wire mesh reinforcement, and the designs shown are therefore in accord with the regulations now in force in New York City.



Information and Special Publications.

For complete information concerning "Clinton" structural products, write for special publications:

"Concrete Floors," and "Miscellaneous Construction," illustrating the uses of "Clinton" welded wire; "Handbook on Lath and Plaster," describing wire lath and giving complete specifications for furring, lathing and plastering; also other booklets describing sizes and uses of welded sheathing and other specialties.

MIDWEST STEEL & SUPPLY CO., INC.

TELEPHONE:
VANDERBILT 8176

522 Fifth Avenue
NEW YORK, N. Y.

CABLE:
"MIDWESTEEL"
All Codes Used

Products.

MIDWEST ANKERAILS (including the Ankerette), MIDWEST STEEL STRINGERS, MIDWEST ACCESSORIES, consisting of Clips, Bolts, Saddles, Moulds, etc. Together these are called the Midwest Steel Sections. Fully protected by existing and pending patents.

Midwest System.

The Midwest System comprises the equipping of industrial buildings with efficient means for:

- (1) The arranging and adjusting of power transmission to meet operating demands.
- (2) Supporting and anchoring shaft hangers to the building structure.
- (3) Supporting overhead trolley runways.
- (4) Fastening track rails for traveling cranes, etc., to concrete girders or floors.
- (5) Suspending heavy or light piping, or cables, etc., from concrete ceilings.
- (6) Supporting piping or cables on walls of tunnels.
- (7) Anchoring motors, machine tools and other equipment to floors or ceilings of concrete factory buildings.

Component Elements.

The component elements of the Midwest Steel Sections used in the Midwest System are:

Midwest Ankerails—They comprise the "box" rail, the "Ankerette" and the "L" rail. These are continuous rolled steel "inserts" to be embedded in concrete structures to provide an anchorage for equipment of all kinds. *They also act as reinforcing bars.*

Midwest Steel Stringers—Used for supporting shaft hangers where these can not be directly attached to the beams or girders of the factory ceiling. They take the place of wooden stringers which are objectionable in many ways.

Typical Method of Using Midwest System.

Fig. 1, representing a sectional view of a factory ceiling, indicates typical method of using the Midwest System. To the right is shown a reinforced concrete floor beam with embedded "box" rail and to the left in the same view, a steel I-beam. To the bottoms of these, a pair of Midwest Stringers, which in turn support the shaft hangers, are fastened. Note the method of fastening stringers to I-beam flange and "box" rail by means of Midwest Bolts and Clips. This method eliminates the drilling of field holes, and makes it possible to adjust or change the stringers easily and quickly.

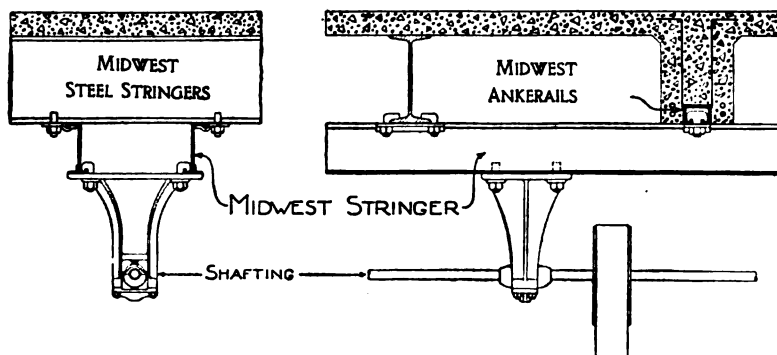


FIG. 1. SECTIONAL VIEW OF FACTORY CEILING SHOWING TYPICAL METHOD OF USING MIDWEST SYSTEM



Midwest Steel Stringers.

These take the place of wooden stringers and can be furnished in any desired lengths. They are supplied in three sections which can be arranged in different ways to meet requirements of loads and spans. (Fig. 2 shows a section.) Their use eliminates all field work except erection. No drilling, cutting or riveting is necessary as the Midwest Stringers can be erected and securely fastened to any kind of ceiling or floor construction by the use of the Midwest Clips and Bolts. The soffit of the stringers is clear and free from cross braces, bolts or other obstructions, so that shaft hangers can be fastened to them at any desired point.

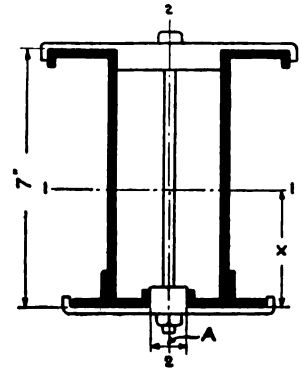


FIG. 2. SECTIONAL VIEW OF MIDWEST STEEL STRINGER

Changes in the transmission layout by reason of installing new machines and the like, can be effected without difficulty where Midwest Stringers are used. By loosening the bolts holding the shaft hangers to the stringers, the former can be changed or adjusted at will. By loosening the bolts holding the stringers to the floor construction, the stringers can be moved longitudinally or transversely at will.

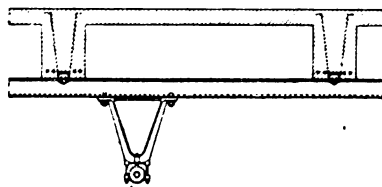


FIG. 3. MIDWEST STEEL STRINGERS AS APPLIED TO CONCRETE CONSTRUCTION

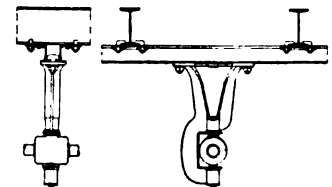


FIG. 4. MIDWEST STEEL STRINGERS AS APPLIED TO STEEL CONSTRUCTION

Advantages of Midwest Steel Sections.

- (1) Great rigidity and unsurpassed strength.
- (2) Ample carrying capacity.
- (3) Flexibility: equipment can be fastened at any point of the ceiling or walls and moved, changed or adjusted at will, a common screw wrench being all that is needed.
- (4) Time saving and economical.
- (5) Can not be destroyed by fire.
- (6) Save reinforcing steel.
- (7) Long use in thousands of factories has proved dependability.

Midwest Service.

This covers the furnishing *free of charge* of preliminary drawings and estimates for installation or alteration of power transmission, involving the use of the Midwest System or any of the Midwest Steel Sections used therein.

It also covers *free of cost* all the help we can give in the planning of factory buildings or the settling of transmission problems. Our experience extends over many years, and covers the designing of many hundreds of factory buildings and power transmission layouts.

A Midwest catalogue will be sent on request. Inquiries invited.

THE DONLEY BROTHERS COMPANY

Manufacturers of Concrete Inserts

7337 Aetna Road
CLEVELAND, OHIO

Products.

The DONLEY INSERT for anchorage in concrete ceilings and walls.

Also Donley Devices and other Building Specialties of interest to engineers, architects and contractors.

Description.

The Donley insert is a malleable iron casting with 2 diverging roots, capped with flat lugs. Lower part contains a cavity. A slot in the exposed under surface communicates with this cavity. One end of the slot is enlarged to admit a bolt head.

Uses.

The Donley insert is suitable for the support of shafting, trolley and conveyor tracks, sprinkler systems, steam and plumbing pipes, machinery, racks or whatever equipment is to be suspended by bolts.

Its superior quality is recommended to users not merely with view to immediate needs, but they are urged to consider the unforeseen future uses to which the insert installation of any building may be subjected. In calculating the strength of floors to be equipped with inserts, the safe load of the inserts should be added to the estimated floor load.

DATA, DONLEY INSERTS

No.	34	58	12	38
Size bolt, in.	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{3}{8}$
Safe load, lbs.	4900	3300	2300	1200
Height overall, in.	6	5	4	3
Length, in.	$2\frac{7}{8}$	$2\frac{1}{2}$	$2\frac{1}{4}$	2
Shipping weight per 100 lbs.	185	135	85	38

Factors of Strength.

In designing the Donley insert, three factors of strength were recognized: (a) strength of the concrete, (b) strength and tenacity of the insert, (c) tensile strength of the bolt. Of these three, the bolt strength is best known. The object in view, therefore, was to produce an insert which would always provide a resistance in proportion to the tensile strength of a steel bolt of appropriate size.

Result of Tests.

To reach this result, a large number of tests were conducted, both of existing inserts and of experimental models. Inserts embedded in cubes of concrete were loaded to failure, and compilation made of the breaking strains and the nature of the failure.

The Donley insert, as finally perfected and shown herewith, withstood a stress in excess of the ultimate

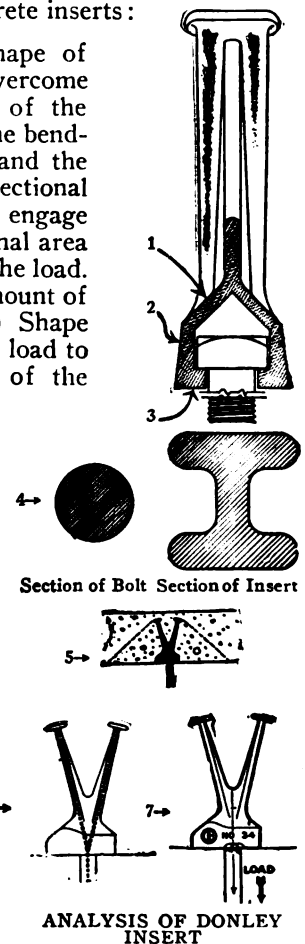
strength of the appropriate bolt. Safe loads, noted in the accompanying table, represent bolt strength subjected to a safety factor of 4.

Analysis for Comparison.

Analysis of the Donley insert is here given and illustrated, which is useful as a basis of judging this in comparison with other concrete inserts:

(1) The section and shape of the top of the socket to overcome bending. (2) The thickness of the side walls, which must resist the bending of the supporting ledges and the tension of the load. (3) The sectional strength of the ledges which engage the bolt head. (4) The sectional area of the leg or legs that support the load. (5) The length of legs; the amount of concrete they make use of. (6) Shape of legs, straight from center of load to the ends. (7) The location of the legs in relation to the load.

NOTE—The tensile strength of steel being three-quarters greater than that of malleable iron, the size of the leg or legs of malleable iron upon which a load is applied should be at least three-quarters larger in sectional area than the steel bolt. The diagrams show the relative sectional areas of the insert and the bolt for which it is made. The sectional area of the Donley insert is two and one-half times as large as the net bolt area.



Complete in Itself.

The Donley insert has the advantage of being complete in itself, in contrast with inserts which have a loop or ring, through which a bar is to be passed for the better engagement of the concrete.

This is an element of economy, but chief claim of the Donley insert for preference is based on superior quality; the insurance that it provides against collapse of overhead fixtures, such as not infrequently occurs where inserts of unascertained strength are used.

Suggested Specifications for Installations.

The Donley inserts No. 12 (or size desired) shall be placed in rows spaced 4 ft. on centers—not to exceed 4 ft. apart in rows. Rows to start 1 ft. from wall or from beams which project below ceiling. They shall be placed on the concrete forms with the insert slot at right angles to the lines of shafting or other equipment to be supported, then nailed securely in position.

KOHLER DIE & SPECIALTY CO.

Concrete Inserts and Metal Specialties

DEKALB, ILL.

Products.

KOHLER THREADED CONCRETE INSERTS: Pressed Steel and Cast; COLLINGS SLOTTED or ADJUSTABLE CONCRETE INSERTS; FLATTENED END BOLTS.

Kohler Threaded Concrete Inserts.

Advantages—The easiest and quickest inserts on the market to set in the forms. No nails or pins required for their use. Adapted for use with either wood or steel forms.



PRESSED STEEL INSERT

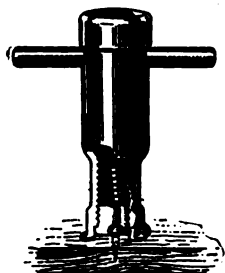
Construction of $\frac{3}{8}$ in. and $\frac{1}{2}$ in. sizes



INSERT WITHOUT SCREW

The screw point, shown clearly in the illustration below, does the work. A blow with the hammer and a couple of turns with the hand sets this screw down so that the insert is held securely in a vertical position ready for the concrete to be poured.

The bottoms of these inserts are squared accurately with the thread, as illustrated, so that the inserts must stand upright when the screw is firmly turned down. After work is finished, forms are easily pulled away from the screws, which are then quickly removed, leaving the insert free for the threaded bolt.



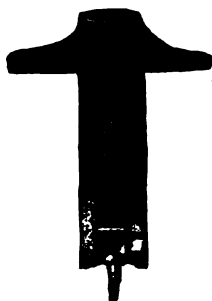
STEEL INSERT IN FORM, WITH SCREW POINT IN PLACE

Construction of $\frac{3}{8}$ in. and $\frac{1}{2}$ in. sizes



EXACT SIZE OF SCREW POINT USED IN $\frac{1}{2}$ -IN. INSERT

(Patented Feb. 27, 1912)



CAST INSERT

Economy—These inserts, regularly spaced in the ceilings, floors or walls of reinforced concrete buildings mean a saving of time and heavy expense in attaching or rearranging shafting, piping or other interior equipment. A necessity in concrete construction.

Strength—Careful tests show that both the pressed steel and cast threaded inserts have an ample margin of safety over the working load of bolts to be used. At the University of Illinois the $\frac{1}{2}$ -in. steel inserts, constructed as shown in the small illustration to the left, supported an average load on five tests of 6070 lbs. Similar tests of $\frac{5}{8}$ -in. cast inserts showed a supporting strength of 9600 lbs.

How Shipped—With both the pressed steel and cast threaded inserts the screw points as illustrated are used. These are put in place at the factory so that insert as shipped is ready for use. Notice it is possible

to set these inserts in the forms almost instantly and with the same accuracy as driving a nail.

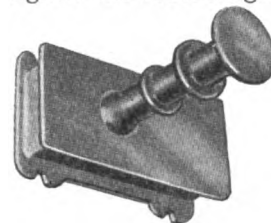
SIZES, WEIGHTS AND PRICES, KOHLER INSERTS

Size bolt	Height	Weight per 100	List price
PRESSED STEEL THREADED INSERTS			
$\frac{3}{8}$ in.	2½ in.	8 lbs.	10¢ each
$\frac{1}{2}$ in.	3 in.	13½ lbs.	13¢ each
$\frac{5}{8}$ in.	3½ in.	42 lbs.	17¢ each
$\frac{3}{4}$ in.	3½ in.	50 lbs.	20¢ each
CAST THREADED INSERTS			
$\frac{1}{2}$ in.	3½ in.	45 lbs.	15¢ each
$\frac{5}{8}$ in.	3½ in.	75 lbs.	19¢ each
$\frac{3}{4}$ in.	3½ in.	85 lbs.	22¢ each
$\frac{7}{8}$ in.	3½ in.	110 lbs.	28¢ each

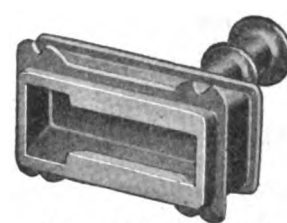
List prices are subject to discount which will be quoted on application.

Collings Adjustable or Slotted Insert.

Made with a corrugated stem that extends up into the compression area of the concrete, the correct place to hang the load. The tapering corrugated base is so shaped that it makes the concrete member stronger. In this insert the fullest strength of the concrete is developed. The greater the load on the Collings insert the tighter the concrete grips and holds.



Note Corrugated Stem and Corrugated Tapering Base



View of Chamber for Bolt

COLLINGS INSERT
(Patented March 26, 1918)

The Collings insert when placed in the form is never in the way of the reinforcing bars, and is so designed that the concrete flows freely around it. There are no sharp corners and with the Collings insert less surface is exposed in the ceiling after the forms are removed than with any other—a very desirable feature.

The Collings insert may be used upside down in the floor for fastening chairs, machinery or permanent fixtures but its greater field is in the ceiling for supporting shaft hangers, sprinkler systems, electric lights, piping and overhead rails. Either the head of the bolt or the nut may be used in the socket. The Collings is the only insert in which the bonding value of the corrugated bar is secured.

SIZES, WEIGHTS AND PRICES, COLLINGS INSERTS

Size bolt	Height	Weight per 100	List price
$\frac{1}{2}$ in.	3½ in.	76 lbs.	16¢ each
$\frac{5}{8}$ in.	3¾ in.	81 lbs.	19¢ each
$\frac{3}{4}$ in.	4 in.	100 lbs.	23¢ each
$\frac{7}{8}$ in.	4¼ in.	120 lbs.	30¢ each

Discounts will be quoted on application.

Flattened End Bolts.

For use in suspending overhead piping and other work supported from concrete inserts.



FLATTENED END BOLT

Flattened, punched, and threaded one end as illustrated.

SIZES AND PRICES, FLATTENED END BOLTS

No. 3—Machine thread, bolt ends, $\frac{3}{8}$ x 2 in.	8c each
No. 4—Machine thread, bolt ends, $\frac{1}{2}$ x 2½ in.	10c each
No. 5—Machine thread, bolt ends, $\frac{5}{8}$ x 2½ in.	12c each

List prices are subject to discount.

SECURITY INSERT COMPANY

Ceiling Sockets for Concrete Work

2 South 15th Street
PHILADELPHIA, PA.

Product.

SECURITY INSERTS, or CEILING SOCKETS, for Concrete Work.

Security Inserts.

The Security insert solves in a practical way the problem of the hanging of machinery or fixtures from the ceilings or walls of factories, warehouses and other buildings of concrete construction.

Designed by engineers after most careful and exhaustive study, the Security insert has proved its practicability because it is being specified repeatedly. The illustrations show the ease of installation and many other commendable features of this socket, such as the absence of any fixed thread, the flexibility of placement of bolt and nut, the strength of design, maximum grip in the concrete, etc.

Features.

The Security insert embodies the following important features:

(1) The sturdy design of the Security insert enables it to carry a greater load than the bolt.

(2) The nut being placed up in the concrete the strain is not entirely dependent on the casting, but is reinforced by the concrete itself.

(3) It has no fixed thread to become rusty or damaged.

(4) In place of fixed thread a standard steel nut (the strongest thread possible) is placed in the insert when ready to use.

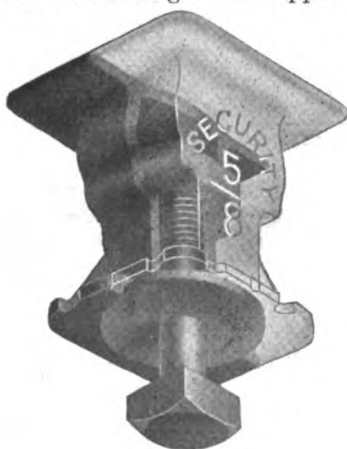
(5) This nut is renewable at any time.

(6) A stud or a bolt may be used, whichever is more convenient for the work.

(7) The Security insert is nailed to the form, thus avoiding waste of time and lumber, and the large flat base assures its remaining upright during pouring.

(8) A unique and convenient way to install Security inserts is by the use of a machine cut wood block as shown in the illustration. This block fits into the rectangular shank of the insert which is merely set down over it. This method avoids leaving nails protruding from the ceiling to be clipped off.

(9) It is desirable to place inserts in all parts of concrete buildings, even offices, storerooms, etc., for they provide



INTERNAL CHAMBER WITH BOLT, NUT AND WASHER IN POSITION



CROSS SECTION SHOWING MACHINED WOOD BLOCK FOR SETTING UP INSERT

easy means for fastening partitions, etc. A unique and exclusive feature of the Security insert is that the holes may be concealed by means of a cardboard disk which fits the washer recess and can be painted.

(10) Once placed, the Security insert is always ready for use. There is nothing in the socket to get out of order or deteriorate.

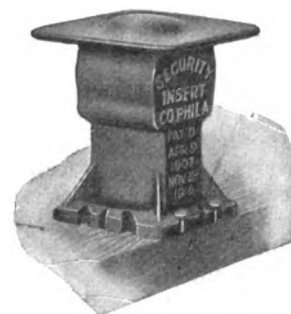
(11) The Security insert has been found to be the most practical means for providing safe, permanent anchorage for any loads from the lightest partition to the heaviest crane.



INTRODUCING OR REMOVING NUT



BOLT AND NUT IN POSITION



INSERT NAILED TO FORM

Safety.

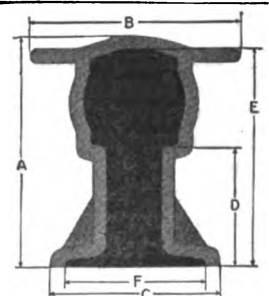
Above all, Security inserts are safe. Even with vibrating loads the nut and bolt are secure. Besides, Security inserts will carry with a factor of safety the safe load of the bolt.

STRENGTH OF BOLTS
Assumed Tensile Strength 60,000 lbs. per Sq. In.

Size of bolt.....	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$
Ultimate strength, lbs.	4,100	7,600	12,100	18,100	25,200
Safe load factor 5.....	820	1,520	2,420	3,620	5,040

DIMENSIONS OF SECURITY INSERTS

Size of bolt	A in.	B in.	C in.	D in.	E in.	F in.
$\frac{3}{8}$	2 $\frac{1}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{8}$	1 $\frac{1}{2}$	2 $\frac{1}{2}$	1 $\frac{1}{4}$
$\frac{1}{2}$	2 $\frac{3}{4}$	2	1 $\frac{3}{8}$	1 $\frac{1}{2}$	2 $\frac{3}{4}$	1 $\frac{3}{8}$
$\frac{5}{8}$	3	2 $\frac{1}{4}$	2 $\frac{1}{4}$	1 $\frac{1}{2}$	2 $\frac{3}{4}$	2 $\frac{1}{4}$
$\frac{3}{4}$	3	3	2 $\frac{1}{2}$	1 $\frac{1}{2}$	2 $\frac{3}{4}$	2 $\frac{1}{4}$
$\frac{7}{8}$	4	3	2 $\frac{1}{2}$	2 $\frac{1}{8}$	3 $\frac{1}{8}$	2 $\frac{1}{4}$
$\frac{1}{1}$	4	3	2 $\frac{3}{4}$	2 $\frac{1}{2}$	3 $\frac{1}{2}$	2 $\frac{1}{2}$



DIMENSION DIAGRAM SECURITY INSERT

WEIGHTS AND PRICES

Made for the following sizes of bolts.....	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$ x 3	$\frac{3}{4}$ x 4	$\frac{7}{8}$
Shipping weight, 100 inserts, lbs.	40	70	110	140	170	185
List price, each.....	11¢	13¢	17¢	21¢	25¢	30¢

WRIGHT & ALEXANDER COMPANY

Manufacturers of Concrete Inserts

ROCHESTER, N. Y.

Products.

"WRIALCO" CONCRETE INSERTS.

Description of the "Wrialco" Concrete Insert.

The most practical and reasonably priced hanger yet devised for automatic sprinkler, shafting and general piping work in connection with concrete building construction.

Made of an exceptionally high grade malleable iron and in strength designed to break the bolt throughout the different sizes. Owing to the design of the "Wrialco" insert, its position in the concrete becomes as a wedge, insuring permanency; its removal can only be accomplished by the destruction of the holding concrete. Of the several pulling strength tests made of the "Wrialco" and its use throughout the country, we do not know of an instance where they have been pulled from their concrete anchorage.

Method of Attaching Inserts to the False Work.

We suggest and recommend, that either coated nails or small wood screws be used in the fastening of inserts to the false work, preferably the wood screws.

The inserts will then be securely fastened and in a position to use when wanted for anchorage purposes.

Distinctive Features of the "Wrialco" Malleable Concrete Inserts.

(1) Strength, due to the wedge construction—its complete embedded surface a resisting force against dislodging from the concrete anchorage.

(2) Compactness.

(3) Adjustment the full length of slot.

(4) Nailing feature. Nails are driven through the lugs provided on either end into the false work or form at a 45° angle slant. This slant nailing feature serves as a wedge, preventing the insert from lifting up in working the concrete.

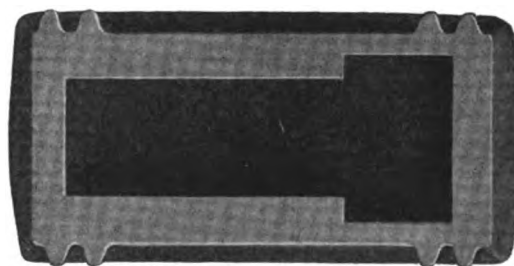
(5) "Wrialco," an insert of exceptional merit, incomparable, the dependable insert for buildings of concrete construction.

MEASUREMENTS AND WEIGHTS

Size of bolt	Height	Length at top	Length at bottom	Width at top	Width at bottom	Length of adjustment slot	Weight per 100
$\frac{3}{8}$ "	$1\frac{1}{2}$ "	$3\frac{1}{2}$ "	$2\frac{3}{8}$ "	$1\frac{1}{2}$ "	$1\frac{1}{8}$ "	$1\frac{3}{4}$ "	56 lbs.
$\frac{1}{2}$ "	$1\frac{1}{2}$ "	$3\frac{1}{2}$ "	$2\frac{3}{8}$ "	$1\frac{1}{2}$ "	$1\frac{1}{8}$ "	$1\frac{3}{4}$ "	56 lbs.
$\frac{5}{8}$ "	$1\frac{1}{2}$ "	$3\frac{1}{2}$ "	$2\frac{3}{8}$ "	$1\frac{1}{2}$ "	$1\frac{1}{8}$ "	$1\frac{3}{4}$ "	69 lbs.
$\frac{3}{4}$ "	$2\frac{1}{2}$ "	$4\frac{1}{2}$ "	$2\frac{7}{8}$ "	$2\frac{1}{4}$ "	$1\frac{3}{8}$ "	$2\frac{1}{4}$ "	112 lbs.
$\frac{7}{8}$ "	$2\frac{1}{2}$ "	$4\frac{1}{2}$ "	$2\frac{7}{8}$ "	$2\frac{1}{4}$ "	$1\frac{3}{8}$ "	$2\frac{1}{4}$ "	130 lbs.
$1\frac{1}{8}$ "	$2\frac{1}{4}$ "	$4\frac{1}{8}$ "	$2\frac{7}{8}$ "	$2\frac{3}{8}$ "	$1\frac{3}{8}$ "	$2\frac{3}{8}$ "	138 lbs.



Side View



Bottom View

"WRIALCO" MALLEABLE CONCRETE INSERT

NATIONAL LEAD CO.

Manufacturers of Expansion Bolts and Anchoring Specialties

111 Broadway
NEW YORK, N. Y.

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Products.

CINCH EXPANSION BOLTS.

Also Steel Drills and Calking Tools for installing Cinch Anchoring Specialties.

Superiority of the Cinch Anchoring System.

The problem of fastening various fixtures to concrete, cement and other masonry was not wholly solved until the advent of the Cinch system.

Numerous and widely different methods of anchoring have been tried from molten lead down to the rigid shield type of expansion bolt, but none have completely met the stringent and varied demands made upon them.

The principal disadvantage of the ordinary expansion bolt with hard, malleable iron shields was that they made contact only at the high spots and when the masonry was soft, fractures and crumbling resulted, and the bolt loosened due to vibration. If the high spots

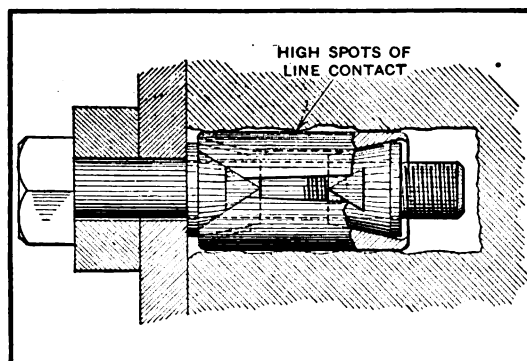


FIG. 1. HARD SHIELD EXPANSION BOLT
Note knife-edge high-spot contact. The hard shield does not expand into contact with the deeper irregularities of the wall of the hole

in contact were hard, nothing more than a knife-edge, friction surface was obtained (Fig. 1).

With the Cinch type of expansion, the relatively soft expansion members are forced by compression against the cylindrical surface of the hole, filling up all irregularities in the surface, without fracturing the masonry. After full expansion, the direction of the reactive forces resisting the pull is at 60° with the axis of the bolt in a conical truss, distributing the load or pull throughout the entire cylindrical surface of the hole (Fig. 2), and not at a few points only, as is the case with other makes of expansion bolts.

The hole being completely and solidly filled by the

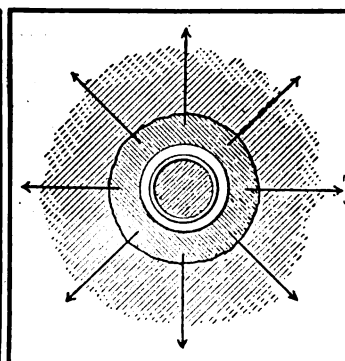


FIG. 2. COMPLETE CYLINDRICAL SURFACE CONTACT OBTAINED WITH THE CINCH TYPE OF EXPANSION
Arrows show how pull of bolt is distributed around periphery of hole

expanded alloy washers, which can not shrink and, being under restraint, can not squeeze out, vibration in the foundation holding the anchorage will not cause loosening of the anchorage.

The load Cinch anchorages will hold depends on the strength of the

masonry they are set in and on the strength of the bolts used. When a Cinch anchorage is compounded, its weakest factor is the tensile and shearing strength of the bolt used.

Cinch specialties are the only anchorage devices that are guaranteed to be stronger than any bolt on the market.

Scope of Use.

Below are listed and illustrated a few of the many uses to which Cinch anchoring specialties may be put. These suggestions will serve to show the wide range of application of the Cinch system and perhaps suggest new fields for its use.

Additional information can be obtained from this company's engineering department, which will submit drawings and specifications to solve the most difficult anchoring problems.

Electrical Work—For switchboards for powerhouses, telephone and telegraph stations and for all electrical fittings and conduits.

Machinery and Powerhouses—For anchoring engines, dynamos, light and heavy machinery, pipe hangers and all fixtures for power transmission, etc.

Building Construction—For windows, shutters, fences, door frames, exterior signs, fire escapes, cornices, hand rails, stair treads, iron staircases, fire doors, mar-

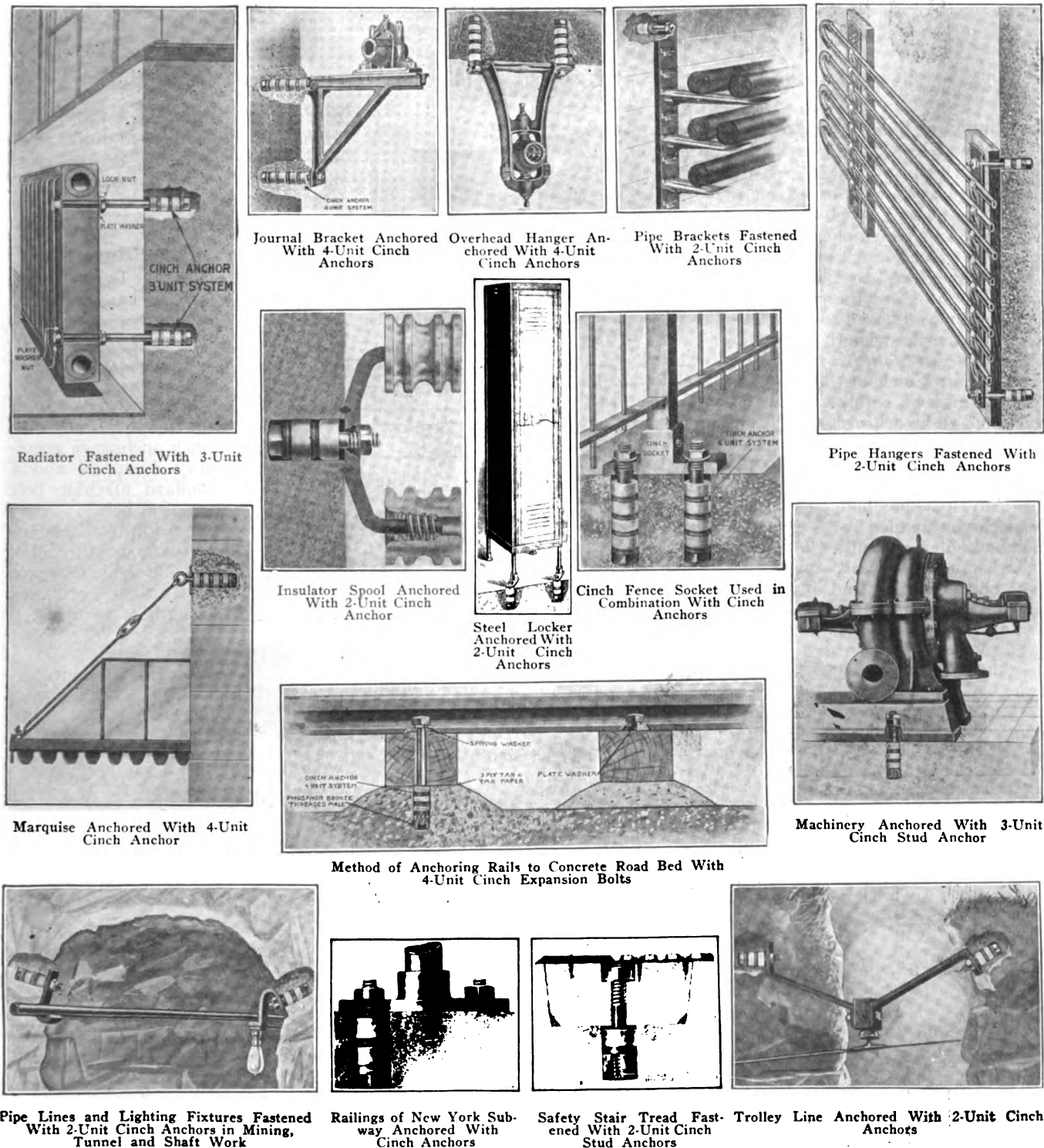


FIG. 3. A FEW USES TO WHICH CINCH ANCHORAGE SPECIALTIES ARE ADAPTED

quises, awnings, safety devices for window cleaners, theater chairs, steel lockers, shelving and numerous other fixtures.

Plumbing—For fastening all kinds of bathroom fixtures, shelf brackets, radiators and for hanging pipes, etc.

Waterfront, Railroad, Subway and Mining Work—For anchoring and hanging all kinds of fixtures for electric cables, semaphores, ties, rails, etc.; for anchoring mooring posts, bulkhead cleats, railings and other equipment to concrete piers.



FIG. 4. ONE-UNIT PLAIN CINCH ANCHORAGE

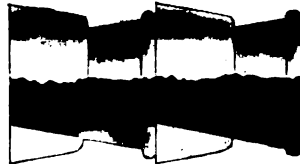


FIG. 5. TWO-UNIT PLAIN CINCH ANCHORAGE

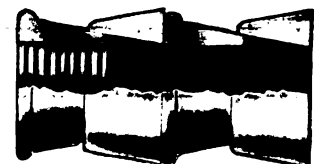


FIG. 6. TWO-UNIT THREADED CINCH ANCHORAGE

Description of the Cinch Anchoring System.

The Cinch system is a positive method of anchoring based on the wedge, screw and lever.

The principle employed is scientifically correct. Each unit (Fig. 4) forms a perfect, conical truss and these units may be compounded 2, 3, 4 or more times to reach or over-reach the tensile strength of any bolt.

The tensile strength of a three-unit Cinch anchorage may be safely computed to be at least one-third more than the tensile strength of the bolt used.

Any machine bolt or machine threaded attachment device with U. S. standard thread may be used with the Cinch system.

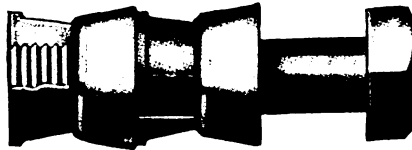


FIG. 7. TWO-UNIT CINCH EXPANSION BOLT

Consists of a two-unit threaded Cinch anchorage (Fig. 6) fitted on a standard machine bolt. Expansion unit on the left is threaded, the other plain, without thread. Order of parts is iron, lead, iron, lead.

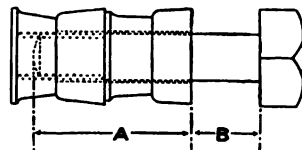


FIG. 8. TWO-UNIT ANCHORAGE

Length of bolt = A + B
A = length of 2-unit anchorage
B = thickness of work

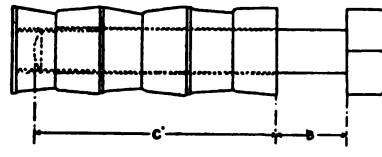


FIG. 9. THREE-UNIT ANCHORAGE

Length of bolt = C + B
C = length of 3-unit anchorage
B = thickness of work

*DIMENSIONS OF CINCH EXPANSION BOLTS

Size bolt, in.	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2
Length A, in.	3/8	1	1 1/4	1 3/4	2 1/8	2 3/4	3 1/4	4 1/4	5 1/4	6 1/4
Length C, in.	1 1/8	1 3/4	2 1/4	2 3/4	3 1/4	3 3/4	4 1/4	5 1/4	6 1/4	7 1/4



FIG. 10. TWO-UNIT CINCH ANCHOR

Consists of a two-unit plain Cinch anchorage (Fig. 5) fitted on a standard machine bolt with nut. Note order of parts is iron, lead, iron, lead as in the Cinch expansion bolt.

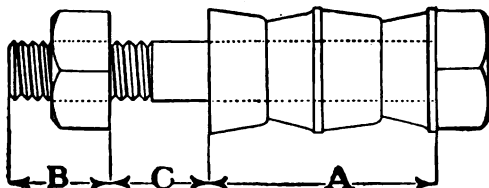


FIG. 12. TWO-UNIT ANCHORAGE

A + B + C = length of bolt
A = length of two-unit anchorage
B = length of unit
C = Thickness of work

*DIMENSIONS OF CINCH ANCHORS AND STUD ANCHORS

TWO-UNIT ANCHORAGE										
Size bolt, in.	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2
Length A, in.	3/8	1	1 1/4	1 3/4	2 1/8	2 3/4	3 1/4	4 1/4	5 1/4	6 1/4
Length B, in.	3/8	1	1 1/4	1 3/4	2 1/8	2 3/4	3 1/4	4 1/4	5 1/4	6 1/4

*For length of bolt required, add thickness of material to length of Cinch expansion units and length of nuts.



FIG. 11. TWO-UNIT CINCH STUD ANCHOR

Consists of a two-unit threaded Cinch anchorage (Fig. 6) fitted on a stud bolt with nut. Note order of parts is the same as in the Cinch expansion bolt.

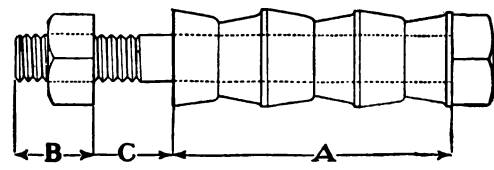


FIG. 13. THREE-UNIT ANCHORAGE

A + B + C = length of bolt
A = length of three-unit anchorage
B = length of unit
C = thickness of work

THREE-UNIT ANCHORAGE										
Size bolt, in.	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2
Length A, in.	1 1/8	1 3/4	2 1/4	2 3/4	3 1/4	3 3/4	4 1/4	5 1/4	6 1/4	7 1/4
Length B, in.	1 1/8	1 3/4	2 1/4	2 3/4	3 1/4	3 3/4	4 1/4	5 1/4	6 1/4	7 1/4

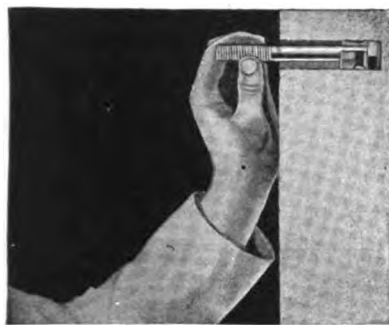


FIG. 14



FIG. 15



FIG. 16

ILLUSTRATING METHOD OF INSTALLING CINCH ANCHORAGE SPECIALTIES BY THE CALKING METHOD

FIG. 14—Insert bolt in hole, together with the first Cinch unit. A Cinch anchor is being used here.

FIG. 15—Expand in position as shown above by means of a piece of pipe or a special calking tool made by this company and sold for that purpose.

FIG. 16—Add another plain male part and another alloy female part, expanding the second expansion unit by swaging as before with pipe or calking tool. If more than 2 units are required, swage the additional units one at a time.

Method of Installing Cinch Anchorages.

Cinch Expansion Bolt—Best installed by taking a stud bolt or dummy bolt (bolt with head removed) and screwing the threaded male upon end of bolt and insert in the hole.

Follow this with an alloy and swage with pipe or calking tool.

Follow with plain male and another alloy and again swage.

Remove the stud or dummy bolt, pass bolt through the work, into the hole and re-engage threaded male at bottom and tighten up.

Cinch Anchor and Cinch Stud Anchor—Installed by calking (see Figs. 14, 15 and 16) which is the most practical method for general use.

It obviates the necessity for holding work in position while bolts are inserted and expansion is made.

Bolts are inserted and expansion completed before work is attached.

Whether the Cinch anchor or Cinch stud anchor is used, the threaded end of the bolt is left outside of the hole, ready for application of the work and bolting on with a nut.

Distinctive Features of the Cinch Anchoring System.

A Cinch anchorage can not pull out or vibrate loose; the greater the load sustained, the stronger the hold obtained.

Cinch anchoring specialties give the only anchorage guaranteed to hold beyond the tensile and shearing strength of the bolt, as well as the breaking strength of the nut.

They require a hole of less depth than any other expansion bolt, affording an enormous saving of labor and time in drilling and a substantial saving of material because of the shorter length of bolt required. They also take less time to install.

They can be set in masonry, with the head of the bolt in or out of the hole before work is placed in position. Work can be fastened in position later and bolted fast.

They will not crush or destroy the face of masonry, as the load is distributed uniformly on the full surface of the hole.

A complete cylindrical surface contact with the walls of regular or irregular holes is made by the Cinch anchorage in contrast to the knife-edged and high-spot contact of systems of the hard shell type (see Figs. 1 and 2).

A perfect conical truss is formed by each expansion unit. The bolts and nut act as a strut, having its abutment in circular form against the lead alloy part and the periphery of the hole. Its beam member is, therefore, substantially supported.

All parts of Cinch anchoring specialties, when in place, are under complete restraint, enabling them to carry tremendous loads.

Cinch anchoring specialties eliminate the necessity of placing long foundation bolts with templates in concrete foundations for machines or engines. When templates are definitely located, bolt holes can be cored or drilled and bolts inserted when the machine is in position.

When Cinch anchoring specialties are used with timber, the shrinkage or expansion will not affect the anchorage as it does with malleable iron shields, which collapse.

The anchorage may be placed any distance from the face of the masonry, eliminating pipe nipples and washers necessary with other types of expansion bolts.

The Cinch anchoring system gives a perfectly watertight hole, obviating the necessity for waterproofing.

There is no limit to the strength of the Cinch anchorage as it can be compounded to 2, 3, 4, 5 and more unit anchorages, adapted to reach or overreach the tensile and shearing strength of any steel on the market.



FIG. 17

TWO-UNIT CINCH EXPANSION BOLT
(INSTALLED)

Note that head of bolt is out of hole.
Bolt can be taken out at any time

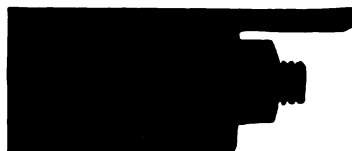


FIG. 18

TWO-UNIT CINCH ANCHOR
(INSTALLED)

Note that head of bolt is in hole.
Bolt can not be removed



FIG. 19

TWO-UNIT CINCH STUD ANCHOR
(INSTALLED)

Note that bolt can be removed

*REPORT OF CINCH BOLT TENSION TESTS

OFFICIAL REPORT
Columbia University, in the City of New York

Machine used,
Olsen 50,000 lbs.

Tested and signed by
PROF. JAMES S. MACGREGOR, M. S.
Cons. Eng. in Test of Materials

CIVIL ENGINEERING DEPARTMENT
TESTING LABORATORY

Made for
J. FRANCIS BOORAEM, M. E.
and GABRIEL E. ROHMER, M. E.
New York City

REPORT OF TENSION TESTS

(Expansion Bolt System, anchored in granite blocks. Test to determine the holding capacity of the anchorage to the point of breaking of bolt or the drawing of the expansion units or expansion system.)								
Material.....	17689	90	91	92	93	94	18269	18270
Laboratory test No.....	1	2	3	4	5	6	7	8
Mark on test-piece.....	1	2	3	4	5	6	7	8
Shape of test-piece.....	Wrt. iron rod	Wrt. iron rod	Wrt. iron rod	Steel rod	Wrt. iron rod	Wrt. iron rod	Wrt. iron rod	Wrt. iron rod
Diameter of bolt, in.....	1	1	1	1	1	1	1	1
Started (elastic limit of bolt).....	21900	21900	22000	17400	11700	1900	22000	23000
Maximum load, lbs.....	28350	27320	28300	22330	13800	2300	28310	31020
Location of fracture.....	In thread of bolt	In thread of bolt	In thread of bolt	Stone split	In thread of bolt	In thread of bolt	In thread of bolt	In thread of bolt
Character of fracture.....	Outside of expansion system	Outside of expansion system	Outside of expansion system		Outside of expansion system	Outside of expansion system	Outside of expansion system	Outside of expansion system

REMARKS: Slide rule used for all computations, making load calculations correct within 10 lbs. and other results exact.
No. 1—1-in. bolt, outside diameter alloy, unit 1 $\frac{3}{4}$ in.
No. 2—1-in. bolt, outside diameter alloy, unit 1 $\frac{3}{4}$ in.
No. 3—1-in. bolt, outside diameter alloy, unit 1 $\frac{3}{4}$ in.
Nos. 7 and 8—1-in. bolt, outside diameter alloy, unit 1 $\frac{3}{4}$ in.
No. 4— $\frac{3}{4}$ -in. bolt, outside diameter alloy, unit 1 $\frac{3}{4}$ in.
No. 5— $\frac{1}{2}$ -in. bolt, outside diameter alloy, unit 1 in.
No. 6— $\frac{1}{4}$ -in. bolt, outside diameter alloy, unit $\frac{5}{8}$ in.
†Steel $\frac{3}{4}$ -in. bolt; all other bolts wrought iron.

*These tests show that three Cinch expansion units have more than one-third greater tensile strength than the corresponding size of wrought iron bolt.

Cinch Anchorage Specialties for Special Conditions.

Cinch Floating Anchor for Bad Brick Walls—If the space between the front and back courses are filled with broken brick and mortar, it is necessary to set the anchorage in the front course where the hole is even and well cut. The Cinch system is admirably adapted for this purpose as the anchorage can be expanded at any point in the wall desired.

Cinch Anchorage with Threaded Extension Sleeve—Cinch anchorages can be furnished with a threaded male cast with an extension sleeve (Fig. 20). The object of the sleeve is to allow the threaded end of the bolt to run beyond the threaded portion of the male. This provides for a variation in thickness of the material being anchored, so that the end of the bolt does not butt against the bottom of the hole before the work is anchored fast to the face of the masonry.



FIG. 20. THREE-UNIT CINCH EXPANSION BOLT WITH EXTENSION SLEEVE

Cinch Expansion Bolt with Pipe Nipple—The pipe nipple or bushing method of installing (Fig. 21) is recommended in cases where the mix is so weak that an expansion bolt can not be tightened up properly in the usual shallow hole without crushing the face of the concrete. The bushing or pipe serves to push the anchorage back into a deeper hole. It is placed between the expansion system and the work to be fastened.

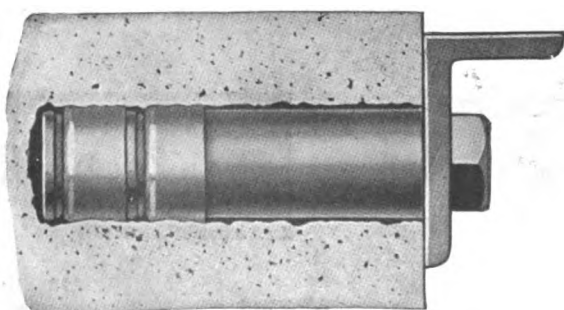


FIG. 21. TWO-UNIT CINCH EXPANSION BOLT WITH PIPE NIPPLE

Cinch Expansion Bolt with Truss Collar—A Cinch anchorage is set back in the hole and provided with a truss collar to take the downward or sideways shearing strain (Fig. 22).

Expansion is made by calking.

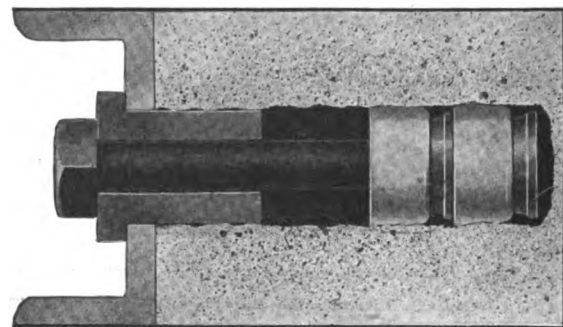


FIG. 22. TWO-UNIT CINCH EXPANSION BOLT WITH TRUSS COLLAR

Cinch Electrical Stud.

A device for fastening electrical fixtures, effecting a saving of at least 30% on labor and material.

Eliminates objectionable method of fastening with nipples, pipes, fittings, wood screw expansion devices, etc.

The installation of the Cinch electrical stud is very simple and the economy in drilling and labor is very great, as it is not necessary to drill through the floor (the deepest hole required for the largest size electrical stud being 2 in.).

Stud is provided with two different threads (Fig. 23), a U. S. thread at one end to engage the threaded male of the Cinch anchorage and a standard pipe thread at the other end to which can be fitted the various electrical fixtures.

Only one man is needed to install it, takes less time to install than other types of fastenings, and studs may be removed whenever desired.

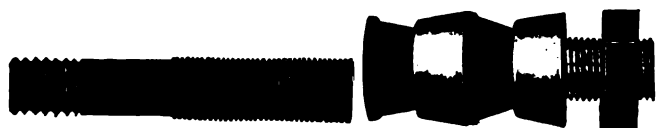


FIG. 23. CINCH ELECTRICAL STUD WITHOUT CINCH UNIT



FIG. 24. CINCH ELECTRICAL STUD WITH CINCH ANCHOR AND JAMB NUT

RICHMOND SCREW ANCHOR CO.

TELEPHONE:
BEEKMAN 4000

Pulitzer Building
NEW YORK, N. Y.

CABLE ADDRESS, "JURICH, NEW YORK"
ABC Code, 5th Edition

AGENCIES

PHILADELPHIA, PA., GILES & RANSOME, Commonwealth Building
BALTIMORE, MD., HENRY H. MEYER Co., 110 S. Howard Street
CHICAGO, ILL., GEO. G. TUCKER Co., 1533 Monadnock Block

SEATTLE, WASH., F. T. CROWE & Co., 1103 First Avenue
MONTREAL, CANADA, J. A. MASTERS & Co., Shaughnessy Building
PARIS, FRANCE, JEAN THIOLLIER, 92 Boulevard Haussmann

Products.

RICHMOND SCREW ANCHORS for fastening all styles of screws into masonry or composition materials; "TYSCRU" FORM TIES.

Also manufacturers of Expansion, Anchor, Form and Centering Bolts; Wall Plugs; Expansion Shields; Concrete Pole Steps, and Concrete Inserts.

Richmond Screw Anchors.

These anchors are made in two types, and can be set before concrete is poured, by affixing to forms; or, later on, by drilling a hole into masonry and setting screw anchor and screw together into it, in portland cement.



SCREW AND DOUBLE COIL ANCHOR
For use in plaster



BOLT AND FLAT COIL ANCHOR
For use in concrete

Strength—Made of steel, a minimum of metal provides a maximum of strength; all stresses are transmitted to surrounding masonry.

Tests show that bolt breaks before anchor loosens.

Placed in concrete it becomes integral with the work, and can not vibrate or loosen without destruction of entire surrounding medium.

Government tests indicate freedom from adhesion for bolts, even in largest sizes, after a lapse of 28 days. Non-adhesion is guaranteed.



RICHMOND SCREW ANCHOR, SHOWING ITS STRENGTH

PRICE LIST PER 100 (SUBJECT TO DISCOUNT)
SQUARE HEAD BOLTS AND FLAT COIL STEEL ANCHORS

Length under head, in.	Diameter of bolt in inches							
	1/4 and 3/8	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
4	\$9.00	\$12.60	\$17.00	\$24.30	.....	.....	.....	.....
5	9.50	13.30	18.00	25.70	\$36.00	\$47.90	.....	.....
6	10.00	14.00	19.00	27.10	38.00	50.50	.....	.....
8	.....	15.40	21.00	29.90	42.00	55.70	.....	.....
10	.....	16.80	23.00	32.70	46.00	60.90	.....	.....
12	.....	18.20	25.00	35.50	50.00	66.10	\$160.00	\$225.00
18	.....	.....	.....	.....	.....	180.00	275.00	.....

FLAT COIL ANCHORS ONLY

..... | \$6.00 | \$8.00 | \$12.00 | \$16.00 | \$21.00 | \$26.00 | \$60.00 | \$100.00

Bolts of other lengths at proportionate prices.

PRICE LIST PER 100 (SUBJECT TO DISCOUNT)

FLAT HEAD IRON WOOD SCREWS AND DOUBLE COIL GALVANIZED STEEL ANCHORS

Length over all, in.	Trade No. and diameter of screw in decimals of an inch					
	No. 8 .1631	No. 12 .2158	No. 16 .2684	No. 20 .3210	No. 24 .3737	No. 30 .4526
2	\$3.70	\$4.75	\$5.55	.....	.....	.....
3	4.40	5.40	6.20	\$8.30	\$10.10	.....
4	.....	6.25	7.00	9.35	11.40	\$17.00
5	.....	.....	7.95	10.60	12.95	19.00
6	.....	.....	9.10	11.95	14.70	21.00

DOUBLE COIL ANCHORS ONLY

.....	\$3.00	\$4.00	\$5.00	\$6.50	\$8.00	\$11.00
-------	--------	--------	--------	--------	--------	---------

Screws of other lengths at proportionate prices.

Form Tie—"Tyscru" (Patented August 28, 1917).

"Tyscru" is good for a working load of 5000 lbs.

"Tyscru" is a fast form tie, saving more than half the time of any other method.



"Tyscru" costs less than annealed wire alone required for any operation, and is four times as fast.

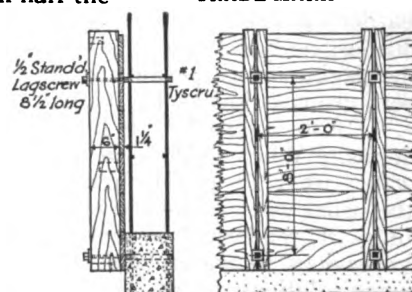
"Tyscru" is tie, spreader, and gauge up to 18 in.

"Tyscru" costs less than rods, clamps and spreaders because it is more than twice as fast.

"Tyscru" gives a handy attachment for reinforcing rods holding them firm and true.

"Tyscru" affords a convenient anchorage for succeeding set-ups in wall construction.

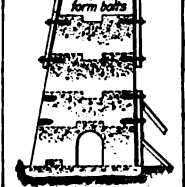
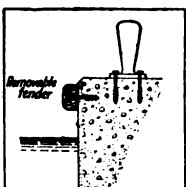
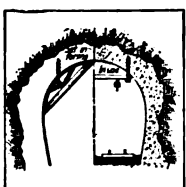
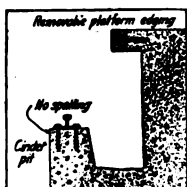
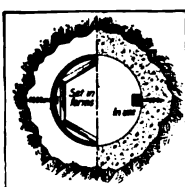
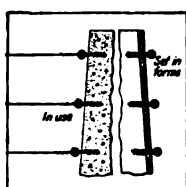
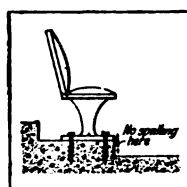
"Tyscru" leaves in the walls anchorages at frequent intervals for work benches, shelving, shafting, steam pipes, starting boxes, etc.



DETAILS OF "TYSCRU" CONSTRUCTION

Price List		Spacing		
Length in.	Per 100	Height of wet unset concrete, ft.	Spacing of Tyscru vertically, ft.	Spacing of Tyscru horizontally, ft.
4	\$19.50	2-0	6-0	18-0
6	20.50	3-0	5-0	12-0
8	22.00	4-0	4-0	6-0
10	23.50	5-0	4-0	4-0
12	25.50	6-0	4-0	3-6
14	28.00	7-0	4-0	3-0
16	29.50	8-0	4-0	2-0
18	31.00	9-0	2-0	2-6
20	32.00	10-0	2-0	2-3
22	33.00	.....	.....	.....
24	34.00	.....	.....	.....
26	35.50	.....	.....	.....
28	37.00	.....	.....	.....
30	38.50	.....	.....	.....

Longer lengths on application.



TYPICAL USES OF RICHMOND SCREW ANCHORS

Grandstands: Yale Bowl; University of Chicago; University of Michigan; McGill University, etc.

Posts and poles: Removable screws permit stripping vertical forms. N. Y. Barge Canal, Catskill Aqueduct

Mine shafts: Removable screws permit stripping vertical forms; cage guides. Catskill Aqueduct, Vulcan Iron Mines

Railroads: Rails to concrete ties; platform edgings, etc. N. Y., N. H. & H. R.R., B. R. T. R.R., D., L. & W. R.R., etc.

Tunnels: Removable screws permit stripping forms. Overhead transmission. C. P. R. in Mt. Royal tunnel

Docks: Used by N. Y. State Barge Canal, U. S. Army and Navy engineers. Montreal, Philadelphia, New York, Baltimore

Cantilever forms: Walls and dams. The anchor only remains in the work; light to handle, easy to set

ANTI-HYDRO WATERPROOFING CO.

TELEPHONE:
WORTH 9184

299 Broadway
NEW YORK, N. Y.

LABORATORIES, NEWARK, N. J.—Telephone, Market 5069

Products and Services.

"ANTI-HYDRO," a Liquid Compound to be used with portland cement for waterproofing, dampproofing, hardening, accelerating without weakening, and other purposes.

CONSULTING WATERPROOFING ENGINEERS. The consulting engineers are ready at all times to advise concerning difficult waterproofing problems. Correspondence is invited.

Description of Anti-Hydro.

"Anti-Hydro's" function may be expressed as waterproofing cement with cement; that is, filling the voids with a cement solution, which crystallizes at the same time as the cement, integrally forming a hard, insoluble silicate of greater tensile strength, density and activity. It enriches mortars so that cost of troweling, mixing and supervision is reduced to a minimum. In fact, it more than pays its cost in labor saving. It hardens wearing surfaces to a degree that makes them dustless and adamant. It lowers the freezing point of the gaging water permitting concreting when the temperature is as low as 15° Fahr.

"Anti-Hydro" is a liquid compound, neutral to litmus. When added, in certain percentage to the water used in gaging portland cement mixtures in the usual way, it has the effect, without retarding setting, of rendering cement in all kinds of masonry impervious to water, moisture, frost, gas, oils, odors, sugar solutions, alkalis and most acids. It excites and brings into service all the cohesive or colloidal possibilities of portland cements, which in themselves are most efficient waterproofing mediums. There are no alums, hydrate of lime, greases, oils, stearic acid, or decomposable ingredients used; neither are there any iron admixtures—all of which disintegrate concrete in time.

When mixed with portland cement, "Anti-Hydro" forms a plastic mass which sets up very quickly and is used for calking metal passing through concrete, and for stopping leaks under pressure. If water is added to the preparation as per the dampproofing specifications, dampproof cold water paint is formed, which can be applied to the inside of masonry walls or to the back of limestone to prevent discoloration.

Uses.

Because of its remarkable properties "Anti-Hydro" is used for hardening cement floors, for waterproofing concrete in mass and in surface coating, for dampproofing and for waterproofing mortar in brickwork.

Quantity Required.

For coatings, 1 gal. "Anti-Hydro" for each 80 to 100 sq. ft. 1 in. thick. For mass concrete, 1½ to 2 gals. for each cu. yd.

Specifications.

Floor Hardener—Upon fill shall be laid a 1-in. topping of 1 part portland cement and 2 parts clean sand. This shall be gaged by addition of "Anti-Hydro" to all water used in tempering dry mixture, in proportion of 1 gal. of "Anti-Hydro" to each barrel (4 bags) of cement. The proper consistency will be obtained if, for each barrel of cement, 1 gal. of "Anti-Hydro" and 10 gals. of water be used.

Waterproofing in Mass—To water used in gaging mix-



TRADE-MARK

ture add 1½ gals. of "Anti-Hydro" for every cubic yard of concrete. Proper consistency will be obtained if, for each barrel of cement, 1 gal. "Anti-Hydro" and from 10 to 15 gals. of water be used. If forms are below water level, concrete shall be poured extremely stiff.

Waterproofing in Coatings—All interior surfaces of all exterior walls, upper surface of concrete floor slab of basement or cellar, all pits, piers, etc., as shown on plans, shall be waterproofed by the addition of "Anti-Hydro" Liquid Waterproofing Compound to all water used in tempering dry mixture of 1 part cement and 2 sand, in proportion of 1 gal. "Anti-Hydro" to each barrel (4 bags) of cement. To assure perfect bond to underlying masonry, all surfaces, before application of waterproofing, shall be thoroughly roughed, cleaned and dampened. Coatings shall be applied not later than 24 hours after surfaces have been prepared. A slush or grout of neat cement, using 1 part "Anti-Hydro" to 3 parts water, is first applied, then followed by a 1 cement: 2 sand mixture.

Floor work shall be 1 in. in thickness, and shall serve the double purpose of a waterproofing agent and dustless wearing surface.

Wall coatings shall be ¾ in. in thickness from floor level, where they shall be properly coved and bonded to floor, and carried up to at least 1 ft. above grade level.

Dampproofing—To a mixture of 1 gal. "Anti-Hydro" and 3 gals. water gradually stir about ½ bag of portland cement to a creamy consistency. Apply in 3 coats with a brush or spray, the surface first being cleaned and dampened.

The first coat is a penetrating one, the mixture for which should be as thick as the brush will carry and well rubbed in, taking particular care to fill all joints and cracks. The second is a further filler. The third is the finish coat, to which any color or effect can be given.

Brickwork—Brickwork to be laid in mortar of 1 part portland cement and 2 parts clean sand. This to be gaged or tempered with water having the addition of "Anti-Hydro" in the proportion of 1 gal. "Anti-Hydro" to 10 gals. water. Each course of brick to be carefully grouted, filling all joints with a liquid mixture as above, carrying the same percentage of "Anti-Hydro" to the water used in gaging it, 1 to 10.

Stucco on Solid Masonry—The stucco shall be applied in 2 coats. The straightening coat shall consist of 1 part portland cement and 3 parts sand. This shall be gaged with a solution of 1 part "Anti-Hydro" to each 10 parts of water. The wall shall first be thoroughly wetted and the straightening coat applied ¾ in. thick. The finish coat shall consist of 1 part portland cement and 2½ parts clean sand, which shall be gaged with the same strength solution of "Anti-Hydro" and water as the straightening coat and applied ¼ in. thick. Surface to be stippled. No lime should be used.

Stucco on Metal Lath—The stucco shall be applied in 3 coats. The first and second coats shall consist of 1 part portland cement and 3 parts clean sand, and shall be gaged with a solution of 1 part "Anti-Hydro" to each 10 parts water. The first coat shall be applied 7/8 in. thick and 3/8 in. over the face of the lath. The second coat shall be 3/8 in. thick. The finish coat shall consist of 1 part portland cement and 2½ parts clean sand, which shall be gaged with the same strength solution of "Anti-Hydro" as the first and second coats and shall be applied ¼ in. thick. Surface to be stippled. No lime should be used.

Acid Resisting—Write for special specifications.

Approval.

The superiority of "Anti-Hydro" for waterproofing and concrete hardening is demonstrated by the permanency of work completed as long as seventeen years ago, and by the comparative tests of the United States Bureau of Standards. In these tests, reported in their Technologic Paper No. 3, they designate "Anti-Hydro" as Compound No. 40, and state "It is most impermeable of any of the Mortars."

Shipment.

"Anti-Hydro" is shipped in standard containers of 5, 10, 20 and 30 gals., f. o. b. Newark, N. J.

CRESCENT SALES & MFG. CO.

Manufacturers of Waterproofing Products

905 Westminster Building
CHICAGO, ILL.

Products.

CRESCENT WATERPROOFING; INDURITE LIQUID HARDENER; CRESCENT METALLIC FLOOR HARDENER; CEM-BRIC COVERING COMPOUND; CRESCENT FOUNDATION COATING; CRESCENT PLASTER BOND; CRESOLAC TRANSPARENT WATERPROOFING; KRES-OIL WOOD FLOOR PRESERVATIVE; HYDROLAC ACIDPROOFING.



TRADE-MARK

Crescent Waterproofing.

The integral method of waterproofing has the prestige of years of successful use. The efficiency of this method of waterproofing concrete, cement mortar and cement stucco has been demonstrated in a practical way to the satisfaction of architects, engineers and builders for so long a time, that it is now conceded to be the economical and correct method of procuring permanently waterproof results.

Crescent Waterproofing (paste or powder) can be thrown in the mixer without any preliminary preparation. This is a distinct advantage over other types of waterproofing. It is efficient beyond the factor of safety, and its use means economy and effectiveness for all classes of waterproofing work.

Indurite Liquid Hardener.

A colorless chemical compound, which, when applied to portland cement surfaces, changes them to a flinty, granitelike hardness. Indurite gives concrete floors a permanent wearing surface, and insures them against dusting and the action of oils and moisture.

The Indurite method is adaptable for both new and old concrete floors. Its effectiveness combined with economy of application makes it a thoroughly practical material for protecting concrete floors against undue wear.

Indurite hardens by chemical reaction and is therefore permanent. A special folder gives detailed information as to its uses.

Covering Capacity—For 2-coat work approximately 100 sq. ft. per gal.

Directions—Thoroughly clean floor, removing all foreign matter such as oils, grease, etc. Workmen should wear rubbers or rubber boots. Apply material in 2 coats. Dilute first coat of Indurite with water, half and half. Flush the floor to full absorbent capacity and scrub in thoroughly with long-handled brushes with stiff bristles. Apply the second coat of Indurite without dilution, after a few hours. Scrub second coat thoroughly into the surface. Any material not absorbed can be removed with a rubber squeegee, preferably with hot water.

Crescent Metallic Floor Hardener.

A finely ground iron compound for hardening and dustproofing concrete floors.

Directions—The dust coat method in most general use is as follows: when topping is partly set, float to even surface. Dust over same a mixture of 25 lbs. each of hardener and portland cement for each 100 sq. ft. of surface. Float in and trowel, giving a second troweling at the proper time to make a smooth, even finish. Protect the floor with wet sand or sawdust for several days.

Cem-bric Covering Compound.

A waterproof decorative paint for exterior surfaces of brick, cement stucco and concrete. Cem-bric penetrates and seals the surface pores and is made in the following colors: white, cream, buff, cement gray, tile green, brown and brick red.

Directions—Give flowing coat over dry surface until pores are thoroughly saturated. If necessary, first coat can be thinned with turpentine. Apply second coat without dilution 24 hours after first coat.

Crescent Foundation Coating.

A heavy black, asphaltic paint for dampproofing outside of foundation walls, under wood floors and work of similar character.

Covering Capacity—About 65 sq. ft. per gal. on brick; 75 sq. ft. per gal. on concrete. Double coat work 40 to 50 sq. ft. per gal.

Directions—Apply with large brush from outer edge of footings to 2 in. above grade level. After first coat dries, apply second coat.

Crescent Dampproof Plaster Bond.

A dampproof protecting and bonding material to be applied to the inside surfaces of outer or exposed walls before application of plaster.

Covering Capacity—60 to 75 sq. ft. per gal. on brick; about 75 sq. ft. per gal. on concrete, for single coat work.

Directions—Apply with large brush and coat thoroughly, leaving no pinholes. Plaster can be applied after 24 hours.

Cresolac Transparent Waterproofing.

A waterproofing liquid to be applied with a brush for protecting exteriors of cement, brick and porous stone against water penetration. It leaves no film on the surface, but enters and effectively seals the pores without changing the color of the treated surface.

Covering Capacity—150 to 200 sq. ft. per gal. for 2 coats.

Directions—Apply with wide brush in 2 coats several hours apart, over dry and dirt-free surface.

Kres-Oil Wood Floor Preservative.

An amber liquid compounded of preservative oils and gums for treating unpainted wood floors to prevent undue wear, moisture absorption and splintering. Gives rich, soft tone, brings out grain of the wood and makes a practical treatment for schoolrooms, office and factory floors.

Covering Capacity—About 300 sq. ft. per gal. for each coat, depending on absorbing quality of wood.

Directions—Apply in 2 coats several hours apart. Surface must be clean and dry.

Hydrolac Acidproofing.

A special acid and alkali resistant coating. The protective value of this material was demonstrated in a recent acid splash test where 2 coats of Hydrolac Acidproofing was not affected by either sulphuric, nitric or muriatic acids.

THE GENERAL FIREPROOFING COMPANY

Waterproofing and Dampproofing Products and Technical Paints

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BRANCH OFFICES

BALTIMORE, Builders' Exchange
BUFFALO, 40 Builders' Exchange
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MILWAUKEE, 1018 First Wisconsin National Bank Bldg.

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KANSAS CITY, 1009 Waldheim Bldg.
OMAHA, 213 Kennedy Bldg.
SAN FRANCISCO, 444 Market St.

EXPORT DEPARTMENT: 438 Broadway, NEW YORK

Products.

WATERPROOFING MATERIALS for Integral and Membrane Methods; DAMPPROOFING COMPOUNDS; CEMENT FLOOR COATINGS; CEMENT ACCELERATOR and HARDENER; STONE BACKING; MASTIC CEMENT; BONDING COMPOUND; METAL PROTECTIVE COATINGS; WOOD PRESERVATIVES.

For Metal Lath Reinforcement, see pages 142-45.

Service.

A Waterproofing Service Department is maintained, which will furnish recommendations on methods and materials; also complete specifications if informed regarding the nature of the work.

GF Waterproofing and Dampproofing Products.

GF No. 10 Integral Waterproofing Paste—A smooth white paste mixed with the gauging water for concrete and cement. A colloidal composition in itself, it augments the greatest colloidal development in the portland cement, thereby causing greater solidification and densification, which result in greater hardness and impermeability.

It is used for waterproofing concrete foundations, floors, tanks, silos, etc., as an integral part of the mix; for waterproof coating when mixed with cement plaster; for waterproofing stucco exteriors over masonry, metal lath, hollow tile, etc.

GF No. 11 Integral Waterproofing Powder—For the same work as GF No. 10 Paste. The only difference is the form and method of application.

GF No. 12 Cement Accelerator—A colorless liquid mixed with water and used to hasten set of cement. Also used to lower the freezing point.

GF No. 16 Foundation Brush Coating—A heavy bitumen which can be swabbed on with a brush; used for dampproofing substructures on the outer surface before refilling with soil.

GF No. 17 Mop Coating, GF No. 18 Waterproofing Felt and GF No. 21 Saturated Fabric—For membrane waterproofing courses. Nos. 17 and 18 are used for waterproofing basements, floors, roofs, etc.; Nos. 17 and 21 for swimming pools, steel and concrete bridge decks, etc.

GF No. 99 Acidproofing—A transparent liquid which effectively resists dilute acids and acid gases.

GF No. 100 Colorless Waterproofing for Exteriors—A permanent pore-filling liquid which in no way changes appearance of walls, but waterproofs them. It is used for waterproofing exterior walls of brick, stone, or stucco; for copings, parapets, cornices; for cisterns, water tanks, and pools.

GF No. 101 Cement and Masonry Coating—For uses similar to those of GF No. 100, except that it imparts a lasting color to the surface. Furnished in colors: white, old ivory, buff, bedford gray, portland gray, concrete gray, tile red, and brownstone.

GF No. 145 Floor Hardener—A concentrated

liquid for hardening and dustproofing concrete floors, both new and old. Also used to prevent streaking and staining on the face of granite and limestone. Proof against water, oil, and dilute acids. Especially suitable for factories, warehouses, etc.

GF No. 150 Floor Primer—A primer which may be used in conjunction with GF No. 155 Floor Enamel.

GF No. 155 Floor Enamel—A decorative, protective coating for concrete floors, extremely long in vehicle, thereby insuring deeper penetration and greater wearing surface. Consequently it makes a better dustproofing. Supplied in red, brown, gray, green, and colorless. Especially suitable for office buildings, hospitals, hotels, and public buildings.

GF No. 200 Dampproofing Coating—A heavy bitumen which is applied cold to the interior of rough brick or masonry walls. While primarily a dampproofing the strong "tack" developed aids in bonding the plaster; also forms an insulator. Used as dampproofing on walls to which plaster is applied directly, or over lath and furring.

GF No. 220 Stainproof Stone Backing—Applied on the back and joint surfaces of limestone, marble, etc., before erection, to prevent staining and efflorescence.

GF No. 250 Mastic Cement—A thick, cementlike waterproofing for concrete roofs and for pointing up joints, window and door casing, etc. In black and colors.

GF No. 250 Liquid Primer—A pure bitumen coating which provides a surface on which GF No. 250 Mastic Cement is applied.

GF No. 400 Bonding Compound—A strongly acidulated powder dissolved in water and used as a wash to increase the bond between old and new concrete.

GF Technical Paints.

GF Nos. 300 and 325 Structural Steel Coatings—For structural steel, either permanently exposed, or to be incased in masonry or concrete.

GF No. 350 Galvanized Iron Coating—A thin, transparent compound in liquid form. One coat applied with a brush to any galvanized surface will neutralize and cover up the oily film, preparing the surface for ordinary oil or graphite paint. GF No. 101, in colors, can be used over this priming coat.

GF Wood Preservatives.

GF No. 160—A high grade wood preservative which may be used on hard or soft wood floors in apartment houses, schools, etc.

GF No. 550—Makes wood impervious to water; protects it from rotting due to dampness; prevents formation of fungi, and discourages wood-boring insects. Applied by brush, spray, or immersion. Nut brown color; leaves no film.

Handbook.

The Waterproofing Handbook containing complete specifications furnished on request.

THE HYDREX CORPORATION

Specialists in Structural Waterproofing, Insulation and Soundproofing

50 Broad Street
NEW YORK, N. Y.

FACTORIES
RAHWAY, N. J.

BRANCH OFFICES
CHICAGO, ILL. PHILADELPHIA, PA.

Products.

HYDREX WATERPROOFING FELT
HYDREX PRIMER and HYDREX (BITUMEN) COMPOUND

HYDREX-"SANIFLOR" DEADENING FELT
HYDREX-"NOVENTO" WATERPROOF SHEATHING PAPER

HYDREX WATERPROOFED BURLAP
HYDREX PRESERVATIVE PAINT
HYDREX-"BIKOTA" SHEATHING PAPER
HYDREX WATERPROOF CLOTH
HYDREX WATERPROOF CANVAS

HYDREX-"PLUVINOX" READY ROOFING
Hydrex Expansion Joint (strips); Technical, Roofing and Asphalt Paints; Cold Storage Insulation, Damp Course, Asphalts, Cloth-backed Case Lining, etc.

Hydrex Waterproofing Felt ("The Membrane Method").

This well-known waterproofing felt is an absolutely impervious leatherlike sheet, first saturated and then given a *glazed coating* on both surfaces. Used in two or more layers with hot Hydrex Compound (as the conditions may require) for waterproofing foundations, tunnels, subways, reservoirs, swimming pools, dry docks, fortifications, battery room floors, etc.

SPECIFICATIONS—For general waterproofing work, specify 4 layers of the felt, cemented together with hot Hydrex Compound (*The Membrane Method of Waterproofing*), which has been successfully used in the most difficult water pressure work throughout the world.

For waterproofing upper floors in mills, warehouses, etc., specify 2 layers of Hydrex Felt "*Penna. Special*" grade, cemented together with hot Hydrex Compound.

Detailed specifications, suited to particular needs and conditions, will be promptly supplied, on request. As engineers and experts in structural waterproofing, this company will furnish estimates, plans and specifications for waterproofing any kind of construction.

Hydrex-"Saniflor" Sound Deadening Felt (Insulation).

A thick, soft felt *coated* on both surfaces so as to hermetically seal in the felt and render it non-absorbent, clean, sanitary and absolutely verminproof. Moths, mice and other vermin will *not* and can *not* eat the coating, because gnawing causes the teeth to stick. The well-known sound deadening quality of Hydrex-"SANIFLOR," together with its verminproof features, makes it unequalled for use in hospitals, residences, apartment houses, schools, etc.

Also widely used under machinery to prevent vibration and as a warmth giving, blanketlike lining under clapboards and roofs, and for cold storage, ice-houses and refrigerator car insulation.

Hydrex-"SANIFLOR" is put up in rolls 36 ins. wide, containing 300 sq. ft.



TRADE-MARK
Reg. U. S. Pat. Off.

Hydrex Primer and Hydrex (Bitumen) Compound.

Used for coating walls, floors, electrical work, etc. Hydrex Compound is a standard for junction boxes, mastic acid resisting floors, etc.

SPECIFICATIONS—When surfaces are dry, brush on a thorough coating of Hydrex Waterproofing Primer, and when dry, mop over it a heavy coating of hot Hydrex Compound.

Hydrex Dampproofing and Preservative Paint.

A heavy bodied black paint for dampproofing the interior or exterior surfaces of walls, and also for hollow terra cotta tile walls to be stuccoed. It excels in *acid resisting qualities*, especially against sulphuric acid, and is therefore standard for use in electric storage boxes and battery rooms, for coating walls and all exposed metal.

This paint forms a heavy, tenacious, impervious coating to which plaster and stucco tightly bond. For the best results, 2 coats should be used. Covering capacity, 1 gal. for about 100 sq. ft. of brick surface.

Hydrex-"Novento" Waterproof Sheathing Paper.

An extra heavy *felt paper*, first waterproofed through and through and then given a *glazed coating* on both sides. *Is further improved by a coating of powdered soapstone* on the weather side, the soapstone being a great water repellent and preservative. Used under clapboards, slate, tile, stucco, tin, etc., the gray or soapstoned surface is turned outward towards the weather; under floors, the soapstone surface is turned upward.

Hydrex-"NOVENTO" contains no *coal tar* or *acids* to corrode tin, nails or other metal. Being alkali resisting, it is largely used under stucco. Made in 1-ply, 2-ply, 3-ply. Put up in rolls of 500 sq. ft.

Hydrex-"Bikota" Waterproof Sheathing Paper.

A low priced, waterproof sheathing paper, coated on both sides, but *not* saturated. Widely used under floors and parquet flooring. Made in 1-ply, 2-ply, 3-ply. Put up in rolls of 500 sq. ft.

Hydrex Waterproof Canvas.

A heavy, strong canvas, impregnated and coated with an elastic waterproof compound. Used on porch roofs, boat decks, piazza floors, etc., where there is considerable walking. Shipped in rolls 29 ins. wide, containing 216 sq. ft.

Hydrex Burlap, "New York Subway Brand."

A saturated and coated burlap accepted and used for waterproofing New York Subways. Put up in rolls of 400 sq. ft.

Hydrex Waterproof Cloth.

A waterproofed woven fabric used for waterproofing in connection with (hot) Hydrex Compound. Shipped in rolls 36 ins. wide, containing 500 sq. ft.

Hydrex-"Pluvinox" Ready Roofing.

A high grade, smooth surfaced, durable roofing. Made in 1-ply, 2-ply, 3-ply. Rolls contain 216 sq. ft.

THE HYDROLITHIC WATERPROOFING CO., INC.

Engineers and Contractors for Waterproofing

TELEPHONES:
GREELEY 2264, 2265

1328 Broadway
NEW YORK, N. Y.

Services and Products.

Engineers and Specialists for WINSLOW'S HYDROLITHIC SYSTEM OF WATERPROOFING.

HYDRO-CRETE, a Protective Concrete.

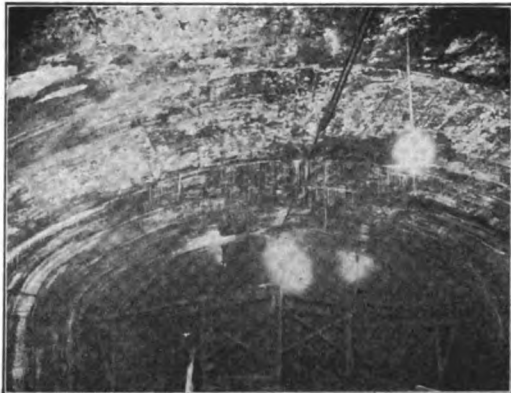
This company takes and executes contracts for the WATERPROOFING of all kinds of SUBSTRUCTURES, such as Subways, Tunnels, Reservoirs, Vaults, Swimming Pools, Boiler Rooms, Cellars, etc., giving a guarantee against any percolation, whether structures are of concrete, brick or stone.

Winslow's Hydrolithic System.

All work is executed in the well-known Winslow's hydrolithic system, using either hydrolithic cement or hydrolite as the conditions may require. Hydrolithic coatings contain all the good points of a first class true portland cement mortar, with the addition of their water repellent and waterproofing qualities.

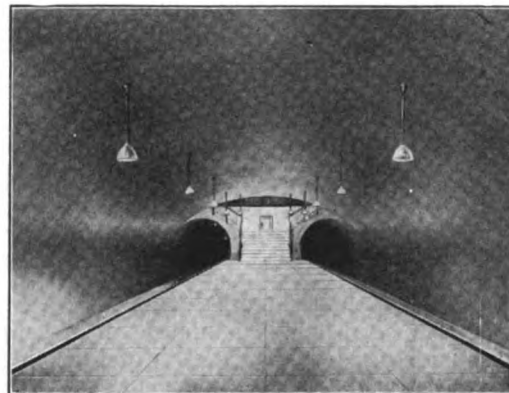
Application—Hydrolithic waterproofing is applied on the interior of exterior walls and floor forming one monolithic shell, and the adhesive qualities are such that

HYDROLITHIC
TRADE-MARK



Before applying Waterproofing

42ND STREET (NEW YORK) STATION, QUEENSBORO SUBWAY



After being Waterproofed

it will withstand any water pressure, and will last just as long as the structures waterproofed will last. Hydrolithic waterproof coatings, $\frac{5}{8}$ in. thick on brick, have withstood a laboratory test of 1200 lbs. per sq. in.; and actual successful work has been done 162 ft. below grade, representing a hydrostatic pressure of over 70 lbs. per sq. in.

Advantages—The advantages of Winslow's hydrolithic system over the old membranous method are many: Repairs of any defects can be made easily, as the work is always in sight; it gains floor space, taken up in the membranous method of protecting brick walls, not necessary under the hydrolithic system; the waterproof coat constitutes the finish of the walls and floors, and, being impervious, is absolutely sanitary. Hydrolithic coatings are perfectly bonded to waterproofed structures, forming a part of such and thereby add strength to walls, and especially to floors.

Record—Winslow's hydrolithic system has been used for more than 20 years; has stood the test of time,

and the company can truly say there is nothing superior to it on the market to-day.

Estimates—If architects will write their requirements, specifications and estimates will be gladly furnished, no matter how large or small the job may be.

References—A few of the buildings where Hydrolithic Waterproofing was used:

Crane Warehouse, New York, N. Y., Starrett & Van Vleck, Architects
S. A. Maxwell Warehouse, Pittsburgh, Pa., Hunting Davis Co., Architects
B. F. Goodrich Co., Akron, Ohio—Water softening plant, Purdy & Henderson, Engineers, New York, N. Y.
Association for Improvement of Poor Building, Pittsburgh, Pa., E. P. Melon, Architect
Pittsburgh Plate Glass Co., Ford City, Pa.
United Presbyterian Church, Crafton, Pa.
Office Building for H. A. Jacobs, Architect, New York, N. Y., H. A. Jacobs, Architect
Royster Building, Norfolk, Va., Carlow, Wrenn & Tazewell, Architects
Machineless Refrigerator Co., Brooklyn, N. Y.
N. Y. Central RR. Coaling Station, Rensselaer, N. Y.
Waverly Oil Co., Pittsburgh, Pa.
U. S. Post Office, Asbury Park, N. J.
William Penn Hotel, Pittsburgh, Pa., Janssen & Abbott, Architects

Hydro-Crete.

A concrete especially adapted to the construction of bank vaults, producing the highest degree of protection against fire, water, intense heat, riots and burglary.

Hydro-Crete received the indorsement of experts after thorough tests had been made, representing as near as possible actual conditions of destruction by fire, drilling, cutting and smashing.

References—Hydro-Crete has been used lately in the construction of the following bank vaults:

Seaboard National Bank, New York, N. Y.
Columbia Trust Company, 60 Broadway, New York, N. Y.
Columbia Trust Co., 34th Street and Fifth Avenue, New York, N. Y.
Columbia Trust Co., 148th Street and Third Avenue, New York, N. Y.
National Commercial Bank, Albany, N. Y.
Rhode Island Hospital Trust Co., Providence, R. I.
Metropolitan Life Insurance Co., New York, N. Y.
Central Trust Co., Cincinnati, Ohio

HYDRO-CRETE
TRADE-MARK

MINWAX COMPANY, INC.

Manufacturers and Consulting Engineers on Waterproofing

18 East 41st Street

NEW YORK, N. Y.

CHICAGO, ILL., 327 South LaSalle Street PHILADELPHIA, PA., 507 Shubert Building
AGENTS AND DISTRIBUTERS IN ALL PRINCIPAL CITIES

Products.

MINWAX ELASTIC MEMBRANE SYSTEM
of SUB-LEVEL WATERPROOFING; EXPAN-
SION JOINT MATERIALS; PROTECTIVE METAL COATINGS.

Also manufacturers of Dampproofing, Concrete
Floor Finish, Clear Waterproofing, Brick and Cement
Coatings.

Minwax Waterproofing System.

This is the original elastic membrane system of sub-level or pressure waterproofing, consisting of 2 layers or plies of Minwax Saturated Cotton Fabric laid in and cemented with 3 swabbings of Minwax Waterproofing Asphalt. It forms a thick, heavy, impervious blanket or sheathing that is practically punctureproof, highly elastic, chemically and physically stable and permanent so far as observations of 15 years can indicate.

Minwax Saturated Fabric is a heavy, strong, elastic cotton cloth, specially woven, and thoroughly saturated with the same highly refined natural asphalt which constitutes the plying cement. Its complete saturation, by means of pressure, not only protects each fiber of the cloth against moisture, but also prevents the lateral transfer of moisture by capillary action through the laminations of the blanket.

Minwax Waterproofing Asphalt is a naturally occurring asphalt refined with the sole object of producing a waterproofing cement absolutely stable both physically and chemically—in other words, permanent in its waterproofing qualities. It has maximum ductility, is extremely tough at all working temperatures without becoming brittle, and shows minimum susceptibility to temperature changes.

Minwax Saturated Fabric and Minwax Waterproofing Asphalt are not two unrelated products, but are specifically designed to function in combination, each supplementing and reinforcing the other and merging into a true unit system of waterproofing.

The Minwax Waterproofing blanket has great tensile strength, will stretch without fracture up to 10% in any direction, resists all ordinary pressures, and remains flexible and elastic under all ordinary temperatures. A structure protected by the Minwax System is permanently protected against water. Cracks and fractures in structures, admitting water, commonly occur as the result of temperature changes, of settlement, or of vibration and shock. The elastic Minwax blanket maintains an unbroken, impervious surface even under these most extreme conditions.

The Minwax System is the one elastic membrane system with a service record extending over years of actual service, proving its dependability and timeproofness. It has demonstrated its dependability on building foundations, bridges, viaducts, pump wells, scale pits, retaining walls, coal pockets and other types of sub-level construction exposed to water pressure.

Complete specifications will be sent on request.

Minwax Expansion Joint Materials.

Minwax Expansion Joint Cement for horizontal joints is a specially refined asphaltic substance of permanent stability, forming a positive and permanent bond

MINWAX

with any material, and remaining flexible and elastic under a wide temperature range.

Minwax Fibrous Expansion Joint Cement, for inclined expansion and construction joints, is a stable asphaltic material carrying a fibrous substance which holds it in place while bonding perfectly with any material.

Minwax Protective Metal Coatings.

These asphaltic derivatives, made in a variety of standard numbers for a variety of services, have the stability and permanent characteristic of all Minwax Protective Products. The best results are obtained where the company is able to make recommendations based on a knowledge of the exposures to be met.

Specifications on the most suitable coating will be furnished on receipt of data describing the service conditions.

Minwax Service.

The excellent results which have attended the use of the Minwax System and Minwax Products, are largely due to the co-operation afforded users by Minwax engineering service. This covers the three vital factors in any waterproofing problem—design, materials and application. It is the result of constant contact with problems in waterproofing and structural protection in diverse fields and localities. It is the basis of the company's slogan, "the proof of quality is a record of service."

The company maintains a corps of superintendents capable of organizing and starting any project or supervising any installation in its several lines, and it is in touch with contractors the country over, with experience and equipment qualifying them for work in structural protection.

Minwax Publications.

Any or all of the following publications will be sent on request—Minwax Products for Standardized Structural Protection, a catalogue; Bulletin 21, Sub-Level Waterproofing; Bulletin 22, Waterproofing Exposed Walls; Bulletin 23, Concrete Floor Treatments; Bulletin 24, Protective Metal Coatings.



DETROIT-SUPERIOR HIGH LEVEL BRIDGE, CLEVELAND, OHIO
A. W. ZESIGER, Bridge Engineer; W. A. STINCHCOMB, County Engineer.
Both decks waterproofed by Minwax System, 250,000 sq. ft.; waterproofing on lower deck protected by Minwax Mastic; completed in 1917

MORENE PRODUCTS CO., INC.

Manufacturers of Portland Cement in Liquid Form and Waterproofing Specialties

247 West 28th Street
NEW YORK, N. Y.

SAN FRANCISCO OFFICE, 142 Stillman Street

AGENCIES

PHILADELPHIA, PA., ARVON Co., Heed Building

BOSTON, MASS., E. R. BRISBIN, Tremont Building

Products.

MORENE LIKWID SEMENT, a Finishing and Protective Coating with which any texture and color can be produced. Adaptable for exteriors and interiors.

MORENE KEMISOL, a Preservative and Permanent Colorless Waterproofing for Stone, Brick and Cement Surfaces.

MORENE PETROFLUID, used integrally in cement plaster for Waterproofing Basements, Tanks, Tunnels, etc., subjected to water pressure.

Technical Service Department.

This company maintains a technical service department. Experts are available for the solution of any problems pertaining to the proper use of Morene products.

Morene Likwid Sement.

Morene Likwid Sement is portland cement in liquid form, produced by a chemical process, carrying sand and asbestos in suspension, retaining the natural set, hardening, and curing features of the original portland cement base. Is free from injury in any temperature.

The base color is white portland cement. It is applied with a brush or trowel on stone, brick, concrete, plaster, metal or painted surfaces. Any smooth, stippled or stucco effect can be produced in any color.

Morene Likwid Sement produces a perfect portland cement surface, will not scale or crack and fine hair checks will not appear as in ordinary cement plaster.

It can be applied without injury when subjected to hot sun and wind. After being applied an hour ordinary showers will not injure the surface.

Rough concrete or brick walls first given a surface application of Morene Kemisol (see directions Kemisol) and a heavy brush coat of Morene Likwid Sement will be absolutely waterproof and have a reasonably smooth appearance, as the small voids and imperfections will be filled.

For exteriors—old defective stone, brick and cement walls can be safely refinished. Morene Likwid Sement applied over brown coat cement plaster makes it unnecessary to apply the usual finish or dash coat of plaster and paint. Likwid Sement will produce both texture and color. Wooden or metal cornices can be finished to match the adjacent stucco or stone work.

For interiors—Morene Likwid Sement applied over troweled brown coat plaster replaces both the hard finish plaster coat and decorative painting.

Results—permanent washable sanitary surfaces, artistic effects, time-saver, lower cost. Likwid Sement obliterates all faults on old and defective painted and kalsomined surfaces.

Two or three heavy brush coats of Likwid Sement applied on structural metals will protect same against corrosion or smoke fumes.

Cold water pipes and other metals developing diffi-

culties from condensation where coming in contact with warm, moist air can be heavily coated with Likwid Sement, successfully eliminating this trouble and producing splendid insulating qualities.

Likwid Sement is absolutely fireproof, and will retain the bond and not crack or peel when applied on metals, even if subjected to 500° of continuous heat. Likwid Sement applied over combustible materials, such as wood, fiber boards, etc. produces an unusually efficient fire retardant.

Morene Kemisol.

The scientific, practical, economical perfection of a colorless waterproofing and preservative for stone, brick, concrete and cement surfaces above ground.

Morene Kemisol is a chemical solution, water base, ready for use, and is efficient only on absorptive surfaces.

Kemisol is a surface application and permanently waterproofs by destroying the basic cause, absorption or capillarity (a force of nature) existing in the material itself, to depth of penetration. Leaves no coat, fills no pores, and is absolutely colorless.

Kemisol is a preservative for stone, brick and cement; prevents discolorations, stains, and damage from frost.

Kemisol applied to the surface prevents efflorescence or alkali from appearing on walls.

Kemisol applied on newly plastered sand or hard finished walls is a perfect sizing for paint and kalsomine.

Kemisol applied to the beds and builds of granite, stone and artificial stone before setting in wall will prevent any stains and discolorations appearing from the cement or lime mortar.

Morene Kemisol should be applied with a compressed air spray; or a large brush as required. Every square inch of exposed surface must be treated. Crevices, cracks, voids and all low places must be thoroughly saturated.

Morene Petrofluid.

An underground waterproofing material for basements, tunnels, tanks and reservoirs, or any concrete brick, or stone construction subjected to water pressure.

Petrofluid is a chemical solution water base ready for use as an integral mix.

Petrofluid waterproofs by destroying the cause, absorption or capillarity existing throughout the cement plaster itself.

Petrofluid is to be used as an integral mixture only in the cement wall plaster and floor topping. This work can be done effectively on the inside against any water pressure from opposite side of wall. Never use Petrofluid in the structural wall or floor slab.

Cement wall plaster and floor topping made non-absorptive throughout the mass by the use of Petrofluid will resist constant and severe water pressure.

The efficiency of Petrofluid in cement mortar is permanent, unaffected by time, heat or acids.

NEW PROCESS CHEMICAL CO., INC.

Waterproofing and Acid Resisting Paints and Cements

39 Cortlandt Street
NEW YORK, N. Y.

Products.

PAINTS: Waterproofing, Acid Resisting, Anticorrosive, Insulating, Concrete, Marine.

CEMENTS: Waterproofing, Acid Resisting, Flashing, Seam, Elastic, Roof, Vault Light, Insulating.

Also manufacturers of Waterproof Linoleum Cement.

XXX Nupro Cement (Maroon and Black)—Elastic, Adhesive, Waterproof and Acidproof.

Applied while hot with a trowel. For waterproofing structures. Will adhere to brick, concrete, steel, wood, tin, iron, slate, glass or felt. Retains its elasticity; will withstand vibration and climatic changes.

Especially adapted for waterproofing foundation walls; for lining steel, wood or concrete tanks; for coating exposed brick walls; for filling cracks and stopping leaks in concrete roofs, foundations, tanks, etc.; for waterproofing steel joints where they go through concrete; for coating steel girders lying in wet or damp places for prevention of electrolysis and corrosion; for uniting old and new concrete, making a perfect watertight joint; for tile and slate roof repairing; for vault lights, for waterproofing interstices of steel structures, etc.

Covering Capacity—1 lb. XXX Nupro Cement covers 2 sq. ft. $\frac{1}{8}$ in. thick.

Note—Used on the Queensboro and Manhattan bridges in New York City for waterproofing expansion joints. In service since 1916, still qualifying.

X Nupro Cement (Maroon in Color).

X Nupro Cement is an especially high grade of flashing for dormer windows, skylights, chimneys, repairing leaks in tin roofs, etc.

It is ready for use. Adheres to wet or dry surfaces and forms a leatherlike impregnable coat that always remains elastic and adhesive and will not become brittle, peel off, crack due to vibration, nor is it affected by climatic changes.

Covering Capacity—1 lb. covers 4 sq. ft. when applied as a flashing.

Nupro Solution and Enamel—Elastic and Adhesive Anticorrosive Coating for All Kinds of Tanks.

Nupro Solution is a primer to be used in steel or concrete water tanks or containers that are to hold cold acid solutions, alcohol or vinegars, after which a coating of Nupro Enamel, $\frac{1}{8}$ in. thick is applied.

Covering Capacity—1 gal. of Nupro Solution covers 400 sq. ft. of surface.

100 lbs. of Nupro Enamel will coat 200 sq. ft. $\frac{1}{8}$ in. thick.

INTRODUCED 1907



TRADE-MARK
Reg. U. S. Pat. Off.

"Tri-Bitume" (Registered).

"Tri-Bitume" is a composition of bitumen mixed with non-oxidizing oils, is elastic, adhesive, waterproof and insulating.

For waterproofing foundation walls below grade, dampproofing walls above the grade level and stainproofing limestone, granite and marble.

Manufactured in several consistencies.

Note—Nupro "Tri-Bitume" was used for waterproofing concrete car floats and barges built by the United States Navy and War Departments.

TRADE
"TRI-BITUME"
MARK

"Tri-Bitume" No. 11 (Primer).

A primer to be used in conjunction with "Tri-Bitume" No. 22 and No. 33 as a first coat where structures are to receive 2 or more coats. Its purpose is penetration and to seal all pores.

Covering Capacity—1 gal. covers 100 sq. ft.

Dampproofing Walls above Grade (Interior).

"Tri-Bitume" No. 22, a black, heavy, elastic, waterproof material that remains tacky, makes a perfect bond between plaster and main wall, eliminates furring and lathing.

Covering Capacity—1 gal. covers 80 sq. ft.

Dampproofing Walls below Grade (Exterior).

"Tri-Bitume" No. 33, a heavy, semiplastic, water-repellent, elastic coating; is applied with a stiff brush or trowel to the outside of foundation walls, after the same have received a coating of "Tri-Bitume" primer No. 11. (Backfill should not be placed until after the coating has dried for at least 48 hours.)

Covering Capacity—1 gal. "Tri-Bitume" No. 33 will cover 40 sq. ft.

Stainproofing Marble, Limestone, Granite, etc.

Apply 1 coat of "Tri-Bitume" No. 11 before stone is to be laid and 1 coat of "Tri-Bitume" No. 22 not more than 24 hours before the stone is laid. The above treatment will eliminate mortar stains and efflorescence.

Nupro Acid Resisting Paint No. 44 (Maroon, Black, Gray and Green).

For factories, foundries and industrial plants. Not being affected by acid fumes or gases, it is especially adapted for coating all steel or iron structural work in industrial plants, foundries, etc., for the prevention of disintegration due to corrosion caused by gases, acid fumes and climatic conditions. Possesses a proper degree of expansion and contraction, and will not crack, chip or peel off.

Maroon is recommended as a first coat.

Covering Capacity—1 gal. covers about 400 sq. ft. of surface.

PERMANENT WATERPROOFING CO.

Engineers and Contractors for Waterproofing

Peoples Gas Building
CHICAGO, ILL.

BRANCH OFFICES

PITTSBURGH, PA., 813-14 Union Bank Building
KANSAS CITY, MO., 230 Lathrop Building
ST. PAUL, MINN., Pioneer Building
MILWAUKEE, WIS., First National Bank Building

HOUSTON, TEX., 204 Beatty Building
FT. WORTH, TEX., 117 South Jennings Avenue
OMAHA, NEBR., 503 Farnum Building
OKLAHOMA CITY, OKLA., 401 First National Bank Building

Services.

The PERMANENT WATERPROOFING CO. maintains a staff of Engineers and practical men fully conversant with problems involving WATERPROOFING and PROTECTING STRUCTURES from DISINTEGRATION.

No material is sold, but all problems are taken by contract and the work performed by experts under guarantee.

Waterproofing.

The Permanent Method involves the use of Ironite, an iron product ground to an impalpable powder mixed with chemicals to hasten oxidation. Applied as a surface treatment to concrete, brick, stone, tile, etc., the Ironite oxidizes and expands, penetrating and filling all surface pores, and becomes an integral part of the structures, both waterproofing and strengthening them.

This treatment insulates against electricity, steam, cold and heat. It is non-magnetic, prevents electrolysis and withstands extreme heat. Tests have proved it unaffected by temperatures at which steel, concrete and fire brick have run.

The Permanent Method protects concrete, brick, etc., from the disintegration of oils, fats, brines, syrups, alkalis, gases, etc.

Where Used—Basements, subways, vaults, powerhouses, scale pits, coaling stations, engine pits, cinder pits, tunnels, swimming pools, tanks, reservoirs, septic tanks, viaducts, retaining walls, bridges, etc.

Application—Applied to either interior or exterior

surfaces as conditions require. Effectively placed on inside of wet walls.

Treatment on interior surface avoids the necessity of excavation, and is, therefore, the most economical for old construction. No interior lining of concrete or brick is required to hold the waterproofing in place. Consequently, in case of cracks in the structure, they are easily located and as easily repaired. Weather conditions do not interfere with the progress of the work.

Pressure—Surfaces treated with the Permanent Method are guaranteed to be, and to remain, waterproof, provided that the pressure does not exceed 4350 lbs. per sq. ft.

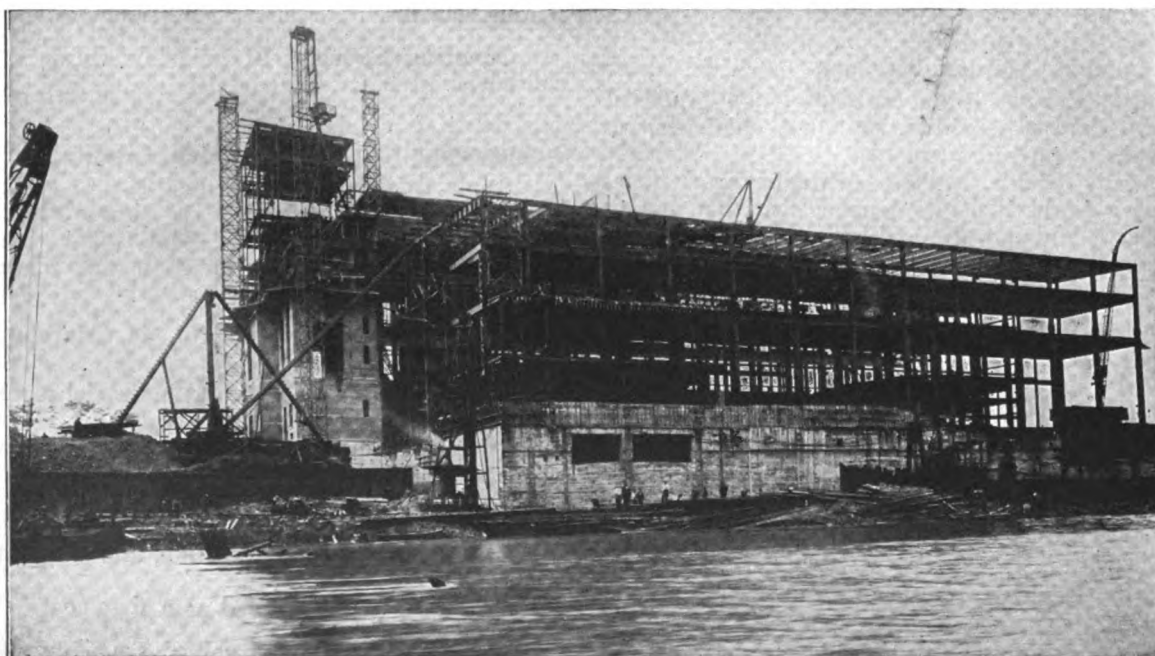
Finish of Walls—Walls may be plastered, painted or decorated directly over the waterproofing.

Life—Treatment remains effective and lasts as long as the structure to which it is applied. In most instances it lengthens the life of the structure.

Specifications—Specify that all surfaces to be waterproofed shall be waterproofed by the Permanent Method applied by the PERMANENT WATERPROOFING Co., Peoples Gas Building, Chicago, Ill.

Oilproofing.

This material is applied similar to the waterproofing, producing a surface coating impenetrable to oil as well as water. It is unaffected by either mineral, animal, or vegetable oils, prevents leakage and protects the structure from disintegrating action. Tanks so treated have been in service for over 3 years and show no signs of deterioration.



COLFAX POWER STATION, DUQUESNE LIGHT CO., PITTSBURGH, PA.

Discharge tunnels, discharge wells, water tank, river walls, etc. waterproofed by the PERMANENT WATERPROOFING Co.

THE STANDARD PAINT COMPANY

Waterproofing Materials and Compounds

95 Madison Avenue

NEW YORK, N. Y.

GENERAL OFFICES

BOSTON, MASS.

CHICAGO, ILL.

SAN FRANCISCO, CAL.

MONTREAL, QUE.

Products.

RUBEROID CEMENT-WATERPROOFING (Patented, formerly called IMPERVITE).

Also Ruberoid Weatherproofing Products, including Roll Roofings, Shingles, Waterproofing Felts, Insulating Papers, Technical Paints and Asphalt Specialties.

Ruberoid Cement—Waterproofing.

Ruberoid Waterproofing has been known for years under the name of *Impervite* and, although there has been a change of name, the compound is still made from the same formula, by the same company and will continue to produce the same results that have gained for *Impervite* a worldwide reputation.

Ruberoid Waterproofing is used for waterproofing, acidproofing and oilproofing. It makes the most impermeable mortar known to science. It will resist an enormous water pressure and will hold gasoline and even compressed air.

A mortar facing containing Ruberoid Waterproofing, plastered on the *inside* of a structure, according to Specification A, will resist successfully a 100-ft. head of water coming from the outside. It waterproofs *with a high factor of safety* and adheres to new or old surfaces. Nothing can pry it loose. Age improves its quality.

Ruberoid Waterproofing is a white paste having a *paraffin* base, emulsified so as to be mixable with water. Unlike compounds containing calcium-stearate or other soap, it does not reduce the strength of mortar, or delay the set. Therefore, larger amounts can be used and greater safety attained, although even for equal weights it will be twice as efficient.

Ten years practical success, as well as conclusive technical facts, await your investigation.

Lean Mixtures Now Possible.

The efficiency attainable with Ruberoid Waterproofing, permits using a lean mortar, no matter how severe the waterproofing requirements.

It has been known for years that lean mortar is strong enough for plastering and does not crack, whereas rich mortar does crack. Lean mortar, however, is naturally porous, so the designer was in a dilemma until the advent of Ruberoid Waterproofing.

The fact is that cement acts like wood, swelling on wetting and shrinking on drying. This is the chief cause of cracking. Sand is not affected; therefore, the more sand in the mortar the less will be the cracking.

Considering these points, it is seen that the choice of mortar depends on its exposure to drying influences. The following specifications are confirmed by independent observation, as well as by countless actual jobs.

Where richer mortars are used, cracks result sooner or later. Full specifications on request.

Abridged Specification A (1:3 Mortar).

Walls and floors, where indicated on plans or specifications, are to be waterproofed with 1:3 cement mortar, containing 12 lbs. of Ruberoid Waterproofing, per bag of cement, as per Specification A of THE STANDARD PAINT COMPANY, New York, whose guarantee must be secured by the contractor before starting work.

Notes: 1:3 mortar should be used for cellars, pits, tunnels, tanks, etc., where artificial heat, circulation of air or other drying tendency may occur. It is also used for fountain and swimming pools because these are occasionally emptied and may be exposed to the sun.

Ruberoid Waterproofing can be guaranteed, when applied according to Specification A. Full particulars on request. Our co-operation in the design and execution of the work leads to greater economy and safety. No charge is made for guarantee or engineering service.

Specification A contains the most advanced practice and original details. It takes more compound than competitors are able to use and gives 12 times the effectiveness, which insures success under the most adverse conditions. It calls for a lean mortar which prevents cracks. The actual cost of the compound used is about 5¢ per sq. ft.

Abridged Specification B (1:2 Mortar).

Walls and floors, where indicated on plans or specifications, are to be waterproofed with 1:2 cement mortar, containing 2 lbs. of Ruberoid Waterproofing per bag of cement, as per Specification B of THE STANDARD PAINT COMPANY, New York.

Note: 1:2 mortar can properly be used for underground tanks, pits, etc., which are continually in contact with moisture, and where no heat or circulation of air is possible

Abridged Specification C (1:2:4 Mass Concrete).

Concrete, where indicated, is to be 1:2:4 mix, containing 1 lb. of Ruberoid Waterproofing per bag of cement, as per Specification C of THE STANDARD PAINT COMPANY, New York.

Abridged Specification D (1:4 Mortar).

Mortar, where indicated, is to be 1:4 mix, containing 4 lbs. of Ruberoid Waterproofing per bag cement, as per Specification D of THE STANDARD PAINT COMPANY, New York.

Note: 1:4 mortar should be used for stucco, roofs and other surfaces exposed to the weather and not in contact with moist earth.

THE TRUSCON LABORATORIES

Waterproofings, Technical Paints and Factory Maintenance Products

DETROIT, MICH.

BRANCH OFFICES

ATLANTA, GA., 604 Forsyth Building
BALTIMORE, MD., 1124 Munsey Building
BOSTON, MASS., 147 Summer Street
CHICAGO, ILL., 22 West Monroe Street
COLUMBUS, OHIO, 261 Taylor Avenue
DENVER, COLO., 510 Colorado Building
DES MOINES, IOWA, 211 Security Building
EL PASO, TEX., 1701 Olive Street
GRAND RAPIDS, MICH., 510 Thomas Street, Southeast
NEW YORK, N. Y., 110 West 40th Street
NORFOLK, VA., 607 Dickson Building
OMAHA, NEBR., 307 Baird Building

PHILADELPHIA, PA., 1011 Chestnut Street
PITTSBURGH, PA., 701 House Building
PORTLAND, ORE., 194 North 13th Street
ST. LOUIS, MO., 1307 Syndicate Trust Building
SALT LAKE CITY, UTAH, 424 McIntyre Building
SEATTLE, WASH., Central Building, 601
SPOKANE, WASH., 1416 Old National Bank Building
SAN FRANCISCO, CAL., 10th and Bryant Streets
SYRACUSE, N. Y., 408 Seitz Building
WASHINGTON, D. C., 314 Woodward Building
LONDON, ENGLAND, 309 Central House Kingsway

Products.

WATERPROOFINGS, and FACTORY MAINTENANCE PRODUCTS: Dampproofings, -Preservatives, Floor Hardeners, Technical Paints.

Truscon Waterproofing Paste, Concentrated.

Integral waterproofing compound, in paste form for concrete and cement mortar; mixes perfectly with water and diffuses readily through the mix, giving uniformly dependable results.

For foundations, dams, tunnels, reservoirs, tanks, and floors where absolute waterproofness is essential.

Specifications—MASS CONCRETE—The dry mix of cement, sand and stone (1:2:4) to be tempered with water to medium consistency and add 1 part Truscon Waterproofing Paste, Concentrated, to each 36 parts of water as per manufacturer's directions. All concrete to be placed in one continuous operation, each pouring to be thoroughly spaded to insure uniform density.

WATERPROOF PLASTER COAT APPLIED TO CONCRETE OR GENERAL MASONRY—To dry mix of sand and cement (2:1), tempered to required consistency, add 1 part Truscon Waterproofing

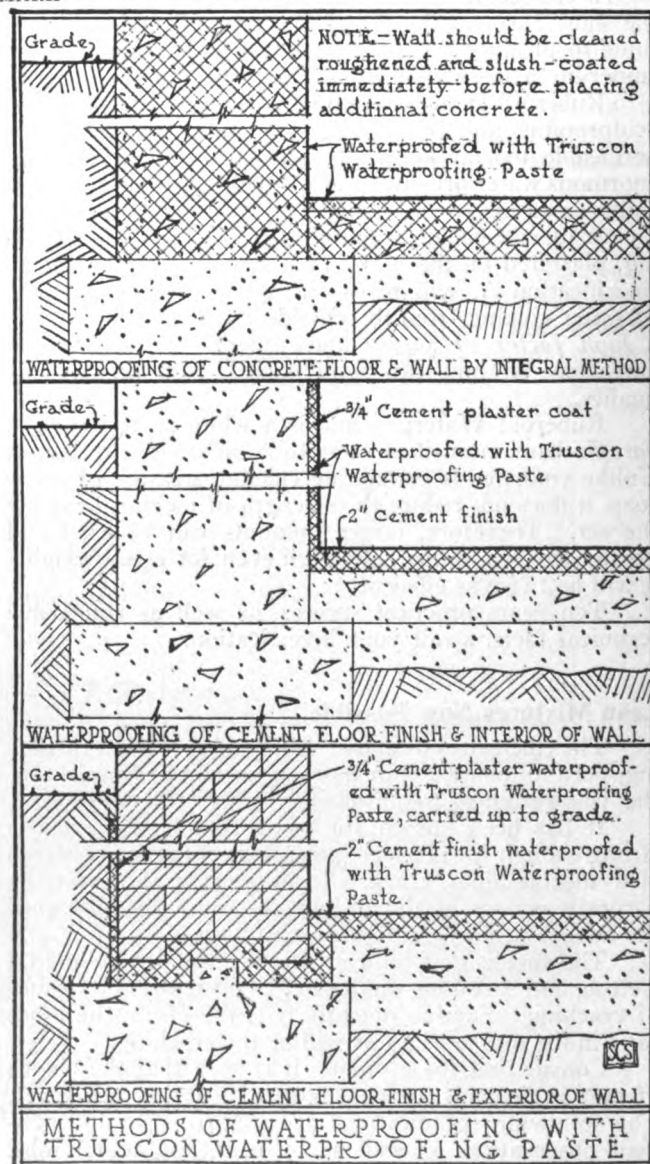
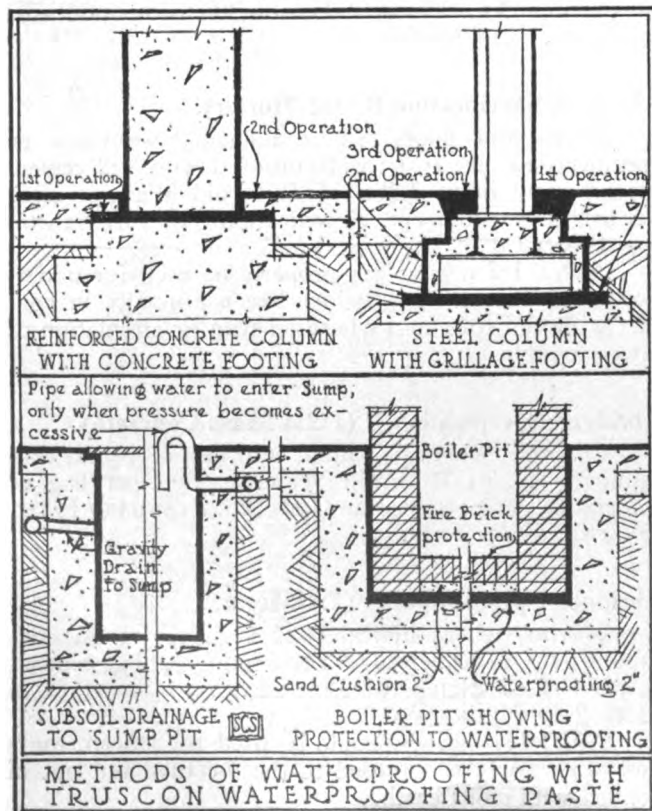


TRADE-MARK

Paste, Concentrated, to 18 parts of water as per manufacturer's directions. Before applying waterproofing coat, chip or otherwise roughen up the masonry and thoroughly clean to afford satisfactory bond. Further treatment of such surfaces as directed by manufacturer.

Plaster to be applied in 2 coats, each $\frac{3}{8}$ in.; the second applied just before the first has reached its final set.

For detail specifications see "Structural Waterproofing," furnished free on request.



TRUSCON MAINTENANCE ENGINEERING SERVICE

MAINTENANCE DEPARTMENT TRADE-MARK

A Maintenance Product for every Maintenance Purpose.

For many years THE TRUSCON LABORATORIES have satisfied the maintenance requirements of manufacturing plants. It has been our special mission to invent and formulate various materials for increasing the value and serviceability of buildings and equipment.

This work has made it necessary for us to make a careful study of general maintenance requirements and to provide materials that would do these requirements justice. The result of this sound experience in maintenance work is offered *free of charge* in Truscon Maintenance Engineering Service.

Offices are located at convenient points throughout the United States—each office in charge of a man who has made maintenance a life study (list on opposite page). These are the Truscon Maintenance Engineers who are ready to cooperate with any engineer or plant superintendent regarding the requirements of his build-

ings. You are invited to call on them for assistance.

Concrete Floors Hardened Chemically—with Agatex—Agatex hardens and densifies the cement, making it dustless, oilproof and long-wearing. Send for booklet "Agatex and Its Performances."

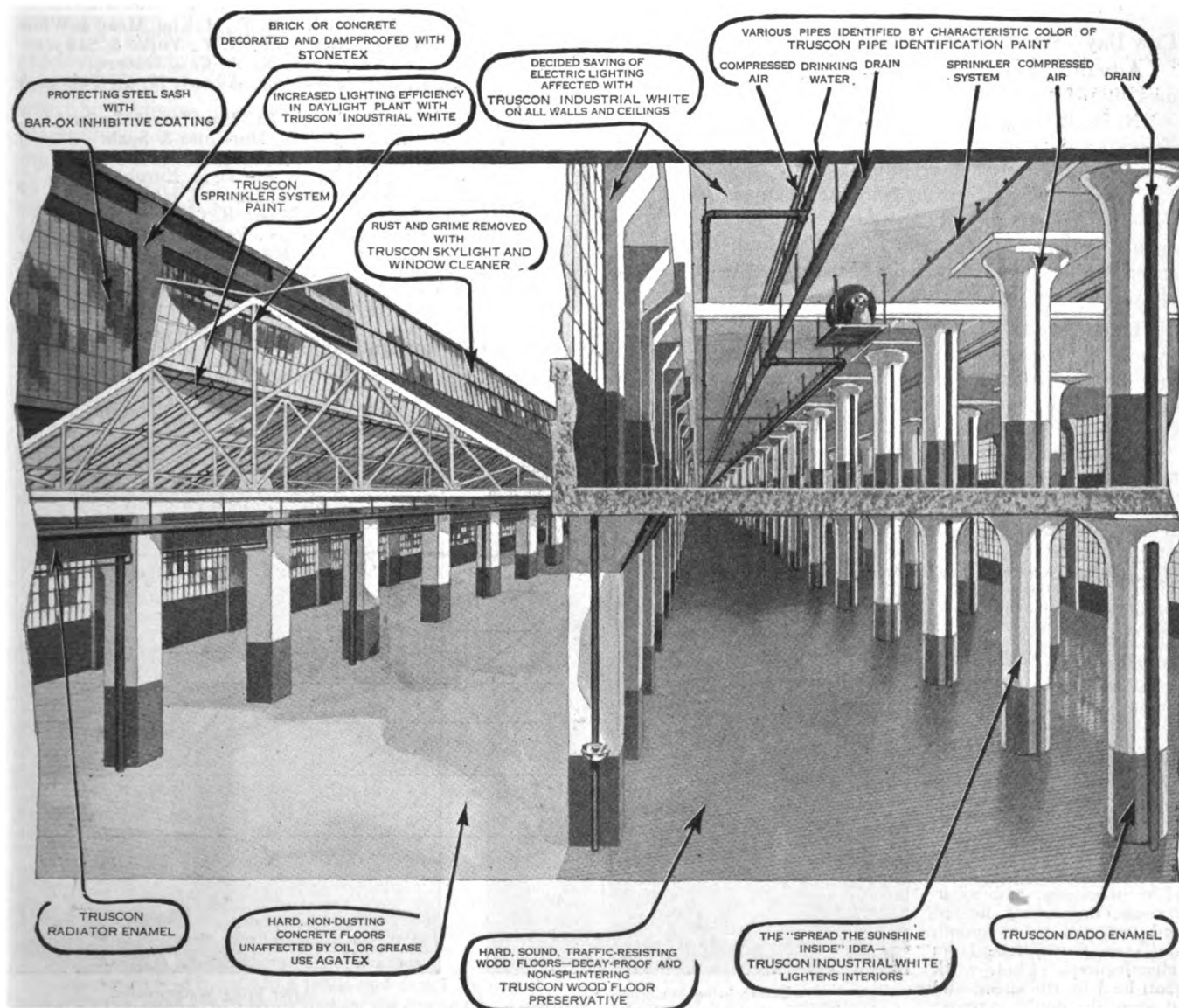
"Daylighting" Interiors—For increasing the lighting efficiency of a plant use Truscon Industrial White. Send for booklet "Spread the Sunshine Inside."

Identification of Pipes—Truscon Pipe Identification Paint in various standard shades for the various pipes in industrial plants: compressed air, drinking water, steam, drain, sprinkler system, gas, etc.

Masonry Protected and Dampproofed—Stone Tex, the specialized coating for dampproofing, protecting and beautifying concrete, stone, stucco, etc. Color card on request.

Structural Steel, Steel Sash Construction; Tanks and Other Exposed Steel Work Thoroughly Protected—Use Bar-Ox Inhibitive Coating—the coating that inhibits corrosion. Send for booklet "Bar-Ox Protective Steel Coatings."

Wood Floors—Prevent drying-out and splintering of wood floors with Truscon Wood Floor Preservative. Penetrates into the wood. Does not make the surface slippery. Protects against decay where floors are subjected to wetting. Booklet on request.



ILLUSTRATING TRUSCON MAINTENANCE ENGINEERING SERVICE

THE WATERPROOFING COMPANY

Engineers and Contractors for Waterproofing

345 East 33rd Street
NEW YORK, N. Y.

BRANCH OFFICES

BOSTON, MASS., 65 Albany Street

PITTSBURGH, PA.

Product and Services.

Manufacturers of "Cow Bay" WATER-PROOF CEMENT.

Engineers and Contractors for WATER-PROOFING, making a specialty of CEMENT WATER-PROOFING. This company contracts for the waterproofing of basements, subways, reservoirs, vaults, tunnels, swimming pools, etc., guaranteeing a positive and permanent waterproofing for all kinds of masonry construction.

Also Designers of and Contractors for REINFORCED CONCRETE CONSTRUCTION, which includes OIL STORAGE TANKS.

Specialists in OILPROOFING CONCRETE TANKS for the storage of fuel oil.

"Cow Bay" Waterproof Cement.

Advantages—Ease and economy with which repairs may be made.

No extra supporting walls are required; they are left with a neat finish; no furring and plastering necessary. No additional floor finish is necessary.

"Cow Bay" waterproof cement, when set, is as hard as the best portland cement mortar, and may be placed beneath grillages and column bases without danger of settlement—eliminating the metal pans used with tar and felt waterproofing.

Experience—"Cow Bay" waterproof cement is beyond the experimental stage, having been employed since 1900. During the past 16 years this company has waterproofed a majority of the important buildings in New York, Boston and Pittsburgh.

Specifications—**MATERIAL**—All interior surfaces of all exterior walls, and upper surface of concrete floor slab throughout basement (or subbasement), elevator pits, machinery foundations, trenches, etc., as shown on plans, shall be waterproofed with "Cow Bay" Waterproof Cement.

WORKMANSHIP—All surfaces, before application of waterproof coating, shall be thoroughly chipped or cleaned, and coating applied not later than 24 hours after surface has been prepared. A perfect bond must at all points be secured with underlying masonry.

Wall coating shall be $\frac{5}{8}$ -in. thickness, applied in 2 coats, thoroughly floated and troweled to a smooth and even finish, free from imperfections. Floor work shall be 1-in. thickness, and to serve the double purpose of a waterproofing agent



TRADE-MARK
Reg. U. S.
Patent Office

and wearing surface. Floor coating shall be floated and finished as described for wall coating.

GUARANTEE—Waterproofing contractor shall furnish written guarantee that his work will be waterproof; that during a period of 5 years after completion of the waterproofing, he will promptly repair any leaks appearing through same which are not due to causes beyond his control.

A Few Important Waterproofing Contracts—Building, location, and name of architect:

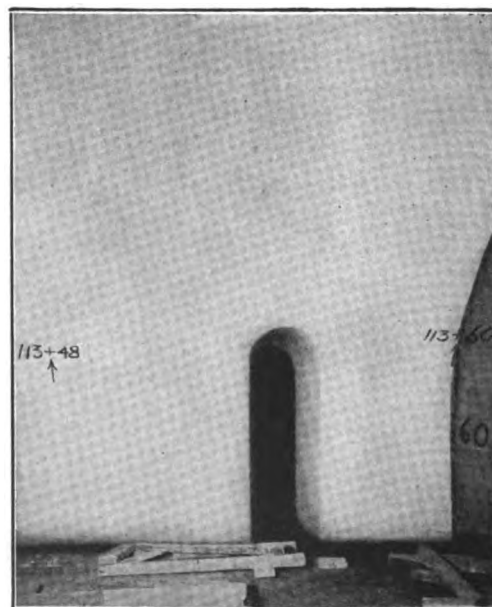
Singer Building, New York, N. Y., Ernest Flag
Morgan & Co., New York, N. Y., Trowbridge & Livingston
Hudson Terminal Buildings, New York, N. Y., Clinton & Russell
Stock Exchange, New York, N. Y., Trowbridge & Livingston
City Investing Building, New York, N. Y., Francis H. Kimball
Adams Express Co., New York, N. Y., Francis H. Kimball
Western Union Telegraph Co., New York, N. Y., Wm. Welles Bosworth
Municipal Building of New York, N. Y., McKim, Mead & White
Guaranty Trust Building, New York, N. Y., Yorke & Sawyer
Woolworth Building, New York, N. Y., Cass Gilbert
New York State Education Building, Albany, N. Y., Palmer & Hornbostel
Union Bank Building, Pittsburgh, Pa., MacClure & Spahr
Jones & Laughlin, Pittsburgh, Pa., MacClure & Spahr
Fort Pitt Hotel, Pittsburgh, Pa., Janssen & Abbott
Oliver Office Building, Pittsburgh, Pa., D. H. Burnham & Co.
Copley Plaza Hotel, Boston, Mass., Henry J. Hardenbergh
Federal Reserve Bank, Boston, Mass., R. Clipston Sturgis
Wentworth Institute, Boston, Mass., Peabody & Stearns
R. H. Stearns Building, Boston, Mass., Parker, Thomas & Rice
Opera House, Boston, Mass., Wheelwright, Haven & Rice
Over 35 Telephone Buildings in various cities, McKenzie, Voorhees & Gmelin

Concrete Oil Storage Tanks.

During the past few years, hundreds of concrete tanks for the storage of fuel oil have been constructed and oilproofed by this company.



Before being Waterproofed



After being Waterproofed

SAME POINT IN PENNSYLVANIA TUNNELS BEFORE AND AFTER BEING WATERPROOFED WITH "COW BAY" WATERPROOF CEMENT

WESTERN WATERPROOFING COMPANY

ST. LOUIS, MO.

OFFICES

ST. LOUIS, MO., 925 Century Building
DETROIT, MICH., 400 Penobscot Building
CLEVELAND, OHIO, 1900 Euclid Building

NEW YORK, N. Y., 103 Park Avenue
BOSTON, MASS., 27 School Street
PHILADELPHIA, PA., 317 Stephen Girard Building
HARTFORD, CONN., 902 Main Street

Services.

Experts in waterproofing and sell no material. All work is done exclusively under contract and is guaranteed. Contracts are taken for TREATING STRUCTURES of CONCRETE, BRICK or other MASONRY, whether new or old. Consultation is solicited from engineers and architects when plans are being made, with a view to assisting them in the solution of problems involving WATERPROOFING, OILPROOFING, etc.

Method Used.

This system involves the use of Ironite Waterproofing, which is a finely pulverized gray iron containing chemicals. Upon brushing this on the walls with the addition of water, the particles are lodged in the surface pores. Due to the chemicals, rapid oxidation of the iron takes place with the resultant expansion of the iron particles. This swelling completely fills the surface pores and seals them against leakage. Sufficient coatings are applied to thoroughly fill all pores. The early coats make a filling or stuffing for the surface pores, and the succeeding coats form a highly oxidized iron filament. This iron oxide surface is extremely dense and impervious, not alone to the action of water, but also to oils, dilute acids, etc.

The treatment is applied on either the pressure side or the side opposite. In the latter case it is impossible to force the waterproofing away from the wall as the particles inside the surface pores have expanded therein and become an integral part of the structure.

Character of Work.

Waterproofing—Tunnels, powerhouses, subways, pits, swimming pools, reservoirs, dams, retaining walls, viaducts, etc.

Treatment for—Fuel oil tanks, gasoline and lighter oils, molasses tanks, pickling vats, mineral or vegetable oil containers.

Acidproofing—To resist soaps, greases, fats, etc.

Treating floors and walls of packing houses, soap factories, tanneries, dairies and other structures requiring protection of concrete and brick against dilute acids.

Specifications.

It is our preference to write a separate specification for each specific job. As a general specification the following may be used:

Basements—All enclosing walls and floors coming in contact with the earth are to be treated on the inside surfaces by the WESTERN WATERPROOFING COMPANY [give here street and town



TRADE-MARK

address of nearest office] according to their system of waterproofing, to be covered by their written guarantee.

Oil Tanks—All interior surfaces coming in contact with the oil are to be waterproofed and oilproofed; and the roof is to be waterproofed on the top surface, carrying the treatment down the outside walls a distance of 2 ft.; all waterproofing and oilproofing to be applied by the

WESTERN WATERPROOFING COMPANY [give here street and town address of nearest office], and to be covered by their written guarantee.

Swimming Pools—All walls and floor to be waterproofed by the WESTERN WATERPROOFING COMPANY [give here street and town address of nearest office]; said work to be covered by their written guarantee. (If tile is used, we leave the walls with a rough finish to give proper bond to tile without further preparation of surface.)

Protection from Greases, Vegetable Oils, etc.—

We have successfully used this system for the protection of concrete and brick walls and floors in packing houses, soap factories, sugar refineries, dairies, etc., but individual specifications are necessary for each job. We solicit inquiries on this class of work.

Waterproofing Completed Structures.

Frequently it occurs that at the time of construction dry conditions obtain, but after completion, the structure develops leakage. Owing to our ability to waterproof on the inner surfaces of the building, we are in a position to economically overcome the trouble, and are constantly doing work of this nature.

Advantages of This Method.

On practically all basements, tunnels, pits, etc., the inside surfaces are treated to withstand any hydrostatic pressure. Thus is eliminated the necessity of the following items which would be needed for an outside surface treatment, such as membrane: extra excavation, extra backfilling, brick or other backing wall for protecting membrane, subfloor on which to lay membrane under main floor, cost of waterproofing footings, as our system does not require this, delay to progress of building incidental to waterproofing of footings; double walls and floors on pits.

References.

We would be pleased to give on inquiring, a list of the many jobs done by us. The best reference is the long list we have of clients, including the best and most prominent architects in all lines throughout the United States who are satisfied with our service and have manifested their satisfaction by continuous repeat orders.

ESTABLISHED 1883

THE BILLINGS-CHAPIN CO.

Factory Paints, Cement Coatings, Varnishes and Japans

438 Pearl Street
NEW YORK, N. Y.

TELEPHONE, WORTH 1354

1163 East 40th Street
CLEVELAND, OHIO

TELEPHONE, ROSEDALE 4675

146 High Street
BOSTON, MASS.

TELEPHONE, MAIN 4137

Products.

Manufacturers of COATINGS, Transparent and Opaque; Waterproof, Decorative and Protective, covering all departments of Exterior and Interior treatment of surfaces—Wood, Metal, Cement, Stucco, Brick, Plaster.



TRADE-MARK

Under average conditions, 1 gal. of Rustnaught will cover about 800 sq. ft. 1 coat or 500 sq. ft. 2 coats.

It is made in 8 colors and black.

Regularly put up in barrels and half-barrels, also in 5-gal. and 1-gal. cans.

RUSTNAUGHT
METAL COATING

TRADE-MARK

U. S. N. Deck Paint—"The Universal Paint."

A quick drying, extremely durable, general purpose paint. It dries hard overnight with a smooth, pleasing luster which withstands washing, scrubbing and the most severe conditions of wear and weather.

Being capable of successful use on practically every surface, its covering capacity in square feet will vary with the surface. However, under any given set of conditions, U.S.N. Deck Paint will cover more per gallon than other paint.

Made in 30 colors, also white and black.

Regularly put up in barrels and half-barrels, also in 5-gal., 1-gal., ½-gal., quart, pint and ½-pint cans.



THE UNIVERSAL PAINT
DRIES HARD OVERNIGHT
TRADE-MARK

U. S. N. Deck Varnish—"The Universal Varnish."

A pale varnish of exceptional durability, suitable for all exterior or interior work. It is particularly adapted to the protection of any surface exposed to unusually hard wear or weather conditions.

U.S.N. Deck Varnish, justly called "The Universal Varnish" may be either applied over or mixed with U.S.N. Deck Paint where high gloss enamel results of extreme durability are desired.

Regularly put up in barrels and half-barrels, also in 5-gal., 1-gal., ½-gal., quart, pint and ½-pt. cans.



THE UNIVERSAL VARNISH
TRADE-MARK

Rustnaught.

An antirust paint of greatest durability, designed to prevent the action of both rust and electrolysis on iron, steel and other metal surfaces. It contains no asphaltum or tar but does contain ingredients best calculated to act as insulators and to successfully resist sulphuric acid fumes, brine and lubricating oils.

Rustnaught is made along the lines indicated by the investigation of the Cushman Laboratories, as the best protective coating for structural steel, bridges, etc. It is also very suitable for metal roofs and all other metal surfaces exposed to severe weather conditions.

Driwal for Concrete or Brick.

A waterproof and decorative coating for cement, stucco, brick, Bedford stone and similar surfaces. It prevents dampness and staining. *Driwal will not blister or peel if properly applied and will leave no disagreeable odor. It will penetrate, color and preserve the texture of the surface.*

Made in 14 colors, including greens, browns, reds, yellows and stone colors; white and black and transparent.

Under average conditions, 1 gal. of transparent or colored Driwal will cover about 175 sq. ft. for the first coat or about 250 sq. ft. for the second coat.

Regularly put up in barrels and half-barrels, also in 5-gal. and 1-gal. cans.

Black Driwal, unlike tar, will not become brittle and may be applied without heating. This black is made in 3 consistencies: No. 1, standard body; No. 2, extra heavy, especially for rough work; No. 3, paste, for filling cracks and crevices.

Driwal
CEMENT COATING

TRADE-MARK

Bilchaco Cement Floor Coating.

Cement floors can be kept from becoming stained or dusty by applying Bilchaco Cement Floor Coating to them. Being oilproof, it is particularly suitable for garage, engine room or other floors liable to injury from the action of lubricating oils and greases.

Bilchaco is also recommended for interior walls of kitchens, lavatories, cement granaries, silos, elevators, tanks for oil, molasses, sugar, etc. It is non-poisonous and acetic acid will not affect it.

Made in 6 colors. Under average conditions, 1 gal. will cover about 450 sq. ft. one, coat if applied strictly according to instructions.

Regularly put up in barrels and half-barrels, also in 5-gal. and 1-gal. cans.



TRADE-MARK

ESTABLISHED 1852

HAMPDEN PAINT & CHEMICAL CO.

SPRINGFIELD, MASS.

BRANCH OFFICES
BOSTON, MASS. NEW YORK, N. Y.

Address all correspondence to Main Office

Products.

"HAMPDEN" SUNRAY MILL WHITE, an oil paint for mill and factory walls and ceilings.

"HAMPDEN" STRUCTURAL PAINT, for the protection of structural iron and steel.

"HAMPDEN" CEMENT FLOOR COATING;

"HAMPDEN" CONCRETE FLOOR HARDENER, for concrete floors.

"HAMPDEN" PIPE ENAMEL, for hot and cold interior piping systems.

Also manufacturers of "Hampden" Interior Flat Finish, for hospitals, offices and public buildings; "Hampden" Mill Enamel, for interior mill trim; "Regal" Wall Coating, a cold water paint; "Hampden" Exterior Concrete Coatings, for exterior brick and concrete surfaces; "Rubercoat" Elastic Carbon Paint, for waterproofing roofs, and all walls below grade; "Hampden" Varnishes, for all classes of work—exterior and interior; "Hampden" Ready Mixed Paints, for exterior work; "Hampden" Permanent Greens, for all exterior work; "Almandine" Reds, for exterior use.

"Hampden" Sunray Mill White.

A white oil paint having extraordinary diffusing qualities, used extensively for interior walls and ceilings of mills, factories, and industrial plants of all kinds. May be applied on wood, brick, or concrete surfaces. Does not chip or scale and spreads easily without leaving brush marks. A permanent washable paint. Supplied in 3 finishes:

Sunray Mill White Gloss—For use in rooms free from moisture. Insures permanent high gloss. Exceptional ease of spread and covering capacity.

Sunray Mill White Eggshell—A pleasing finish between that of flat and gloss. Great covering capacity, and opaqueness combined with ease of spread.

Sunray Mill White Flat—For interior use where moisture and steamy conditions exist. A permanent, velvety finish, pleasing to the eye.

Specification Data—FOR NEW SURFACES—Surfaces must be dry and free of all loose particles. All knots and sappy places in woodwork should be coated with shellac of good body.

FOR OLD SURFACES—Surfaces must be dry, and cleaned of loose particles. Previous applications of whitewash or similar coatings removed and surface left clean.

Grease and oil stains removed and surface coated with shellac.

FIRST COAT—Concrete, brickwork, and plastered surfaces given 1 coat "Hampden" Concrete Primer brushed well into pores. Allow at least 24 hours for drying.

Unpainted galvanized surfaces given 1 coat "Hampden" Galvanized Iron Primer. Woodwork given 1 coat "Hampden" Sunray Mill White Flat. Allow at least 48 hours for drying.

SECOND COAT—1 coat "Hampden" Sunray Mill White Flat. Allow at least 48 hours for drying.

THIRD COAT—1 coat "Hampden" Sunray Mill White—Flat, Eggshell or Gloss, as desired.

All paints, when necessary, to be made workable by addition of "Hampden" Sunray Mill White Thinners in proportion not greater than 10%.

"Hampden" paints may be obtained from HAMPDEN PAINT & CHEMICAL Co., Springfield, Mass., or authorized agents.

Note: The second coat of "Hampden" Sunray Mill White Flat may be omitted for 2-coat work; it is not advised, unless surface has been previously painted and old paint is in good condition.



TRADE-MARK

Conservative Covering Capacity, Over Primed Surfaces—On wood, 50 sq. yds. per gal.; on brick and concrete, 30 sq. yds. per gal.

"Hampden" Cement Floor Coating.

A sanitary finishing paint for cement floors in hospitals, schools, office buildings, halls, etc. It hardens the surface, and prevents cement dust, thus lengthening the life of even the best concrete floors. Easily kept clean. It is oilproof, therefore very valuable for use in garages, factories and engine rooms. Not intended for wet basement floors.

"Hampden" Concrete Floor Hardener.

For hardening, waterproofing, and dustproofing concrete floors. Chemically transforms the concrete—colorless.

"Hampden" Structural Paints.

"Hampden" No. 502 Structural Gray—A paint with a base of sublimed blue lead. This pigment has unequalled protective and rust-inhibiting qualities. Made in 2 colors: natural and dark gray.

Specification Data—SHOP WORK—All metal surfaces must be thoroughly scraped and cleaned of all rust, mill scale, dirt, and dust. All grease removed, and surfaces dusted. Apply 1 heavy coat "Hampden" Structural Gray No. 502; thinned, if necessary, by addition of pure turpentine in proportion not greater than 10%. All surfaces inaccessible when assembled to receive 2 coats before assembling.

ERECTION—After erection, all rust spots and places where paint is off to be thoroughly cleaned. All edges, rivets, nuts and bolt heads to receive an extra coating of above paint.

FINISHING—2 coats "Hampden" Structural Paint (of shade selected). Allow from 3 to 5 days' drying time for previous coat. Nothing but strictly pure settled linseed oil shall be used in reducing, and in proportion not greater than 15%.

"Hampden" paints may be obtained from HAMPDEN PAINT & CHEMICAL Co., Springfield, Mass., or authorized agents.

Other Structural Paints—In addition to No. 502 Structural Gray, other structural paints are manufactured, of somewhat different composition and relatively lower cost. These are known as No. 300 Structural Red, No. 400 Structural Green, No. 303 Structural Brown, No. 500 Structural Black, and No. 307 Structural Graphite.

"Hampden" Pipe Enamel.

These enamels are adapted for hot and cold interior piping, and form permanent coatings for the preservation of metal pipe. Made in shades adopted by the American Society of Mechanical Engineers.

Packages.

Paints packed in 1-bbl., ½-bbl., 5-gal. and 1-gal. containers. When packed in barrels, same are equipped with mechanical agitators when requested.

Publications.

Bulletins and pamphlets describing the different paints listed, also complete specifications covering any "Hampden" paint, will be furnished to engineers and architects on request.

DETROIT GRAPHITE COMPANY

Makers of Paints in all Colors for all Purposes

DETROIT, MICH.

BRANCH OFFICES

NEW YORK, N. Y.	CHICAGO, ILL.	BOSTON, MASS.	SPRINGFIELD, MASS.	CLEVELAND, OHIO
BUFFALO, N. Y.	ST. LOUIS, MO.	KANSAS CITY, MO.	SAN FRANCISCO, CAL.	GREENVILLE, S. C.
HOUSTON, TEX.	CHARLOTTE, N. C.	PHILADELPHIA, PA.	CINCINNATI, OHIO	EL PASO, TEX.

Products.

SUPERIOR GRAPHITE PAINT for structural steel and metal surfaces; ANTI-AQUA, a Dampproof Coating for stone, concrete or brick walls and foundations; STA-WHITE, a pure White Oil Paint for industrial interiors.

Also manufacturers of Degraco-Lite, a White Enamel for interior and exterior; Degraco-Tone, a Flat Washable Finish for interior use on plaster, metal, wood, cement, wall board, etc.; Degraco Concrete Wall and Floor Paint; Degraco Colors for exterior and interior use.

Where Our Products are Sold.

DETROIT GRAPHITE COMPANY products are sold through branch offices with warehouse stocks in all principal cities.

Superior Graphite Paint.

The base of Superior Graphite Paint is Lake Superior amorphous graphite ore. This ore is a natural combination of graphitic carbon and silica, carrying as well percentages of oxides of aluminum and iron.

Extreme fineness is secured in the preparation of the ore, which is thoroughly ground and mixed with refined and treated linseed oil of highest grade.

Lake Superior graphite ore has a greater affinity for linseed oil than many of the commercial graphites on the market. Proved methods of machine grinding and manufacture make for unusual uniformity of mixture and proper drying qualities. The inert nature of the ore prevents chemical action between pigment and vehicle, and the paint film therefore retains its elasticity and durability over a long period.

Superior Graphite Paint prevents rust action on structural steel, fire escapes, steel window sash, frames and all metal surfaces. Unusual and severe conditions of exposure are met by this paint.

Elasticity to expand and contract with surface on which it is applied prevents cracking and checking of the film.

Large covering capacity, opacity, and ease of application make for initial economy in materials and labor.

Durability (proved in service) results in low ultimate cost.

Superior Graphite Paint has established its reputation as a leader among metal protective paints through service records covering a period of 30 years.

Manufactured in the following colors:

No. 30. Natural	No. 35 Red
No. 32 Brown	No. 36 Stack Black
No. 34 Black	No. 59 Olive Green

Standard packages: barrels, half-barrels, 5 gals. and 1 gal.



TRADE-MARK

Note: No. 32 Brown is generally used as a shop coat, No. 30 Natural, field coat, and No. 59 Olive Green, final finish coat. This combination of colors facilitates inspection and insures complete coats being applied. Other colors or combinations desired may be used with equal success.

Specification—All scale, dirt and foreign matter shall be removed from structural steel before any painting is done in the shop.

Covered surfaces, surfaces in contact, and surfaces enclosed, of all parts of riveted members, shall receive 1 coat of Superior Graphite Paint No. 32 Brown after pieces are punched and before assembled.

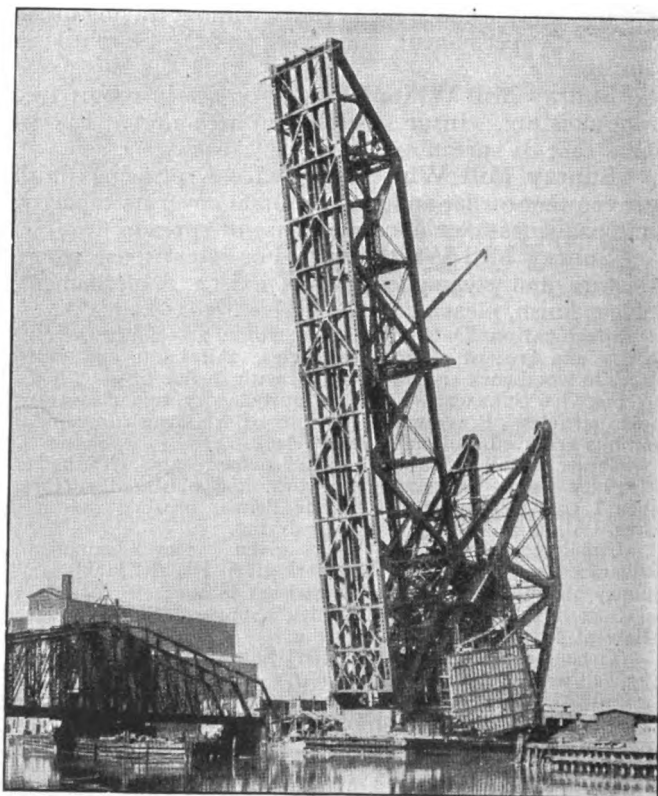
All finished members shall receive 1 complete coat of Superior Graphite No. 32 Brown before taken from shops or exposed to weather. Foundation beams and connections shall receive 1 coat in shop. All bolts used in erection and remaining permanently in structure shall be dipped in Superior Graphite Paint.

All pins and bored pinholes or other planed surfaces shall be coated with white lead and tallow before leaving shop.

All surfaces accessible after erection shall receive 2 coats of Superior Graphite Paint No. 30 Natural and 59 Olive Green, respectively; after being placed in position.

All painting shall be done on dry and preferably warm surfaces.

Paint used shall be Superior Graphite Paint manufactured by DETROIT GRAPHITE COMPANY, Detroit, Mich.



DOUBLE TRACK STRAUSS BASCULE BRIDGE, ST. CHARLES AIR LINE, ILLINOIS CENTRAL R. R.
260 ft. high. 1750 tons of steel protected with Superior Graphite Paint

All paint shall be delivered to shop and to erection site in unbroken packages, subject to inspection and approval of architect and engineer.

Repainting Specification—All metal work and other exposed surfaces to be painted shall be thoroughly cleaned with steel brushes, and where necessary all loose scale shall be removed with three cornered steel scrapers and hammer. No paint shall be applied until all dust, mud and grease have been carefully removed, nor shall any paint be applied during wet or foggy weather, or upon a wet surface.

First coat shall be Superior Graphite Paint No. 30 Natural applied as soon as parts are cleaned. Any parts of structure liable to hold moisture shall be cleaned and slushed with this paint.

When first coat has dried sufficiently, a period of at least 1 week being allowed to elapse, second coat shall be applied using Superior Graphite Paint No. 59 Olive Green.

All paint used shall be that manufactured by DETROIT GRAPHITE COMPANY, Detroit, Mich., and shall be delivered in unbroken packages.

Anti-Aqua Dampproof Coating.

Anti-Aqua is a waterproofing and dampproofing paint especially recommended for the following uses:

As a coating on the exterior of stone, brick and concrete foundations to prevent seepage of water.

As a coating on the interior of stone, brick and concrete walls to exclude dampness.

As a coating for the unexposed surfaces of marble, granite or other fine stone used in buildings to prevent seepage and staining.

As a coating between concrete walls and exterior tile or face brick of buildings.

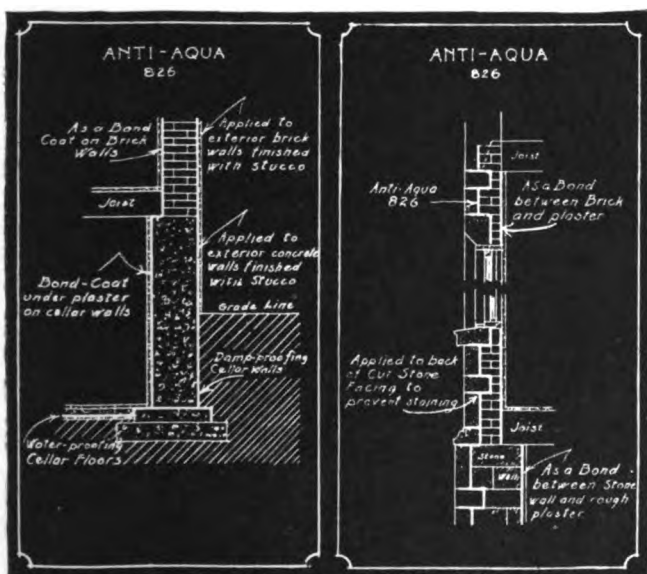
As a plaster bond.

Anti-Aqua is a liquid bituminous paint of ordinary brushing consistency which dries within a few hours and when applied to stone, brick or concrete surfaces, enters into and seals up the pores, and on account of its penetration, the coating can not be destroyed by abrasion during backfilling of foundations.

Two coats of Anti-Aqua may be applied on concrete or brick walls and then followed by a coat of rough plaster. When used in this way, Anti-Aqua acts as a waterproofing paint and at the same time eliminates the use of furring and lathing.

The use of Anti-Aqua as a plaster bond on ceilings is not recommended.

The covering capacity will depend on the porosity



DETAILS SHOWING METHOD OF APPLYING ANTI-AQUA DAMP-PROOF COATING

of the surface, but under normal conditions it will be from 80 to 100 sq. ft. per gal.

Anti-Aqua is supplied in the proper consistency for application, but if for any reason thinning is necessary, only special Anti-Aqua thinner should be used. Gasoline, benzine, petroleum solvents, turpentine or its substitutes will not mix with Anti-Aqua and should not be used for thinning this paint.

Sta-White.

Sta-White is a pure white oil paint for industrial interiors with unusual light-reflecting qualities.



It contains no lead, glue or other harmful or easily affected ingredients, bleached oil or pigments, and consequently shows no tendency to turn yellow.

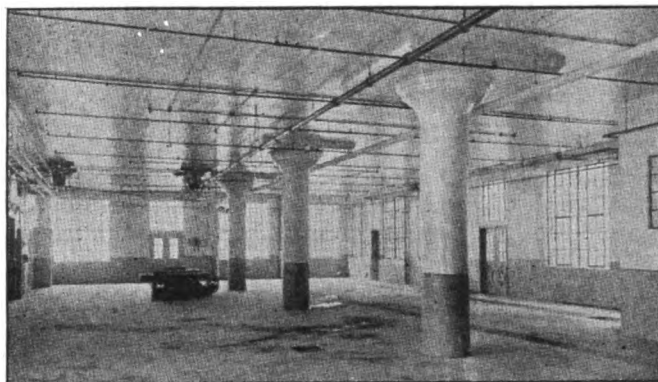
Sta-White will not chip, flake or peel.

It is recommended for interior painting of mills, factories, offices, public buildings, schools, hospitals, theaters, hotels, restaurants, etc.

Sta-White may be used on wood, metal, concrete, plaster, brick, and other surfaces. When, after a period of years, Sta-White becomes soiled, covered with dust or other settlements, the original whiteness and reflecting qualities are easily restored by brushing or washing without injury to the finish.

Sta-White will give maximum service that is expected of highest grade interior whites, both as to light reflecting qualities and durability.

Sta-White is made in high gloss enamel finish, although semigloss and flat finishes are also furnished.



AMERICAN HARD RUBBER CO. BUILDING

Painted with Sta-White. Note how the high gloss finish reflects the light

Specifications for Concrete, Brick, Plaster, Wood or Metal—The surfaces shall be dry, and free from dust or loosely attached matter such as old paint, rust, scale, etc. All oil spots shall first receive a coat of shellac.

The first or priming coat shall be Sta-White Primer applied with a full brush.

The final coat shall be Sta-White Gloss (semigloss or flat as desired) brushed in the manner varnish is applied, i.e., *flowed on* rather than brushed out. Care should be taken to see that the paint does not sag.

DRYING TIME—At least 48 hours shall be allowed between coats.

THINNING—For brick, concrete, plaster or wood surfaces, Sta-White Primer may be thinned with turpentine or turpentine substitute (petroleum spirits), not to exceed 1 qt. to 1 gal. of paint.

For steel, the primer shall be thinned with not to exceed 1 pt. to 1 gal. Sta-White Gloss (semigloss or flat) shall not be thinned under any circumstances.

All paint used shall be that manufactured by the DETROIT GRAPHITE COMPANY, Detroit, Mich., and shall be delivered in unbroken packages. All work shall be subject to inspection and approval of the architect or engineer.

E. I. DU PONT DE NEMOURS & CO., INC.

Sales Department, Paint and Varnish Section

WILMINGTON, DEL.

BRANCH OFFICES

PHILADELPHIA, PA.
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COLUMBUS, OHIO

BOSTON, MASS.
KANSAS CITY, MO.
SAN FRANCISCO, CAL.

NEW YORK, N. Y.
PITTSBURGH, PA.

Products.

DU-LITE (Mill White), ANTIOXIDE (Rust Inhibitive), BARN & ROOF PAINT, CEMENT & STUCCO COATING, FLOOR & DECK PAINT, DU PONT PREPARED PAINT, ELASTIC WALL PRIMER.

Also manufacturers of Flat Wall Paints, Machinery Enamels, Acid Resisting Black Paint, Graphite Paint, Smoke-stack Paint and a complete line of Paints and Varnishes for all types of construction.

For Explosives, see page 51.

Quality.

The all important factor in the manufacture of the above products is the maintenance of a quality standard, attained through the use of highest grade raw materials, scientifically formulated and tested, and incorporated by modern machinery.

The result of this careful formulation and production speaks for itself in the durability of the products, their covering or hiding power and the perfect protection they afford to the various types of material to which they are applied.

Service.

The Du Pont Architectural Service Bureau, Paint and Varnish Section, has been of valuable assistance to architects and engineers in solving difficult paint problems, through detailed advices, information, literature, color cards and specifications. This service is entirely unobligative, and performs a necessary function in bringing to a successful conclusion any project where paints and varnishes are used.

Du-Lite (Mill White).

An intensely white, solid covering paint for factory, mill, hospital and public building interiors. This is an oil paint, with non-poisonous pigments, greatly superior to calcimine or cold water paints, both from the standpoints of appearance and durability. Du-Lite may be used on wood, metal, concrete or brick surfaces equally well, producing a tough, elastic finish that will not chip or flake off. It retains its color exceptionally well, and is not affected by steam or fumes.

Finish—Supplied in flat, eggshell or gloss finish.

Covering Capacity—Will cover approximately 500 sq. ft. per gal., 1 coat.

Specifications—FOR CEMENT, CONCRETE, BRICK AND PLASTER—All surfaces when thoroughly dry, shall be wire brushed to remove loose particles of cement, and then dusted. Cement and plaster should age for at least 30 days before painting.

First Coat: Du Pont Du-Lite Flat to which has been added equal parts of Elastic Wall Primer.



TRADE-MARK

Second Coat: Du Pont Du-Lite Flat.
Third Coat: Du Pont Du-Lite Gloss or Eggshell.

FOR WOOD AND WALL BOARD—Surfaces shall be reasonably smooth, dry and free from grease and dirt. Knots and sappy places in wood shall be shellacked before painting, and all nailholes puttied after first coat.

First Coat: Du Pont Du-Lite Flat, reduced to priming consistency with equal parts of pure raw linseed oil and pure spirits of turpentine.

Second Coat: Du Pont Du-Lite Flat of package consistency.

Third Coat: Du Pont Du-Lite Gloss or Eggshell.

STRUCTURAL STEEL AND ALL OTHER METAL WORK PRIMED OR UNPRIMED (EXCEPTION: GALVANIZED IRON)—Wire brush metal surfaces to remove rust, scale or loose particles. Remove oil or grease with turpentine or benzine.

First Coat: Du Pont Ferro-Keep Gray.

Second Coat: Du Pont Du-Lite Flat.

Third Coat: Du Pont Du-Lite Gloss or Eggshell.

(Note: When Galvanized Iron is used, special treatment is required before painting. Special information will be furnished on request.)

Flat White Finish: Wherever a flat white finish is desired, substitute for final coat of Du-Lite Gloss or Eggshell, a finishing coat of Du Pont Flat Wall Paint, White.

Du Pont Antoxide (Rust Inhibitive).

A high grade, rust inhibitive paint, made with a varnishlike vehicle which prevents moisture attacking the metal and causing rust. It curbs progressive oxidation where it has begun and withstands acid fumes and conditions to an unusual degree.

Colors—Made in four colors as follows: red, bronze green, maroon and black.

Covering Capacity—Covers approximately 750 sq. ft. per gal., 1 coat.

Specifications—PREPARATION—All iron and steel work shall be cleaned of scale, rust and dirt before painting.

FINISHING—

Shop Coat: All structural metal shall receive 1 shop coat of Du Pont Antoxide Red.

Field Coats: Cast iron columns shall not be painted until after inspection. Where surfaces in riveted work come in contact, they shall be painted before assembling.

After erection, all work shall be painted with 2 coats of Du Pont Antoxide, color to be selected.

Where structural steel is already delivered on the field with shop coat of Red Lead, 2 coats of Du Pont Antoxide shall be applied after erection.

PIPING—All pipe lines shall be indicated by their color and painter must get color schedule before painting.

Note: Where Galvanized Iron is used, special treatment is required before painting. Special information will be furnished on request.

All materials delivered on the work shall be of E. I. DU PONT DE NEMOURS & Co., INC., manufacture and shall be in original packages for inspection by architect.

Ferro-Keep.

An excellent metal protective paint prepared with special rust-inhibitive pigments. Dries with a full oil gloss.

Colors—Supplied in black, green, red and gray.

Covering Capacity—Will cover approximately 600 sq. ft. per gal., 1 coat.

Specifications—See Antoxide.

Barn & Roof Paint.

A good covering, durable paint for exterior use, on outbuildings, fences, roofs, and similar work. May be used on wood or metal surfaces.

Color—Supplied in bright red, green and brown.

Covering Capacity—Will cover approximately 500 sq. ft. per gal., 1 coat.

Specifications—**COATS**—1 or 2 coats in accordance with surface conditions.

Cement & Stucco Coating.

A protective and decorative coating for cement, concrete, stucco, plaster and brick surfaces, interior or exterior. It preserves the texture and individuality of concrete and its composition includes a special vehicle unaffected by lime or alkalis.

Covering Capacity—Will cover approximately 300 to 350 sq. ft. per gal., 1 coat.

Specifications—Concrete should age for at least 30 days before painting. When thoroughly dry, wire brush to remove loose particles of cement and then dust.

First Coat: Du Pont Cement and Stucco Coating thinned with 20% pure raw linseed oil and 5% turpentine.

Second Coat: Du Pont Cement and Stucco Coating of package consistency.

Floor & Deck Paint.

For interior and exterior wood and concrete floors. Makes a tough and elastic coating and one that is impervious to moisture. Prevents the gradual wearing away and "dusting" of concrete floors, due to abrasion or heavy traffic.

When treating concrete floors a coat of Du Pont Concrete Floor First Coater is applied as a foundation over which the Du Pont Floor & Deck Paint is applied.

Colors—Supplied in spruce, dark spruce, buff, light stone, dark stone, dust color, brownstone, maroon, light brown, and green.

Covering Capacity—Will cover approximately 275 sq. ft. per gal., 2 coats.

Specifications—All floor surfaces shall be dry, clean, free from grease and dirt, and reasonably smooth. Concrete surfaces should age for at least 30 days before painting. Wire brush to remove scale or loose particles.

WOOD FLOORS—First Coat: Du Pont Floor & Deck Paint thinned at the rate of 1 pt. of pure turpentine to 1 gal. of paint.

Second Coat: Du Pont Floor & Deck Paint of package consistency.

CONCRETE FLOORS—First Coat: Du Pont Concrete Floor First Coater.

Second Coat: Du Pont Floor & Deck Paint of package consistency.

Third Coat: Du Pont Floor & Deck Paint of package consistency.

Concrete Floor First Coater.

A product of varnishlike consistency for the treatment of concrete floors before painting. Stops the suction and prevents lime and alkali from affecting subsequent coatings.

Covering Capacity—Will cover approximately 400 sq. ft. per gal., 1 coat.

Specifications—See Floor & Deck Paint.

Elastic Wall Primer.

A sealing coat for concrete, cement, brick or plaster surfaces. Stops suction and is not affected by lime or alkalis. Forms a perfect foundation for all paint coatings when used on surfaces mentioned.

Covering Capacity—Will cover approximately 300 sq. ft. per gal., 1 coat.

Specifications—See Du Pont Du-Lite.

Du Pont Prepared Paint.

The highest grade of prepared paint, for all general exterior woodwork wherever a coating of exceptional durability is required.

One hundred and twenty-five years of paint making experience is back of this product, together with every facility to maintain its quality and uniformity.

Colors—Supplied in 30 shades, black and whites.

Covering Capacity—Will cover approximately 350 to 400 sq. ft. per gal., 2 coats.

Specifications—All surfaces shall be dry, clean and smooth. Grease and stains to be removed with benzine.

Putty all nailholes and surface imperfections after priming coat.

Priming Coat: For close grained, non-absorbent woods, thin with equal parts pure raw linseed oil and pure turpentine. For hard or yellow pine, cypress, poplar, thin with 3 parts pure raw linseed oil and 1 part pure turpentine. For hard or yellow pine, cypress, Norway pine and other resinous woods, thin with 1 part raw linseed oil and 3 parts pure turpentine.

Second Coat: Thin with 2 parts pure raw linseed oil and 1 part pure turpentine.

Third Coat: Apply as found in package except when conditions warrant the use of a little turpentine or linseed oil.

ESTABLISHED 1888

THE GOHEEN CORPORATION

Paint Engineers

25 West 43rd Street
NEW YORK, N. Y.

FACTORY:
NEWARK, N. J.

WAREHOUSES AND BRANCHES

PHILADELPHIA, PA., Land Title Building
PITTSBURGH, PA., 5th and Smithfield Streets

CHICAGO, ILL., 139 No. Clark Street

AGENTS IN THE PRINCIPAL CITIES OF THE WORLD

Products.

GOHEEN'S PRODUCTS include Protective Coatings for iron and steel; Interior and Exterior Wood Paints; Enamels; Dampproofings and Waterproofings for concrete and masonry surfaces; Concrete Floor Paints and Hardeners; Canvas Waterproofings; Wood Floor Preservatives; Shingle Stains.

Co-operation.

Our engineers are always in the field co-operating with the trade. Our Engineers' Handbook, color cards and folders will be furnished on request.

Goheen's Galvanum.

Goheen's Galvanum is the only paint that adheres permanently to galvanized iron. The process of galvanizing leaves the sheets with a film of basic zinc chloride, which causes the ordinary paint to peel and blister off in a short time. The use of Galvanum eliminates the necessity of washing the metal with solutions to neutralize this acid film, or to allow the metal to weather before painting.

Galvanum is applied directly to new or old galvanized iron without the use of a primer. Galvanum acts both as a primer and finishing coat.

Thirty-three years' service is proof of its success. Write for testimonials as to the service given by Galvanum.

Specifications—(1) Metal must be thoroughly dry and cleaned of all dirt, grease and loose particles. Painting must be done under cover, or in bright weather if done outside.

(2) All galvanized iron shall have applied 1 coat of Galvanum Paint, as manufactured by THE GOHEEN CORPORATION, well brushed out.

(3) After first coat is firm and hard, apply second coat of Galvanum Paint in shade desired.

Note: If desired, a third coat of Galvanum in shade desired may be applied.

(4) Paint must be delivered to the job in manufacturer's original containers, properly labelled as Galvanum, and must be used as received and not thinned or mixed with other paints.



Goheen's Highway Red.

Highway Red is a chemically combined red lead paint which has a spreading capacity of 800 sq. ft. per gal. and spreads freely and smoothly, giving a very uniform coat throughout. The base of Highway Red is pure red lead, combined with certain inert materials,

which combine with the vehicle and lead to prevent the red lead from separating and settling to the bottom, which accounts for the large spreading capacity and uniform coating.

Highway Red is a product which combines all of the merits of red lead without its deficiencies.

Testimonials as to the service given by Highway Red will be supplied on request.

Specifications—(1) Metal must be thoroughly dry and cleaned of all grease, rust, mill scale and dirt. Painting must be done under cover, or in bright weather, if done outside. Paint must be dry before loading on cars.

(2) On assembling, all inaccessible parts, at time of riveting, shall have applied to the portion of each piece of metal that comes in contact, a liberal coat of Oxidized Carbon Cement in paste form, as manufactured by THE GOHEEN CORPORATION.

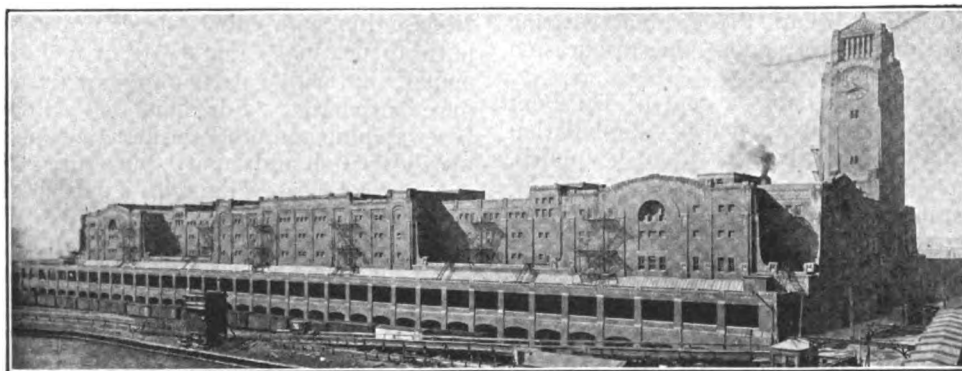
(3) All metal shall then be given one thorough and complete coat of Goheen's Highway Red Paint; must be dry before loading on cars. Painting on cars positively prohibited.

FIELD WORK—(4) All inaccessible parts to receive same attention as directed on shop assembling.

(5) As erection of metal progresses, all dirt, rust, scaled and scarred or abraded places must be thoroughly cleaned and recoated with Goheen's Highway Red Paint.

Goheen's Carbonizing Coating.

Carbonizing Coating is an inhibitive and protective coating for iron and steel. Carbonizing Coating will give from 7 to 10 years' service under normal conditions. It covers about 1000 sq. ft. per gal., reducing cost far below the ordinary metal coating, and at the same time doubling the service given. It has the same co-efficient of expansion as the metal, dries uniformly throughout and is therefore less liable to peel. It is a non-conductor of electricity, will not re-act with the steel and prohibits electrolytic action.



PENNSYLVANIA RAILROAD FREIGHT TERMINAL, CHICAGO, ILL., PROTECTED BY GOHEEN PRODUCTS
PRICE & McLANAHAN, Philadelphia, Pa., Architects

References—Has protected the Inter-City viaduct at Kansas City for 14 years and still in good condition. Hedrick & Hedrick, Engineers, Kansas City, Mo. Is approved for use by U. S. Navy Department. Further references supplied on request.

Specifications—(1) Metal must be thoroughly dry and cleaned of all grease, rust, mill scale and dirt. Painting must be done under cover, or in dry weather if done outside; paint must be dry before loading on cars.

(2) On assembling, all inaccessible parts, at time of riveting, shall have applied to the portion of each piece of metal that comes in contact, a liberal coat of Oxidized Carbon Cement in paste form, as manufactured by THE GOHEEN CORPORATION.

(3) All shall then be given 1 thorough and complete coat of Goheen's Carbonizing Coating. (Color as selected.) Paint must be thoroughly dry before loading on cars. Painting on cars is positively prohibited.

FIELD WORK—(4) As erection of metal progresses, all dirt, scaled and scarred or abraded places must be thoroughly cleaned and re-coated with Goheen's Carbonizing Coating. (Color as selected.)

(5) When re-coating (as noted in article No. 4) is dry and hard, a second coat of Goheen's Carbonizing Coating (color as selected) is to be applied.

(6) If third coat is used, steel is to receive same attention as directed in Article 5.

Note: Where it is desired to use a shop coat of red lead and field coats of Carbonizing Coating see Highway Red.

Goheen's Concrewaltum.

A paint for dampproofing and beautifying masonry surfaces; prevents efflorescence and staining of walls; where used on concrete floors it prevents dusting and sanding of the surface and presents a neat and clean appearance. It is particularly recommended for use on concrete floors which have been treated with a chemical floor hardener, such as Goheen's Rockote.

References—Specified by Price & McLanahan, Architects, Philadelphia, and used on Pennsylvania Freight Terminal at Chicago, Ill.

Further references supplied on request.

Specifications—(1) On new work, the surface should be cleaned of all dirt and loose particles with a stiff broom or brush and then primed with a liberal coat of Goheen's 5 in 1 to neutralize the alkalinity and seal up the pores.

(2) When primer is thoroughly dry, surface to be coated should again be cleaned of all dirt and loose particles, and a first coat of Goheen's Concrewaltum (shade as selected) applied. Care should be taken that material is well brushed out, giving particular attention to seams and laps.

(3) When first coat of Concrewaltum is thoroughly hard and dry, a second coat shall be applied, following the same directions as noted in Article 2. Where it is desired a third coat can be applied.

Rockote.

Rockote is a chemical hardener to be applied to new or old concrete floors. Rockote dissolves the surface of the floor and re-crystallizes same on drying to a hard, permanent rocklike surface. There is no change whatever in the color or general appearance of the floor, but it positively eliminates any dusting or sanding of the surface.

Rockote is more economical than other floor hardeners, because it is concentrated and permits dilution with water before use; only 2 applications of Rockote are necessary where other hardeners require 3 or more.

References—Thermoid Rubber Co., Trenton, N. J. Alamo Industries, San Antonio, Texas.

Specifications—(1) The floor shall be free of all grease, dust and dirt, and anything that will prevent the Rockote from being absorbed by the surface.

(2) The Rockote, as received, shall be diluted in the following proportions and applied in liberal coats with a long handled brush or broom same to soak up, as much as possible, into the concrete.

For the first application, use 2 parts hot water and 1 part Rockote. Allow 24 hours to dry.

For the second application, use equal parts of Rockote and hot water.

Note: In very bad cases, it is very often advisable to make a third application of Rockote, using 2 parts Rockote and 1 part hot water.

The floors will dry out within an hour after each application of the Rockote, and they can be used without harm between applications, after surface has become dry, provided they are swept clean before each subsequent application.

The hardening of floors with Rockote need not interfere with operations, because Rockote can be applied in the evening and the floor used during the following day without harm.

Covering capacity varies with the porosity of the surface, but averages 150 sq. ft. per gal. of Rockote.

Other Products.

Goheen's Old Honesty—Where the highest grade paint for exterior and interior wooden surfaces is desired, Old Honesty is recommended. This is a combination of lead, zinc and linseed oil and is recommended particularly where a high grade outside white is desired. Made in all colors, and has a covering capacity of 600 to 700 sq. ft. per gal. under normal conditions.

Goheen's Asbestos Ore Paint—A fire retardant wood preservative coating for wooden tipples, trestles, fences, shaft houses, etc. Made in reds, browns, greens, black and special colors. Covers 400 sq. ft. per gal.

Goheen's Hydrolite—A concentrated paste for waterproofing concrete. Readily miscible with the gauging water. Can be thrown directly into the mixer; no skill required. 7 lbs. waterproofs 1 cu. yd. of mass concrete. Costs less than any other good waterproofing on the market.

Goheen's Flat Wall Finish—A sanitary washable flat paint which dries with a rich velvet effect. Covers 600 sq. ft. per gal. Hides in 1 coat.

Goheen's Public Service White—A high grade mill white for factories, public buildings, schools, hospitals, dairies, etc. Increases lighting efficiency. Retains its gloss and whiteness indefinitely.

Goheen's Enamelette—A white enamel that stays white. Absolutely sanitary. Can be washed without harm. Equal to highest grades of imported enamels and more economical.

Goheen's Roof Cement—An asbestos fiber cement for renewing old composition, tin, paper, felt and wood roofs. Made in liquid and paste form.

Goheen's Special Acid and Heat Resisting Paint—Resists combined effect of chemical fumes, heat and steam on exterior exposure. For interior conditions, use Goheen's Oxidized Carbon Cement R No. 1.

Literature.

Literature and further information gladly supplied on these and other Goheen products. Remember, there is a Goheen product for every individual need.

THE SHERWIN-WILLIAMS CO.

Paints, Varnishes, Enamels, Stains, Wood Preservatives

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SALES OFFICES AND WAREHOUSES IN PRINCIPAL CITIES

Products.

Manufacturers of a complete line of PAINTS; VARNISHES; ENAMELS; STAINS; ROOF CEMENTS; WOOD PRESERVATIVES; CONCRETE and CEMENT HARDENERS; WATERPROOFING COMPOUNDS.

Facilities and Quality of Products.

To meet the paint requirements of mine owners and operators, THE SHERWIN-WILLIAMS Co. has thoroughly investigated the conditions surrounding the industry and as a result has developed a line of materials particularly adapted to meet the severe and widely differing destructive influences to which such paints are subjected.

Sherwin-Williams' facilities for producing just the right product for each specific purpose are unequalled in the paint and varnish field. The sources of supply of many of the most important raw materials are controlled by THE SHERWIN-WILLIAMS Co., who operate 5 factories for the production of paints and varnishes—tin can factory, box factory, mines and smelters, and other essential raw material producing units.

Each product is designed for the particular use specified and will economically and effectively produce the best results.

S-W Mine, Mill and Factory Colors.

Sherwin-Williams Mine, Mill and Factory Colors are recommended for decorating and preserving exterior surfaces where a durable oil paint is required at moderate cost.

Used largely where operators desire to maintain standard uniform colors at various plants, employees' houses, etc. (see plant standardization plan on next page).

S-W Metalastic (Liquid).

Metalastic is a combination of carbon black, graphite and specially treated pure linseed oil, producing a film that is very elastic and durable. The drying is so regulated by special dryers that it is an ideal paint for shop coats on structural steel. It is also recommended as a fabricating coat. Furnished in four colors—black, brown, green and dark gray—ready for use.

Put up in 1-qt., 1-gal. and 5-gal. cans, also barrels.

S-W Non-corrodible, Acid Resisting Paint.

A splendid antirust paint with graphite for its pigment base. It will be found very durable and economical for metal surfaces. It is a scientifically prepared coating for use on metal surfaces subjected to the action of gases, acids or their fumes, salt water, ammonia, and other disintegrating agents. Especially adapted for use



on smelters or buildings adjacent, which are subjected to sulphuric acid fumes, and similarly exposed locations.

Put up in 1-gal. pails, 5-gal. square tin cans and barrels.

S-W Galvanized Iron Primer.

Prepared ready for use. This is a paint for priming or first coating galvanized iron and sheet metal surfaces; metal sash and trim, cornices, leaders and in fact any galvanized iron surface. [It is a perfect undercoating and can be successfully applied to galvanized iron and sheet metal surfaces.] It is made especially for high class work and subsequent coats of S-W Metal Protective and Oil Paints must be applied not longer than 4 days later. Made in gray only.

Put up in 1-qt., 1-gal. round cans, 5-gal. square cans and barrels.

S-W Roof and Bridge Paint.

An economical paint for roofs, bridges, barns, fences, etc., of metal or rough lumber.

S-W Carbon Paint, Red Diamond Brand.

Absolutely the best chemically inert carbon metal protective paint possible to manufacture. Produces a homogeneous film which insures maximum protection.

S-W Salamander Smoke-stack Black.

Especially made for boilers, smokestacks and surfaces subjected to great heat. Elastic and very durable.

S-W Gas Engine Enamels.

Especially adapted for finishing machinery, engines, and all metal work, etc., where a rich gloss elastic finish is desired. Does not become brittle nor mar easily.

S-W Graphite Pipe Joint and Gasket Compound.

A practical advantageous material indicated by its name. It makes a perfectly tight joint with less labor and cost than red lead and other materials, and in addition allows the various fittings on which it has been used to be uncoupled without the loss or breakage characteristic of red lead, cement or rust-set joints. Does not become hard in the package.

S-W Lustral Enamels.

Designed particularly for use on wood and metal surfaces, where an elastic high gloss enamel finish is desired. Constructed to withstand severe usage to a maximum degree. Made in a number of attractive shades.

S-W Egg-shell Mill White.

Egg-shell Mill White is an intensely white paint for coating interior surfaces of mills and large manufacturing plants.

It dries with a perfect egg-shell or semimatt finish, producing the greatest amount of light distribution or diffusion possible to secure from a white paint, eliminating to a certain extent the reflective glare found in many plants where high gloss finish is used.

It is put up in 1- and 5-gal. containers; also in barrels.

S-W Ajax Insulating Varnishes and Compounds.

In Ajax insulating materials THE SHERWIN-WILLIAMS Co. offers a complete line of insulating varnishes, both air drying and baking compounds, acid resisting paints, spirit varnishes, etc. The same care that is used in the manufacture of the entire line of Sherwin-Williams paint and varnishes is used in the production of insulating materials. The raw materials are selected with the greatest of care by experts in this line and are combined in a way that only long experience, careful research and a full knowledge of the business can teach.

Every batch is carefully tested in THE SHERWIN-WILLIAMS Co.'s well equipped laboratories (before shipment is made) for heat resistance, oilproof and moistureproof qualities, as well as dielectric strength.

This painstaking care that is used both in the manufacturing as well as the testing of S-W insulating materials, assures a product that at all times will meet the exacting requirements of users of electrical equipment of all kinds.

S-W Preservative Shingle Stain.

An exceptional line of shingle stains made on a creosote basis for use on shingle roofs and all shingle parts. Is also well adapted for stables and outbuildings, as it is an excellent wood preservative, as well as a strong disinfectant.

S-W Ebonol.

An economical black elastic paint for use on paper, composition, felt and canvas roofing and on exterior equipment of any sort where an economical paint is desired. Can be used on tin roofing, as it absolutely contains no acids harmful to the metal. Is also adapted for use on rain water tanks, standard pipe, sluice boxes, water troughs, gutters, copings, fences, etc.

Ebonol has excellent covering capacity, works well under the brush and will stand outdoor exposure.

S-W Ebolastic Roof Cement.

Without doubt the most durable and economical roof cement on the market today. For use in repairing all leaky roofs, can either be used for patching or can be spread over the entire roof, making practically a new roof at a very small cost. Cracks and holes in brick, stone, concrete, chimneys and other exposed surfaces can be sealed up with comparatively little trouble by using this material. It is made on a pine tar basis with long asbestos fiber as its pigment, which makes it fire-proof.

S-W Ebolastic Roof Cement will remain plastic in all temperatures, will not run in the hot summer sun or crack in freezing temperatures.

Put up ready for use in 1-, 5-, 25- and 100-lb. containers and barrels.

100 sq. ft. of roofing will require from 25 to 50 lbs.

S-W Carbolic-Oil (A Wood Preservative.)

Carbolic-Oil is a pure anthracene oil derived from the distillation of pure coal tar, or in other words, the heaviest oil produced from the distillation of coal tar and what is known as a high boiling point oil. The distinction between an anthracene and creosote oil is that the latter distills at a low temperature, consequently is lighter in gravity, more volatile, and generally recognized as not being efficient for the types of work for which Carbolic-Oil is recommended.

Particularly recommended for use on poles, shaft timbers, trestles, flumes, tipples, air shafts, sheds, etc.

Carbolic-Oil can be sprayed, dipped or brushed and where possible, dipping is preferable, heating the material about 200° Fahr. It is always preferable to heat a wood preservative before applying, as this greatly assists the impregnation of the wood.

S-W Concrete and Cement Hardener.

An effective preparation for hardening and waterproofing cement. The value of using a preparation for hardening and waterproofing cement can not be over-estimated. Cement, the same as all other materials, is subject to wear and decay from the elements unless properly protected. By filling up the open pores or voids with S-W concrete and cement hardener, the cement may be greatly strengthened or hardened, thus giving it much better wearing properties. The elements have no effect on S-W Concrete and Cement Hardener, as, after the pores of the cement are filled with this material, the cement becomes permanently and thoroughly waterproof.

S-W Permelastic Foundation Damp-proofing.

An excellent damp-proof, alkaliproof, and acidproof black composition, used for hermetically sealing concrete and stone foundations against the detrimental agents mentioned.

S-W Plant Standardization Plan.

THE SHERWIN-WILLIAMS Co. has a plant standardization plan of special interest to mine operators (see sample below). Complete information of this plan, together with a system worked out for general use will be submitted on request.

STANDARDIZATION CHART OF PAINTS AND VARNISHES LEHIGH & WILKES-BARRE COAL COMPANY WILKES-BARRE, PA.				
NUMBER	COLOR	USE	HOW USED	PER GALLON COVERING CAPACITY
12 Best-Flat Black No. 12		Breaker and Molding Engines, Fan Engines, Compressors and Pumps. (Interior Only)	One coat over Blue	400-450 sq. ft. one coat
14 Best-Flat Black No. 14		For Draft Engines, Compressor Fan Engines, Chain Hoist and Sheave Engines, Hot Water Heaters, Inside Heating Engines, Inside Pumps, Exterior and Interior	One coat over Blue	400-450 sq. ft. one coat
16 Intermediate Coat No. 16		Stems chipped down to Blue	One or more coats as needed	400-450 sq. ft.

STANDARDIZATION CHART

Special Paints.

It is of course impossible to describe the entire line of Sherwin-Williams products in these columns—only a small percentage being mentioned here. However, this company makes a special paint for every surface and is prepared to furnish at once and in any quantity just the right product for any purpose. THE SHERWIN-WILLIAMS Co. will be glad to solve specifically any paint problem.

THE TROPICAL PAINT & OIL CO.

Manufacturers of Technical, Structural, and Dampproofing Paints of Scientific Reliability

GENERAL OFFICES AND FACTORIES
CLEVELAND, OHIO

Special Products.

ENGLISH STRUCTURAL STEEL PAINT.
ELASTIKOTE—Exterior Protective Paint.
TOCO GRAPHITE—Superior Quality.
CEMENTKOTE—A Waterproofing Paint for buildings of brick, cement, etc.
FLOORKOTE—Cement Floor Paint.
TROPICAL WATERPROOFING PAINT—Foundation Waterproofing.
TROPOLITE—High Heat Resisting Black.
TROPICAL RUBBER PAINT—A Waterproof Roof Black.
TOCOSEAL—Plastic Roofing Cement.
TROPICAL FINEST OUTSIDE GLOSS WHITE PAINT.
TOCO MILL WHITE—In Dull and Gloss.
TOCOTONE—Interior Flat Wall Finish.
B. and P. ENAMEL—Interior Finish for hard service.
BOILER SEAL—A Heatproof Insulation for boiler settings.
ARCHITECTURAL VARNISHES—Of the Highest Grade.



many users have against the ordinary prepared paint; and in working out the Elastikote problem it was discovered that, in the practical application of Elastikote, certain new and unusual protective features were developed.

In its wide adaptability, Elastikote, applied to wood, metal, iron or steel, brick, stone, cement, etc., is probably the only paint that possesses the necessary elasticity, toughness, adhesive qualities and extreme weather resisting qualities necessary to conform to the various conditions met with in treating the several surfaces mentioned, and from which dependable results can be obtained.

In the manufacture of Elastikote a certain percentage of a specially prepared natural elastic gum is incorporated by a process of our own. This gum, scientifically fused and blended with the usual paint pigments finely ground, and the resulting combination thoroughly mixed with pure linseed oil and dryers, forms the basis of Elastikote to which is added only the purest and most durable tinting colors.

Although Elastikote is made in light colors, such as white, buff, fawn, etc., its greatest elasticity is obtained in the darker positive colors, such as the greens, reds, browns, maroon colors, etc., for the reason that these darker shades carry the gum base, which so greatly adds to the flexibility and durability of Elastikote.

Elastikote comes ready to apply. It is a full, heavy bodied paint, stays well in suspension and will thoroughly cover more surface than any prepared or hand mixed paint. Two coats are recommended.

English Structural Steel Paint.

There are certain classes of work requiring the highest grade of ferric oxide paint. English Structural Paint is made specifically for exposed metal surfaces, such as iron and steel construction work, bridges, railway and street railway maintenance; gas, electric and water plants; towers, tanks; telegraph, telephone and trolley poles.

The protection of metal against rust, corrosion, and electrolysis is a waterproofing problem and its solution can only be accomplished by the use of a continuous, impervious insulation that will protect it from contact with moisture. Corrosion can not exist without oxygen, which is supplied by water. Rust is steel or iron chemically changed by the presence of moisture.

To properly protect exposed metallic surfaces requires a paint film which is, first, impervious; second, elastic; and third, one having a pigment base that is inert, finely ground, and at the same time powerfully adhesive. English Structural Paint is the result of years of practical tests. The combination of pigments and vehicles used in its make-up has proved to be of very great durability.

English Structural Paint is made in the usual standard colors: maroon, English oxide red, green, brown, lead color, and black; is full bodied, and ready for the brush. Two coats are recommended.

Elastikote.

A high standard protective and preservative paint made in strong positive colors, black and white, designed for general use on all exterior surfaces exposed to severe weather-wear, requiring solid, substantial, durable paint protection.

Elastikote is the result of thirty years' experience and scientific research to overcome certain prejudices

Toco Graphite.

A full bodied graphite paint of the greatest durability and wear resisting qualities. It will follow the expansion and contraction of metal perfectly without scaling or cracking and is particularly adapted for coating structural steel to be incased in concrete. In this dampproofing and alkali resisting feature, Toco Graphite is superior to other graphites, which renders it especially desirable for bridge and railroad work.

Toco Graphite dries with a tough, glossy, dark steel gray finish and will stand up under the most severe test.

While ordinary metallic paints are not claimed to cover more than 300 to 400 sq. ft. under favorable conditions, Toco Graphite will cover from 600 to 700 and as high as 1000 sq. ft. to the gal. Two coats are recommended.

Cement Coatings.

Long experience in dealing with the problem of waterproofing and painting cement and concrete surfaces qualifies us to place at our customers' disposal the following products of proved reliability:

Cementkote, for cement, brick, stone or concrete walls above ground; Floorkote, for concrete and cement floors.

All concrete or cement work is permeated with a fine network or system of capillaries, which absorb and distribute moisture to all its parts. These ducts or capillaries can not be filled during the curative stage of the concrete without materially interfering with the chemical action of the cement, as these conduits are necessary to introduce the moisture so essential during the curative stages.

Nothing therefore should be used in mixing mortar that will fill these capillaries, but they should be left open until the chemical action of the cement has taken place, thoroughly set and hardened, also dried out and seasoned for several months. The surface is then ready to paint. Walls should be painted and dampproofed with 2 coats of Cementkote applied according to directions.

Cementkote—A preservative and decorative paint for exterior dampproofing of cement, brick or stone walls above ground. Cementkote dries with a flat finish.

Covering capacity 150 to 200 sq. ft. to gal., 2 coats.

Floorkote—A durable, wear resisting coating for cement floors. Dries with a full gloss.

Cement floors should be painted with Floorkote, which not only fills and finishes the surface in a beautiful glossy tilelike effect but also prevents staining, grinding and dusting that is sure to follow the use of unpainted concrete floors.

Covering capacity 200 to 250 sq. ft. to gal., 2 coats.

Floorkote is superior to ordinary floor paint for wood floors as well.

Tropical Waterproofing Paint.

All concrete, cement, brick and porous stone foundation walls should be thoroughly waterproofed on the exterior side before filling in the earth between the foundation and the unexcavated ground. Tropical Waterproofing Paint has proved itself to be a foundation proofing of the highest order. It is a tenacious black which is easily and readily applied, covering about 65 sq. ft. to the gal., 2 coats.

Tropical Waterproofing Paint produces a continuous film which has sufficient elasticity to remain intact regardless of the expansion and contraction of the surface to which it is applied.

Tropical Waterproofing Paint prevents water seeping through the walls of concrete cisterns, swimming pools, elevators, elevator pits, water troughs, etc.

Tropical Waterproofing Paint prevents metal lath from rusting, and should be used on all artificial stone and concrete work, marble, etc., to prevent mortar stains.

Tropolite.

In this product this company has developed the greatest heat resisting paint known. It dries with a black, glossy enamel finish and is unaffected by heat that will break down the best graphites, boiler and front end paints on the market. Tropolite will stand from 700° to 800°, which is 200° higher than any other known paint coating will stand. Two coats are recommended.

Tropical Rubber Paint.

A black roof and metal paint that is tough and elastic. For general use. Dries with a brilliant black gloss finish. Two coats are recommended.

Tocoseal.

An asbestos fiber plastic roofing cement. This product is manufactured from genuine asbestos fiber, combined with mineral gum. It comes in the form of a soft, pliable paste and is applied to new or old roofs with an ordinary oblong shaped smoothing trowel or a long

handled spreading tool. It sets up in 2 or 3 days and gradually hardens into a rough rubbery coating, that is waterproof, fire resistant and extremely durable. Tocoseal puts a new roof on a building, without removing the old one, at a moderate cost, and will last longer than several coats of the most expensive paint.

Consult us on any roofing problem.

Tropical Finest Outside Gloss White.

Made originally for private use only. This product is the last word in exterior white paint. It is of unusual whiteness, magnificent body, and will outwear and outlast any other white paint made. Two coats are recommended.

Toco Mill White.

A high grade, durable, solid body white paint for factories, textile mills, warerooms, where lighting and cleanliness are essential features. Made in both gloss and dull finish. Toco Mill White is durable and washable; will not scale or check off, and holds its color to a remarkable degree.

Tocotone.

A durable, non-absorbent, washable interior flat paint. Tocotone can be used upon all plaster surfaces—rough, smooth, sand finished or pebbled; also upon composition wall board, metal ceilings, wood trim, and upon burlap and other cloth wall coverings, and, in fact, it is suitable for any interior wall surfaces. Two coats are recommended.

B. and P. Enamel.

For plaster, cement, wood or metal. This special line of interior enamels has been produced to fit the peculiar and exacting requirements of breweries, packing houses and bakeries, where the interior finish of these buildings must withstand condensation of steam, fumes and odors, or for condensers, ammonia pipes, hop jackets, boiling or storage tanks and where the interiors must be kept scrupulously clean for washing.

This enamel does not absorb moisture, because when applied it produces a porcelainlike, hard and durable film. Sulphate or carbonate of lead is not used in this product. Many government laws and regulations restrict the use of lead in paints used where food products are manufactured or handled.

B. and P. Enamel is sanitary, decorative, and free from detrimental volatile odors. It is dampproof, therefore, no mildew, mold, dry rot, decay or dampness can exist, preventing the breeding or growth of fungi or germs.

Recommended for the protection and decoration of walls and ceilings in killing rooms, butter and sausage rooms, refrigerators, coolers, engine rooms, the outside of aging tanks, offices and showrooms.

Covering capacity on concrete or plaster 200 to 250 sq. ft. per gal., 2 coats.

Tropical Boiler Seal.

A plastic insulating cement for boiler settings. It eliminates the suction of cold air through the cracks, crevices and pores of the brick, thus preventing cooling of the boiler shell and furnace gases. An accurate, unprejudiced test shows an increase of CO₂ from 9% to 11½% by its use.

Architectural Varnishes.

In addition, this company manufactures a line of highest grade architectural varnishes to meet every possible requirement.

WAILES DOVE—HERMISTON CORPORATION

FORMERLY AMERICAN BITUMASTIC ENAMELS COMPANY

Manufacturers of Protective Paints and Coatings

17 Battery Place
NEW YORK, N. Y.

BRANCH OFFICES

PHILADELPHIA, PA., 322 South Delaware Avenue

CLEVELAND, OHIO, Rockefeller Building

WORKS, GARWOOD, N. J.

Products.

BITUMASTIC and HERMASTIC SOLUTIONS, ENAMELS and PAINTS—Protective Coatings for iron, steel and concrete exposed to atmospheric moisture, electrolysis, acids, acid fumes, sewage, brine, gases, alkalis, etc., buried in the ground or submerged in fresh, salt, or mine water.

General Description of Bitumastic and Hermastic Compositions.

These compositions are of a bituminous base, so treated in manufacture as to eliminate all useless and harmful substances. Being free from those ingredients which limit the life and usefulness of ordinary coal-tar and asphaltum compounds, they possess exceptional physical properties—i. e., toughness, tenacity and pliability. These properties they retain throughout a far broader range of temperature and under more severe mechanical distortion and abrasion than have generally been considered to be within the scope of a bituminous composition.

Bitumastic Solution.

A heavy, black, bituminous paint of superior preservative properties and mechanical strength. It dries quickly, forming a tough, elastic coating.

Under conditions of moderate severity where ordinary paints last but a short time, the solution gives exceptional protection for long periods.

Adaptability—It is used against acid fumes, sewage, brine, water, gases, alkalis, moisture, electrolysis, etc. In industrial plants it is used to paint structural steel, boiler fronts, smokestacks, coal bunkers, brine systems, tanks, pipe lines, sheet iron and steel, and for other similar purposes.

In the engineering and construction field its applications will suggest themselves to the engineer.

Method of Application—The surfaces to be coated must be thoroughly clean and free from rust, scale, paint, oil and moisture. Bitumastic and Hermastic Coatings should not be applied to wet, frosty or greasy surfaces.

On metal, 2 coats are customary, the second following the first after an interval of 12 to 24 hours. On wood, 3 coats are recommended.

Covering Capacity—Properly applied, is as follows: On steel, 1 coat, 1 gal. to 200 to 250 sq. ft.; 2 coats, 150 sq. ft. On cast iron, covering capacity is a trifle less; on concrete surfaces, approximately 100 sq. ft. to the gal. Is suitable for use on any surface to which paint may be applied.

Containers—Put up in 1-gal., 2-gal., and 5-gal. cans and in 50-gal. barrels.

Hermastic Enamel.

A durable, protective coating to be used under the most severe corrosive conditions where lasting protection and ultimate economy are of the first importance. It is applied hot over a coat of priming solution, to such thickness as may be desired (usually $\frac{1}{8}$ in.), and forms a black coating which hardens immediately, ready for service.

This coating is exceptionally ductile, strongly adhesive and impervious to moisture, chemical fumes, sulphurous gases, salt water, salt atmosphere, most acids and other corrosive agents. As its insulating capacity is high it is an effective protection against electrolysis. The resistance of this coating to mechanical injury from distortion and abrasion under service conditions is exceptional and marks a distinct and noteworthy advance in the art.

Adaptability—Hermastic Enamel is particularly recommended for the following:

Internal and external surfaces of steel pipe lines, and other parts of drainage systems; tanks of every description, coal bunkers, ventilating fans and blowers which must handle moist air and acid fumes; conveyors, penstocks, trash racks and other steel items of hydraulic plant; cooling towers, bridges and other steel structures exposed to salt air and spray or other especially corrosive conditions; sheet steel buildings, chemical installations, sheet steel piling, and many other uses too numerous to be listed here but familiar to every engineer, architect and industrial executive.

The coating is sanitary, tasteless and odorless and may safely be used as a lining for tanks to contain drinking water.

Application—Hermastic Enamel may be applied in the field or at the point of fabrication, as may be preferable and consistent with best results, either by dipping, brushing or pouring, as may be required by the specific exigencies of the work in hand. When the dipping process is used the priming coat may be dispensed with, provided the surfaces to be coated can be heated before dipping to a temperature of 350° to 400° Fahr. This is the prevailing practice when steel pipe lines are coated at a shop where a dipping tank and a heating furnace are available.

The enamel is shipped in solid form in drums, barrels or blocks. It is heated to between 350° and 400° Fahr. and applied while in a molten state, after the primer has dried to a tacky consistency. It sets immediately, and when applied about $\frac{1}{8}$ in. thick covers approximately 2 sq. ft. per pound.

Full instructions for application will be supplied on request. Whenever necessary, the manufacturers are prepared to supply expert instruction and supervision over the application of these coatings, or, under special conditions where the best interest of the purchaser will be served thereby, to do the work on a contract basis with their own workmen.

Ultimate Economy of Hermastic Enamel—The chief item in the maintenance cost of steel structures is the cleaning and preparation of the surfaces for repainting. After the application of Hermastic Enamel this expense is saved, for this coating will outlast many coats of the ordinary protective paints.

It is this saving of the cost of continual repainting that makes Hermastic Enamel the protective coating of ultimate economy.

Bitumastic Paints in Colors.

Bitumastic Paints comprise a line of liquid preservative paints of the same standard that has been associated with the name Bitumastic for nearly seventy years.

Engineers, shipbuilders, shipowners, industrial executives, in short, all who must contend with the destructive corrosion of steel and other structural materials will find in these paints the answer to their demand for a protective paint that should have the preservative qualities and the durability of the bitumens but should get away from the uniform *black color* that has hitherto limited the usefulness of ordinary bituminous paints and compositions.

As with all Bitumastic products, these paints are in no sense by-products or side-lines. Quite to the contrary, they have been made possible by the application of new principles and methods which are the outgrowth of more than a half-century of experience in the manufacture and use of bituminous paints and compositions. For years our laboratories have been working to produce a *colored* bituminous paint that would be so entirely satisfactory from the standpoints of service, appearance, and cost as to justify our marketing it under the Bitumastic name. This purpose we feel has now been accomplished.

Despite their excellence, these paints compare so favorably in price with other paints used in the same service that they will command the confidence of the experienced buyer and user of protective paints, who knows what should be expected of them, and who is competent to size up the true relation between first cost and ultimate economy.

Permanency of Color—Bitumastic paints are not colored with vegetable dyes, but contain only reliable and enduring ingredients. Once they have dried, there is no further chemical action in the film tending toward its deterioration and eventual breakdown. They will not soften, crack or run under any extremes of atmospheric temperature, and will retain their depth of color and shade equal to the best grade of oil paints. The pigments are kept in suspension by special processes, assuring an exceptionally small amount of settlement which is easily overcome by stirring when about to use the paints.

Covering Capacity—Bitumastic paints brush out easily, and on ordinary structural steel cover at the rate of about 350 sq. ft. per gal. in 2 coats, which is the ordinary practice in protecting structural steel. They dry quickly, forming a tough elastic film of full body and attractive surface with just sufficient gloss.

The covering capacity here given is based upon the requirements of effective service under normal conditions, and it will be understood that it is quite possible to brush the paints out over a far greater area if it is desired to sacrifice thickness of protective film.

Adaptability—Bitumastic Paints are recommended

IN GENERAL CONSTRUCTION FOR

Steel bridges, buildings and tanks
Steel framing and sheet steel siding for industrial buildings
Metal roofs, gutters and eave-spouts
Iron fences, fire escapes and ornamental iron work
Window sash, ventilators and skylights
Wrought iron pipe and fittings

ON RAILROADS FOR

Cars, under-frames and trucks
Signal bridges and transmission towers
Steel car-floats and other floating equipment
Bridges, buildings and other structures

ON SHIPBOARD FOR

Decks
Top-sides
Cargo holds
Boot-topping
Masts and spars

ON MACHINERY FOR

Farm machinery
Industrial equipment
Construction plants

In general for all structures that must be protected against fresh or salt water, cement alkalis, or corrosive vapors and fumes.

These paints are not affected by the action of lime or setting cement and may be used on steel that is to be built into cement or concrete without fear of their destruction and the resulting corrosion of the steel.

The use of different colors for successive coats will overcome the inspection difficulties that have hitherto worked against the use of black bituminous paints for this service despite their manifold and well-known merits.

Bitumastic paints have high dielectric properties and are proof against the action of SO_2 and other corrosive fumes. They possess antiparasitical properties and when used on wood act not only as a protective film but also as a preservative stain.

Containers—They are put up in 1-gal. and 5-gal. cans, and in 50 gal. barrels.

Method of Application—The surfaces to be coated must be thoroughly cleaned and free from rust, scale, oil and moisture. On metal 2 coats are customary. As Bitumastic paints are subject to a slight volatilization when exposed to the air, the containers should be kept closed except while paints are being taken from them.

Specifications.

The form of specification for Bitumastic and Hermastic products is dependent upon the nature of the work and the exposure to which surfaces are subjected. A thoroughly protective specification to meet any given condition will be furnished on application.

ESTABLISHED 1848

TOCH BROTHERS

Technical and Scientific Paints, Waterproofing Compounds and Enamels,
Varnishes and Colors

320 Fifth Avenue
NEW YORK, N. Y.

DISTRIBUTING AGENCIES IN THE WORLD'S PRINCIPAL CITIES
WORKS AND LABORATORIES: LONG ISLAND CITY, N. Y.

Products and Services.

Inventors and manufacturers of
STEEL PROTECTIVE PAINTS; DAMPPROOF-
ING and WATERPROOFING PAINTS and
COMPOUNDS.

Also manufacturers of Decorative
Paints for all purposes; Insulating Paint;
Machinery Enamel; Smokestack Paint; Roofing Paint;
Cement Floor Coatings; Enamels; Mortar, Cement and
Plaster Colors.

A thoroughly equipped chemical laboratory is main-
tained by us and the services of the chemists are at the
disposal of clients who desire paints for special condi-
tions. Correspondence and personal inquiries are in-
vited on technical paint and waterproofing problems.

"R. I. W." Tockolith (Patented).

A portland cement paint, gray in color, used only
as a priming coat on iron, steel or other metal. Must
be painted over as soon as practicable, and in any event
not more than 4 to 6 months after application. Can be
made specially to withstand longer exposure where con-
ditions demand it. A finishing coat must always be ap-
plied according to the character of the finished surface
required and the nature of the service expected.

An unexcelled combination for preventing chemical
or electrolytic corrosion is "R. I. W." Tockolith for the
priming coat and "R. I. W." Damp Resisting Paint for
the finishing coat.

Approximate covering capacity (1 coat) per gal.,
500 to 700 sq. ft.

No. 137 "R. I. W." (Red).

For interior or exterior use. Resists acid fumes.
Endures the excessive heat and moisture in the tropics.
A remarkable preservative of wood and metal under
adverse conditions in chemical works where acid fumes
prevail; on roofs, gutters, tanks, shutters, fire escapes
and structures constantly exposed to the weather.

Should be used as a finishing coat over a priming
coat of "R. I. W." Tockolith.

Approximate covering capacity (1 coat) per gal.,
400 to 600 sq. ft.

No. 110 "R. I. W." Damp Resisting Paint.

Black or maroon, waterproof, for painting steel-
work in factories or laboratories where paint must resist
corroding agencies such as fumes of acids or alkalis.
For interior use.

Used as a finishing coat on structural grillage work
which is to be embedded in masonry, also on railroad
bridge floors and column footings, sprinkler pipes, poles
and pipes buried in the ground. Adheres perfectly to
concrete. Positive protection against electrolytic corro-
sion, having an insulating value of over 800 volts per
millimeter. Usually applied over "R. I. W." Tockolith,
but 2 coats may be used without primer, if desired.

Approximate covering capacity (1 coat) per gal.,
250 to 400 sq. ft.

**No. 112 "R. I. W." Damp Resisting Paint.**

Similar to No. 110 "R. I. W.," but
has the additional advantage of resisting
the influence of the elements during erec-
tion of steel. Also used on brine and
condenser pipes, and interior iron and
wood work subjected to moisture, alkalis,

acids, or electrolytic action. Has an insulating value of
over 550 volts per millimeter.

Approximate covering capacity (1 coat) per gal.,
300 to 500 sq. ft.

"R. I. W." Battleship Gray.

Designed primarily for United States Navy and
still in use by them. Endures excessive heat and mois-
ture in the tropics. Particularly adapted for molasses
tanks, fire escapes, and other steel or metal structures.
Used by many sugar centrales as a finishing coat over a
priming coat of "R. I. W." Tockolith, as it does not
attract and intensify heat on metal structures as is the
case with black or dark colored paints. Does not turn
white, streak, or lose its gloss near sea water.

Should be used as a finishing coat over a priming
coat of "R. I. W." Tockolith.

Approximate covering capacity (1 coat) per gal.,
500 to 600 sq. ft.

"R. I. W." Self-Healing Bridge Cement.

This material is adhesive, elastic, waterproof and
alkaliproof, and when employed for waterproofing pur-
poses has the following salient characteristics:

(1) Is truly elastic even under the critical condi-
tion of low temperature.

(2) Requires no skill to apply.

(3) Obviates the use of costly treated felts and
fabrics.

(4) Is effective in two- and even one-ply.

Approximate covering capacity (1 coat) per gal.,
20 to 40 sq. ft.

"R. I. W." Toxement (Patented).

Even under pressure, water can not penetrate port-
land cement construction in which "R. I. W." Toxement
has been incorporated.

"R. I. W." Toxement is the ideal integral water-
proofing compound because it lubricates the mix, in-
creases its workability, plasticity and flowability, renders
it non-porous, and eliminates the necessity for extreme
tamping and vertical chuting.

No. 421 "R. I. W." Acidproof Toxement (Patented).

A special grade of "R. I. W." Toxement, which,
when mixed with portland cement, will produce a con-
crete that will withstand the action of 50% sulphuric
acid. An ideal material for concrete floors and walls
in chemical plants.

Used in conjunction with "R. I. W." Acidproof
Filler to protect concrete storage tanks against the action
of acids and oils.

Catalogue.

Send for a copy of Toch Specification Book.

THE BARRETT COMPANY

Wood Preservative

NEW YORK
CINCINNATI
MINNEAPOLIS
ATLANTA
LEBANON
LATROBE

CHICAGO
PITTSBURGH
DALLAS
DULUTH
YOUNGSTOWN
BETHLEHEM
HOUSTON

PHILADELPHIA
DETROIT
NASHVILLE
SALT LAKE CITY
MILWAUKEE
ELIZABETH
DENVER

BOSTON
NEW ORLEANS
SYRACUSE
BANGOR
TOLEDO
BUFFALO

ST. LOUIS
BIRMINGHAM
SEATTLE
WASHINGTON
COLUMBUS
BALTIMORE
JACKSONVILLE

CLEVELAND
KANSAS CITY
PEORIA
JOHNSTOWN
RICHMOND
OMAHA

THE BARRETT COMPANY, LIMITED

MONTREAL

TORONTO

WINNIPEG

VANCOUVER

ST. JOHN, N. B.

HALIFAX, N. S.

Product.

BARRETT CARBOSOTA—*Grade-One Liquid Creosote Oil* for Preserving Wood.

Description.

A highly refined and specially processed coal-tar creosote particularly adapted to surface treatments (brush treatment or painting, spraying and dipping) and the open tank process (hot and cold, or hot and cooling treatment). It conforms to standard specifications.

Coal-tar creosote has been the universally recognized standard wood preservative for over fifty years. There is no authentic record of the failure of creosote, properly applied, to protect wood from decay. First used in Europe, the recognition of its value in America is indicated by a normal consumption of 100,000,000 gals. per annum.

Advantages and Superiority.

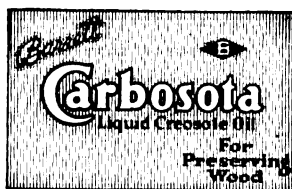
Carbosota is physically superior to commercial coal-tar creosote for non-pressure treatments because:

It is liquid at 41° Fahr. (5° C.); free from water; practically non-volatile; does not evaporate or leach from the wood; has high specific gravity. It has low viscosity and being liquid it readily penetrates into the wood, imparting a pleasing, dark brown color. It is a clean, uniform, standardized oil, readily obtainable throughout the United States and Canada.

Carbosota is the recognized "standard" for non-pressure treatments, conforming to government standards—to the specification of the United States Shipping Board, Railroad Administration, etc.

Methods of Application.

Timbers, whether used in buildings or exterior structures, which will be exposed to conditions favorable to the development of decay, should be protected by preservative treatment. Specifications should include



TRADE-MARK

detailed requirements as to method of treatment and grade of creosote oil; specific instructions as to procedure and equipment, and provision for inspection.

Carbosota can be readily injected into many species of seasoned wood by the open tank process or applied by surface treatments. Green lumber or timber can not be effectively creosoted by non-pressure processes. It should be air-dry.

Open Tank Process—Consists of the impregnating structural wood with refined coal-tar creosote oil (Carbosota Liquid Creosote Oil) by immersion in two baths—first in a hot bath, the oil being at 175° to 200° Fahr., and following this by a cold bath with oil at atmospheric temperature (minimum 50° Fahr.); or by application of the hot and cooling treatment, where the wood remains submerged after expiration of the hot bath, and both oil and wood allowed to cool to the prescribed temperature of the cold bath.

Advantage is taken of the vacuum formed within the wood, due to the differences in temperature, and a good penetration is thus obtained. The duration of the treatment will depend upon the dimensions and species of the timber.

Special detail data relative to quantity of Carbosota required for various species and specifications for treatment are obtainable by addressing nearest office.

Surface Treatments—Surface applications of preservatives at all points of contact of timbers, such as mortises, tenons and bearings; or where it is the dual purpose of retarding decay as well as decorative painting, may be applied (a) by brush treatment, that is, application of 2 or more coats of Carbosota applied with a broad, wire bound brush; (b) by spraying, which is often preferable because of rapidity with which large areas may be covered; (c) by dipping, that is, complete immersion for short periods of entire stick in heated Carbosota.

Where species readily impregnated are employed, this treatment may be substituted for the open tank process.

Surface treatments require the Carbosota to be heated to about 150° Fahr.; when this is difficult or impracticable the oil may be used unheated providing the atmospheric temperature is not less than 50° Fahr.



TANK USED FOR CARBOSOTING 10,000 FT. B. M. OF TIMBER PER DAY BY OPEN TANK PROCESS

(Hot treatment during afternoon, cooling during night; replacing charge in morning)



WOOD ROOF DECK OF PAPER MILL CREOSOTED BY OPEN TANK PROCESS WITH CARBOSOTA LIQUID CRESOTE OIL

(Dark ceiling is not a detriment)

SAMUEL CABOT, INC.

Manufacturing Chemists

141 Milk Street
BOSTON, MASS.

NEW YORK, N. Y., 1133 Broadway

BRANCHES

CHICAGO, ILL., 24 West Kinzie Street

Products.

CONSERVO WOOD PRESERVATIVE for preserving ties, timbers, pilings, planks, bridges, boats, posts, poles, sills, sleepers, etc., from wet and dry rot, insects and worms.

Also manufacturers of Dampproofing; Insulating and Deadening Quilt; Creosote Shingle Stains; Water-proof Brick and Cement Stains.

Description of Conservo Wood Preservative.

Conservo is a creosote carbolineum compound of high-boiling coal tar distillate, non-volatile, insoluble, non-viscous, and antiseptic. Its tone on wood is rich*butternut brown.



OLD CHAIN BRIDGE,
NEWBURYPORT—AMESBURY, MASS.
The oldest suspension bridge in America, restored
in 1910, and woodwork preserved
with Conservo

Advantages.

Conservo is a scientific product made to cover the three cardinal principles of wood preservation, i. e.:

- (1) Penetrating power—to get into the wood.
- (2) Permanence—to stay in the wood.
- (3) Sterilizing power—to destroy the bacteria that cause decay.

Penetration.

No preservative can preserve the wood unless it penetrates; and Conservo is so limpid that its penetrating power is unique. The heavier carbolineums are from twice to five times as viscous (viscosity is that "cold molasses" quality that prevents most wood preservatives from penetrating) as Conservo.

Permanence.

It not only goes more quickly and deeply into the wood than more viscous products but, when it gets in, it stays in, because it is insoluble and non-volatile. It will not dissolve out nor evaporate out. Heavy preservatives can not penetrate and are washed off the surface by the first rains.

Sterilizing.

Decay is caused by bacteria in the wood.

Conservo has always carried the proper percentage—7% to 10%—of phenols or tar acids to sterilize the wood and poison this bacteria. The phenols also combine with the lignin of the wood and increase the penetrating power. This is of special value for unseasoned wood. These phenols in Conservo form permanent asphaltic bases in the wood, that make the preservative results lasting.

Non-inflammable.

Conservo is non-inflammable and, as it gives off a cooling vapor under flame, it actually makes the wood less inflammable after drying than untreated wood.

Application.

Conservo is so limpid, and has such great penetrating power, that it can be effectively applied without heating. At normal temperatures this quality is of great importance where heating arrangements are not feasible, but heat should always be used, if possible, because it increases the limpidity, and helps to expel moisture from the wood.

Conservo can be applied by any method preferred. The most common methods are:

Brush coating, like paint, with a wide flat brush or a mop brush for speed, or with a spraying machine.

Dipping, using tanks of appropriate size for the lumber to be dipped.

Soaking, using tank equipment for either cold or alternate hot and cold soaking, as in the open tank vacuum method.

Temperature for hot treatment, from about 170° Fahr. for seasoned timber, to about 225° Fahr. for unseasoned timber.

The length of treatment depends upon the condition and character of the timber; seasoned and porous woods requiring a shorter treatment than unseasoned or dense woods.

Cost.

The cost of treating depends upon the method selected, the character and condition of the wood, and the economy of handling, which includes wages, waste, etc.

Prices and estimates furnished on request.

Covering Capacity.

Brush Coating—The amount varies somewhat, according to the character and condition of the wood; but the following are safe and conservative figures: 1 gal. covers about 100 sq. ft. of rough sawed lumber, 2 coats; 1 gal. covers about 200 sq. ft. of rough hewn lumber, 2 coats; 1 gal. covers about 250 sq. ft. of dressed lumber, 2 coats.

Dipping—About the same as brush coating, if the Conservo is drained back into the dipping tank to prevent waste.

Soaking—The covering capacity varies so greatly for both methods of soaking, owing to differences in wood, heating, length of immersion, etc., that it is impossible to give exact figures; but simple soaking for a short time will take about twice as much as dipping; the vacuum process, from 4 to 12 cu. ft. per gal.; and, by the expensive impregnation pressure process, the wood can be made to take up 2 or 3 gals. per cu. ft.

ESTABLISHED 1867

INCORPORATED 1911

THE NORTHEASTERN COMPANY

Wood Preservatives

74 Wall Street
NEW YORK, N. Y.

80 Beverly Street
BOSTON, MASS.

Products.

LETTENEY WOOD PRESERVATIVE (Carbolineum).

Also manufacturers of Anthracene Oil and Dead Oil of Coal Tar (to specifications).

Record.

Letteney has an unequalled record of more than 50 years of efficient treatment of timber.

Description of Letteney.

Letteney is a liquid compound manufactured from by-products of wholly bituminous coal tar. Guaranteed to contain at least 99.5% pure coal tar oil. Distills only at high temperatures and contains no light volatile matter.

Guaranteed to be well within standard specifications for carbolineum and similar wood preserving oils.

Letteney penetrates the wood and remains there permanently. It is not soluble in water and will not wash out.

Permanent color is dark red brown.

Specifications.

Have the wood, before treating, as well seasoned as possible. Posts, poles, ties, piles, etc., should have all bark removed before being treated.

If there is any accumulation of dirt or other foreign matter on the timber, it shall be scraped off with a wire brush before the preservative is applied.

Brush Treatment—When the wood is dry, thoroughly apply Letteney Wood Preservative with a broad, flat, stiff bristle brush, by two applications; the second after the first has been absorbed. Apply the preservative at a temperature of from 175° to 210° Fahr.

LETTENEY
WOOD PRESERVATIVE

TRADE-MARK

Open Tank Treatment—After cutting and fitting, all lumber shall be completely immersed for 20 minutes in a tank containing Letteney Wood Preservative, which must be maintained at a temperature of from 175° to 210° Fahr.

Spraying Treatment—This treatment shall consist of one heavy spraying with Letteney Wood Preservative, heated to a temperature of approximately 175° Fahr. Surfaces must be thoroughly covered, and treatment given to the refusal point whenever spraying seasoning checks, joints and contact surfaces.

Covering Capacity for Good Practice.

On Rough Lumber—

2 brush coats } 100 sq. ft. per gal.
20 minute dip
Sprayed

1 brush coat 150 sq. ft. per gal.

On Dressed Lumber—

2 brush coats } 150 sq. ft. per gal.
20 minute dip
Sprayed

1 brush coat 300 sq. ft. per gal.

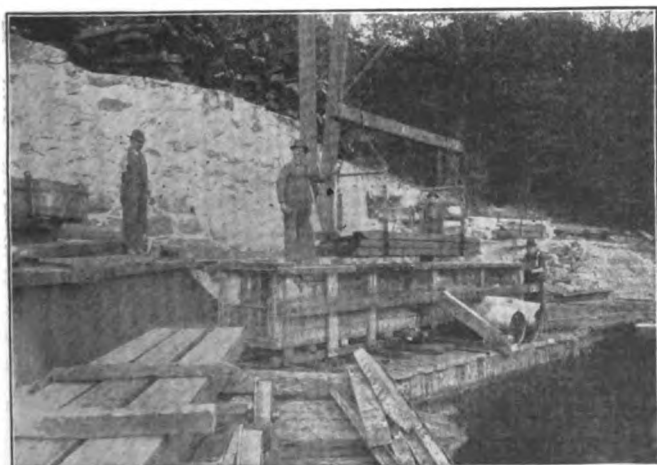
NOTE—Correspondence is solicited for details for handling of lumber in open tank treatment.

Packages.

Letteney Wood Preservative is put up *ready for use* in the following size packages: 50-gal. barrels, drums, ½ barrels, and in 5-gal. and 10-gal. cans.

Prices.

Delivered prices to all freight stations furnished promptly on application.



TANK USED FOR TREATING 300,000 FT. TIMBER WITH LETTENEY

SWEET'S CATALOGUE



APPLYING LETTENEY WITH SPRAYING MACHINE TO UNDER-PLANKING OF NEW YORK CITY PIER

PROTEXOL CORPORATION

SUCCESSOR TO CARBOLINEUM WOOD PRESERVING CO.

36 Barclay Street
NEW YORK, N. Y.

WORKS AND WAREHOUSE, KENILWORTH, N. J.

DEPOTS: SAN FRANCISCO, CAL.; HONOLULU, T. H.; HAVANA, CUBA; SAN JUAN, PORTO RICO

Products and Services.

PROTEXOL (formerly produced by us as Avenarius Carbolineum) and other standardized WOOD PRESERVATIVES: ANOLINEUM (Carbolineum type), NEOSOTE.

Also, Creosote Oils, Shingle Oils; Preservative Black Varnishes for wood and metal, and other Coal Tar Products.

A complete line of Timber Treating Accessories: Heating Tanks, Thermometers, Brushes, Spray Outfits, etc., for brush, spray or open tank treatments.

Services include CHEMICAL ANALYSES, RESEARCHES, EXPERIMENTAL WORK, DESIGN and LAYOUT, ESTIMATES for COVERING CAPACITY on submitted timber schedules and all matter pertaining to CONSULTING PRACTICE on the subject of TIMBER PRESERVATION.

Wood preserving problems in charge of Ernest F. Hartman, *Assoc. Am. Soc. C. E.*

Experience.

Protexol has been successfully used for the surface treatment of timber to prevent its decay, by brush, spray or open tank application for 44 years under its former name. Protexol (protects all) represents value demonstrated by actual time tests.

The erection of works at Kenilworth, N. J., to produce as primary products a complete line of wood preservatives, aims at economical production and distribution.

Wood Preservatives—Technical Description.

Protexol—A non-volatile, heavy oil, derived from the highest boiling distillate of coal tar. Its constituents belong to the anthracene group, the permanent antiseptic properties of which are generally acknowledged. After filtration and refining, the oil is chemically treated to improve its character and to increase its efficiency. It readily penetrates wood, imparting a durable nut brown color, and is highly toxic.

Anolineum—A straight run anthracene oil distillate to meet the chemical standard for what is known as the carbolineum type of oil.

Neosote—A mixture of the lighter anthracene oils obtained in redistilling to produce Protexol Wood Preservative and heavy creosote oils. A pure coal tar product run to a uniform standard. Liquid at all temperatures.

Recommendations.

Protexol Wood Preservative for all general surface treatments to protect timber against premature decay as the very best preservative—specifically where only brush or spray treatments are to be given.

Anolineum whenever the higher cost of Protexol Wood Preservative does not appear justifiable, either owing to construction requiring a heavier open tank



TRADE-MARK

treatment or because the construction is not of a permanent character.

Neosote for heavy open tank treatments only where depth of penetration is considered the measure of preservation or as a temporary preservative; or where the only object in using any preservative is high initial toxicity to destroy organisms on timber placed in situations where decay is not likely if sound timber is used.

Where hot and cold treatments or double tank treatments are required to obtain heavy absorptions it is recommended to use Protexol or Anolineum in the hot bath and Neosote for the cold bath. Where inflammability of the treated timber is an important factor the use of Protexol Wood Preservative is unreservedly recommended. Where waterproofing is the prime object sought to be attained, Anolineum is recommended. Where the lowest cost compatible with a satisfactory return on the investment is sought, Neosote is suggested.

It is worth bearing in mind that the item of labor cost will be substantially the same in the application of any one of the three grades. Equipment cost will likewise be substantially the same, except where heavy open tank treatments are desired.

A proper consideration of all the factors entering into the problem is essential to attaining the object of preserved wood with the desired extended life, not alone of the timber entering into the construction, but of an extended life for the structure itself and a low maintenance charge.

The Consulting Department maintained by this company is for the benefit of users of its products. Its only aim is *service* to those responsible for the use of wood preservatives.

Specifications for Use.

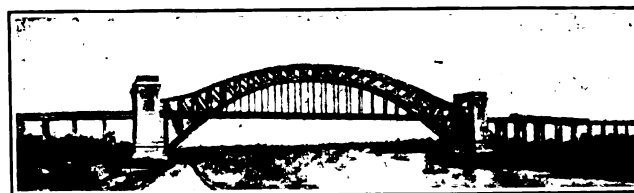
See former editions of SWEET'S CATALOGUES.

These are designed especially to meet the requirements of each case and include a consideration of the conditions to be met and the kind and quality of timber to be used.

Cost estimates will be prepared when schedule of timber is submitted.

Literature.

A list of all available bulletins and circulars will be sent on request. Each answers definite questions.



HELL GATE BRIDGE, NEW YORK
GUSTAV LINDENTHAL, Chief Engineer

On which over 3,000,000 ft., board measure, of timber in deck structure, including flooring, received open tank treatment with Protexol Wood Preservative

GRANITEX COMPANY, INC.

Concrete Hardening, Strengthening and Waterproofing Compound

TELEPHONE:
VANDERBILT 7543

171 Madison Avenue
NEW YORK, N. Y.

FACTORY AND LABORATORY
BROOKLYN, N. Y.

Product.

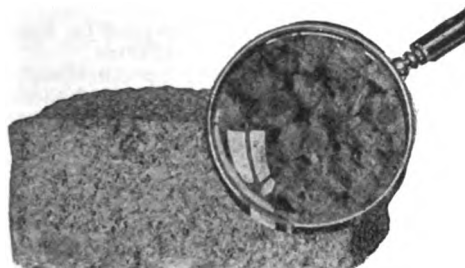
VITRI-FLUX, for permanently Hardening, Strengthening, Waterproofing, and Accelerating the set of Concrete.

Vitri-Flux for Better Concrete Floors.

Its Chemical Properties—Vitri-Flux is a carefully compounded combination of chemicals in a liquid form. No "by-product" materials or chemicals are used in its manufacture.

Its Effect on Cement and Cement Products—It strengthens, hardens, and waterproofs portland cement, and all mixtures of portland cement with other materials. It acts as a flux, causing the heterogeneous mass of materials which compose concrete to knit or bond more closely and firmly together.

It accelerates and stimulates the setting and hardening processes. It increases hydration by breaking down one of the strongest barriers to the complete hydration of cement, namely the surface tension of the water. It so enriches the mix that it is more easily worked, more plastic, and more quickly applied and finished, effecting a decided saving in the time of finishing off concrete floors. This saving in time and labor more than pays for Vitri-Flux.



CONCRETE MIXED WITH PLAIN WATER RESULTS IN A POROUS STRUCTURE WHICH IS SUBJECT TO DISINTEGRATION.

Vitri-Flux
TRADE-MARK

Specifications for Use of Vitri-Flux.

For Wearing Surface of Floors—Use Vitri-Flux in the proportion of 1 part of Vitri-Flux to 9 parts of water by volume.

For Waterproofing Mass Concrete—Use 1 part of Vitri-Flux to 12 parts of water.

For Stucco—Use 1 part of Vitri-Flux to 7 parts of water.

For Waterproof Mortar Coats—Use 1 part of Vitri-Flux to 8 parts of water.

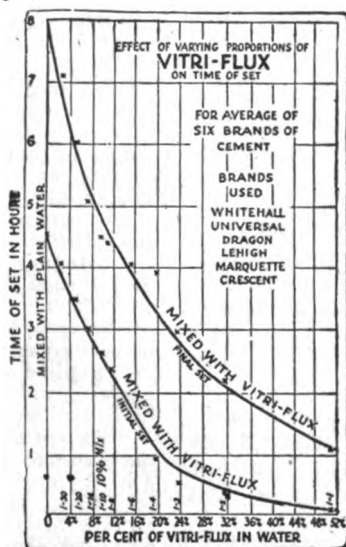
For Bonding to Old Surfaces—Use a cement grout of the consistency of paint, using 1 part of Vitri-Flux to 5 parts of water.

Shipment.

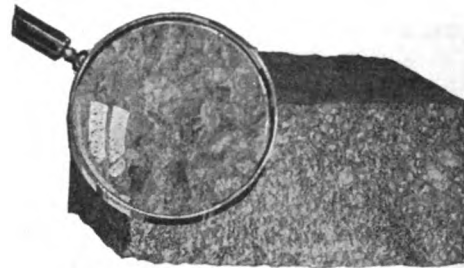
Vitri-Flux is shipped in 1-gal. and 5-gal. cans, crated, and in 30-gal. and 55-gal. drums. The charge for drums is refunded in full when empty drums are returned in good condition, freight prepaid.

Co-operative Technical Service.

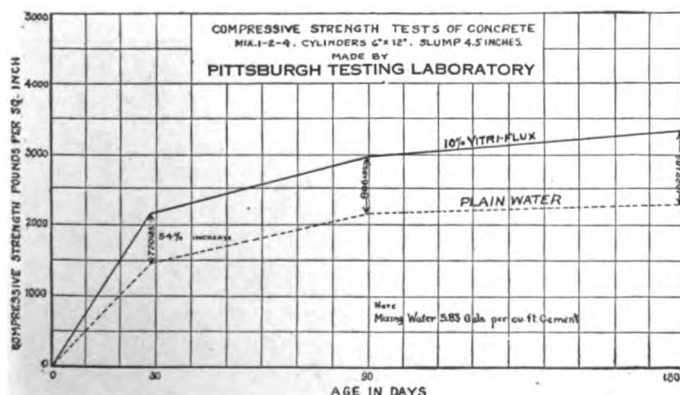
The GRANITEX COMPANY, INC. will co-operate with users of Vitri-Flux by detailing one of its technical staff to see that Vitri-Flux is used in accordance with specifications, in which case results are guaranteed.



VITRI-FLUX EFFICIENCY CHART
Points indicated are the average of 6 determinations by the standard method, using Gilmore needles. This chart shows that almost any desired speed of setting may be obtained by adding the right proportion of Vitri-Flux.



CONCRETE MADE WITH VITRI-FLUX POSSESSES THE DENSITY, HARDNESS AND THE PERMANENCY OF NATURAL GRANITE



COMPRESSIVE STRENGTH CHART

Tests made on 6x12-in. concrete cylinders in proportions of 1:2:4 with and without Vitri-Flux.

Note the continuous increase in strength of Vitri-Flux specimens over plain water specimens as age increases



WILLYS-OVERLAND CO. PLANT AT ELIZABETH, N. J. MILLS, RHINES, BELLMAN & NORDHOFF, Toledo, Ohio, Architects
WARREN, MOORE & Co., Philadelphia, Pa., Builders
One of the largest industrial buildings in the East. Vitri-Flux used for hardening floors, driveways, and stairways

THE MASTER BUILDERS COMPANY

Specialists in Masterbuilt Concrete Floors
CLEVELAND, OHIO

SALES OFFICES

NEW YORK CHICAGO PHILADELPHIA
KANSAS CITY, MO. SALT LAKE CITY

DETROIT ATLANTA DALLAS MINNEAPOLIS BOSTON
SAN FRANCISCO MONTREAL TORONTO AMSTERDAM

Products.

MASTER BUILDERS CONCRETE HARDNER, used in accordance with **MASTER BUILDERS METHOD** for making concrete floors dust-proof, wearproof and waterproof.

MASTER MIX (controls concrete) a colorless, odorless liquid chemical used integrally in cement mixtures, stucco, brick mortar, etc.

MASTER BUILDERS SANISEAL, a liquid chemical for hardening and dustproofing cement floors.

Also manufacturers of Master Builders Liquid Waterproofing; Waterproofing Paste and Powder; Master Builders Technical Paints.

Description and Advantages of Master Builders Method.

Ordinary concrete floors dust and wear into ruts and holes. The reason for this is their porous structure and lack of proper wearing aggregate. Master Builders Method is a formula for building concrete floor surfaces according to definite, standardized principles which eliminate the defects of ordinary concrete floor surface construction and produce wearproof, dustproof and waterproof concrete floors.

To accomplish this result, Master Builders Method employs Master Builders Concrete Hardner, a perfectly graded, scientifically treated metallic aggregate, which, when added to the sand and cement when the topping of the floor is installed, eliminates all pores and supplies a hard wearing, permanent, non-abrasive element that withstands the wear and tear under which ordinary concrete floors break down and wear out.

Master Builders Method is the original and standard method for producing concrete floors that will not dust or absorb moisture and that will resist the hardest kind of wear. Over 30,000 users have more than 100,000,000 sq. ft. of surface in use to date.

Master Builders "Standard Specification."

Recommended for making wearproof, dustproof and waterproof concrete floors in every type of building.

Wherever practicable, topping to be laid before base has set.

Proportions of Topping—Topping (thickness at least full $\frac{3}{4}$ in.) shall consist of the following proportions: 1 part tested portland cement; 2 parts coarse, gritty, clean sand.



TRADE-MARK
Registered United States
Patent Office

If rock or grit is used in addition to sand, specify as follows, instead of above: 1 part tested portland cement; 1 part crushed rock or grit (not over $\frac{3}{8}$ in. in size), free of dust; 1 part clean, coarse, gritty sand.

Measuring Volumes—These proportions shall be accurately measured by volume, in suitable size boxes. No counting by shovels, or measuring by wheelbarrows or other approximation will be permitted. To determine proper proportions, 1 bag of cement shall equal 1 cu. ft. of sand or grit.

Addition of Water—Mix thoroughly dry until uniform in color, showing no streaks or patches of the constituents; if mixed by hand, topping aggregate shall be turned over dry three times. Add

sufficient water to saturate mixture and mix thoroughly again. Topping shall at no time be made sloppy.

Application of Topping—Lay and straightedge the topping to a true and even surface; float the surface well with wooden floats to close all voids and hollows.

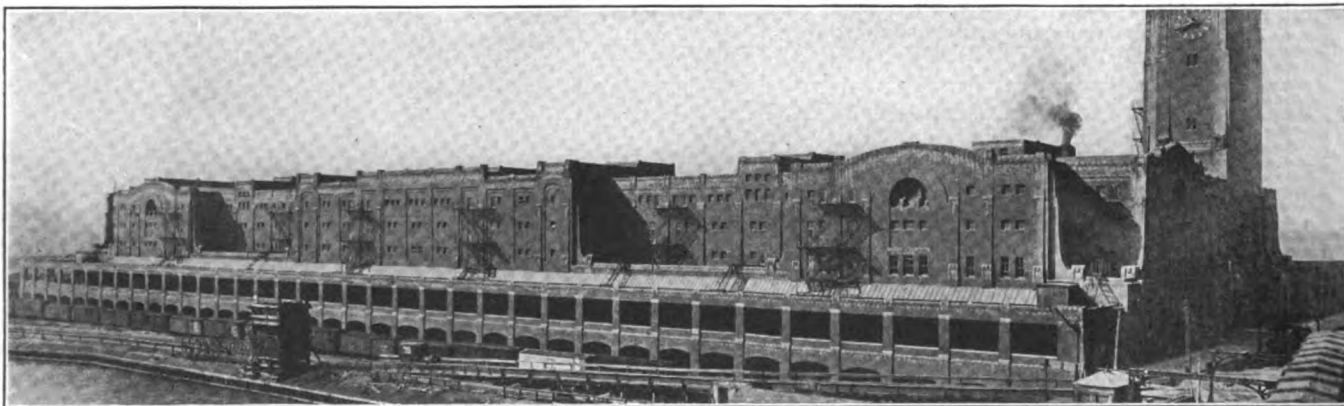
Wearproof Finish—A dry mixture of 1 part Master Builders Concrete Hardner to 1 part tested portland cement (by weight), mixed to an even color, shall be sprinkled evenly over surface. Not less than 20 lbs. of Master Builders Concrete Hardner and 20 lbs. of portland cement shall be distributed in this manner over each 100 sq. ft. This shall be floated in thoroughly and troweled. A second troweling shall be given surface when it has set sufficiently to finish hard and smooth.

Under no circumstances shall the wearproof finish be applied when there is any surplus water on the floated surface.

Safeguarding the Floor—After topping has set up, contractor shall cover it with a uniform layer of soft wood sawdust, shavings, or other suitable covering. This covering must not be applied until experiment shows surface hard enough to prevent covering from scratching or injuring the finish. Surface shall be kept wet for at least 5 days. Floors, if protected as above, will be ready for light traffic in 1 week, and for heavy traffic in 3 weeks, under favorable weather conditions.

Exceptions—The foregoing "Standard Specification" is the standard method of procedure for the average building. The 20 lbs. of Master Builders Concrete Hardner recommended per 100 sq. ft. will give a surface which will withstand any average service. However, there are some cases where the quantities should be varied. These exceptions follow:

In buildings where floors are subjected only to light foot traffic, specify 15 lbs. of Master Builders Concrete Hardner to every 100 sq. ft. for the wearproof finish. For floors, piers and loading platforms, etc., which receive extremely heavy wear, specify 25 lbs. of Master Builders Concrete Hardner to every 100 sq. ft. for the wearproof finish. For railroad repair shops, forge shops, etc., specify 30 lbs. of Master Builders Concrete Hardner to every 100 sq. ft. for the wearproof finish.



PENNSYLVANIA R. R. FREIGHT TERMINAL, CHICAGO, ILL.
GEO. A. FULLER, General Contractors; O. W. ROSENTHAL-CORNELL Co., Floor Contractors
Total area, 1,000,000 sq. ft. Masterbuilt Floors

Master Builders Red Concrete Hardner.

Master Builders Red Hardner produces a hardened concrete surface with a pleasing tile color finish. It combines the advantages of the Hardner with a colored floor widely used in office buildings, schools, institutions, etc. Specifications on request.

Master Builders Saniseal.

On concrete floors, already laid and not giving satisfactory service, or where it is impossible or impracticable to use a metallic hardener in laying the floor, Saniseal is the ideal material to use. It combines with the lime in the cement, forming a new crystal that is exceedingly hard and wear resisting. It changes the soft, porous surface to a flintlike hardness.

Saniseal is easy to use. No complicated dilutions or applications necessary. Except where a floor is exceptionally porous, 1 gal. of Saniseal will cover approximately 100 sq. ft. Does the work overnight in most cases.

Master Mix.

Master Mix gives the answer to five vital questions in concrete construction:

(1) How to accelerate the final set of the cement, and increase its initial tensile strength. (2) How to produce ideal troweling conditions. (3) How to create at low cost a dense, hard surface that will not dust. (4) How to secure waterproof concrete. (5) How to prevent concrete from freezing at ordinary low temperatures.

The scientific explanation of how Master Mix settles these "how" problems requires more space than is available here, but its accomplishments can be touched upon in sufficient detail to show the amazing possibilities and opportunities in this preparation.

Master Mix accelerates the final set of the cement from 2 to 4 hours; increases the tensile strength 71% in the first 24 hours and from 5% to 10% permanently; produces a "fatty" condition of the cement that makes it 100% easier to trowel; hydrates from 40% to 50% more cement than water, thus producing a dense, hard surface that will not dust or crumble; prevents concrete and stucco from freezing at ordinary low temperatures; renders concrete waterproof, through giving it sufficient density to prevent water seeping through.

Every claim made for Master Mix is amply borne out by years of actual use in all types of buildings and

millions of square feet laid in the most important building operations in the country.

Contractors have long been waiting for a material that would produce ideal conditions and results without having to follow complicated instructions. Here it is in Master Mix.

Master Mix Specifications.

For Accelerating Set of Cement and Hardening Concrete Floors—1-in. topping is recommended, proportioned 2 parts clean, fairly coarse, sharp sand and 1 part fresh tested portland cement. Mix thoroughly dry. Add Master Mix to gauging water gradually in proportion of 1 gal. Master Mix for every barrel of cement used. Pour, float and trowel cement in usual manner. A second troweling when surface is sufficiently set will produce a hard smooth finish. Protect surface from injury and keep it wet until surface is hard. For this purpose use a layer of soft wood sawdust, properly wet down.

For Waterproofing Brick Masonry—Mortar in which bricks are laid should be 1 part cement and 2 parts sand. Mortar to be tempered with water to which has been added Master Mix in proportion of 1 gal. waterproofing to 10 gals. of water. Carefully grout each course of bricks, taking care that all joints are filled with mortar.

For Waterproofing Concrete and Cement Mixtures—To waterproof 1-2-4 mass concrete add $\frac{1}{4}$ gal. of Master Mix to gauging water to each barrel of cement. To waterproof 1-2-5 mass concrete add 1 gal. of Master Mix to gauging water to each barrel of cement.

Concrete walls, floors, etc., can be made waterproof by the application of a cement coat into which Master Mix has been introduced. A mixture of 1 part cement to 2 parts sand should be made and tempered with water and Master Mix in the proportion of 1 gal. of Master Mix to 18 gals. of water.

For Waterproofing Stucco—Stucco shall be applied in 2 coats. The straightening coat shall consist of 1 part portland cement and 3 parts sand. This shall be gauged with a solution of 1 part Master Mix to each 18 parts of water.

Wall shall first be thoroughly wetted and the straightening coat applied $\frac{3}{4}$ in. thick. Finish coat shall consist of 1 part portland cement and $2\frac{1}{2}$ parts clean sand, which shall be gauged with the same strength solution of Master Mix and water as the straightening coat and applied $\frac{1}{4}$ in. thick.

To Make Masonry Impervious to Moisture—To a mixture of 1 gal. Master Mix and 3 gals. water gradually stir about $\frac{1}{2}$ bag of portland cement to a creamy consistency. Apply in 3 coats, with a brush or spray.

First coat is a penetrating one, mixture for which should be as thick as the brush will carry, and well embedded, taking particular care to fill all joints and cracks. The second is a further filler. The third is the finish coat to which any color or effect can be given. Above coating also acts as a cold water paint.

To Prevent Concrete from Freezing—Use the following proportions to hydrate the mixture at indicated temperatures. Add Master Mix to gauging water. Temperature 32°, 1 part Master Mix, 20 parts gauging water; temperature 25°, 1 part Master Mix, 15 parts gauging water; temperature 18°, 1 part Master Mix, 10 parts gauging water; temperature 13°, 2 parts Master Mix, 10 parts gauging water.

Master Mix
CONTROLS CONCRETE
TRADE-MARK



UNITED STATES NAVAL BASE, BROOKLYN, N. Y.

TURNER CONSTRUCTION COMPANY, Contractors

Area 3,000,000 sq. ft. Master Mix used to accelerate set of concrete floor topping and harden floor surface

L. SONNEBORN SONS, INC.

Manufacturers of Concrete Floor Hardeners and Technical Paints

262 Pearl Street
NEW YORK, N. Y.

FACTORY: AVONDALE, N. J.

Products.

LAPIDOLITH, the Liquid Hardener for concrete floors, and Waterproofer for concrete and stucco walls.

CEMCOAT, a Wall and Floor Coating for concrete and other building materials.

FERMO, an Integral Liquid Chemical for the acceleration of the setting, and for prevention of freezing of concrete mixtures.

LIGNOPHOL, a Preservative for wooden floors.

Also manufacturers of Hydrocide, for dampproofing foundations and walls; Structural Steel Paints.

Lapidolith.

Lapidolith is an inorganic liquid chemical which renders new concrete floors hard, dustproof, wearproof and watertight. When applied to old concrete floors, Lapidolith will prevent further dusting and disintegration.

LAPIDOLITH
TRADE-MARK
TRADE-MARK

Advantages of Lapidolith.

Prevents dusting and wear of floors. This chemical permeates the concrete and renders it as hard as granite.

Lapidolized floors take on a fine surface finish under service and can be easily washed and swept.

Lapidolith prevents the formation of concrete dust, thus saving expensive repairs to machinery, injury to merchandise, etc.

Lapidolized floors are protected against the action of oils, alkalis, most acids and industrial solutions.

The labor cost of applying Lapidolith is negligible. Only unskilled labor is required, and an average man should be able to cover from 10,000 to 15,000 sq. ft. per day with one application.

Covering Capacity of Lapidolith.

According to porosity, 1 gal. will cover about 70 to 100 sq. ft.

Directions for application furnished in each case.

Lapidolith Specifications for Concrete Floors.

Harden and dustproof all concrete floors with Lapidolith, manufactured by L. SONNEBORN SONS, INC., New York, as per their directions and under their supervision.

Service Work for Lapidolith.

This company itself is prepared to apply Lapidolith under the supervision of a service engineer on areas of 20,000 sq. ft. and over. In New York City and wherever it has branch offices or representatives, or in localities where its service crew happens to be work-

ing, it is able to undertake service work involving smaller areas.

Some Present Users of Lapidolith.

Aluminum Co. of America	B. F. Goodrich Co.
American Woolen Co.	Johns Hopkins University
American Writing Paper Co.	Buildings
Armstrong Cork Co.	Mid West Refining Co.
Bethlehem Steel Co.	National Lamp Works
Canadian Fairbanks-Morse Co.	Pennsylvania R. R.
Carnegie Steel Co.	A. G. Spalding & Bros. Mfg. Co.
Chalmers Knitting Co.	Standard Oil Co.
Chevrolet Motor Car Co.	United Drug Co.
Continental Can Co.	U. S. Navy Department
General Chemical Co.	U. S. Steel Corporation
	Washburn-Crosby Co.

Cemcoat for Interior and Exterior Use.

Cemcoat is an ideal, enamellike wall and floor coating, in white and colors. Absolutely free from all poisonous ingredients.

Cemcoat
TRADE-MARK

It forms an even, light reflecting, non-porous surface, which affords no lodgment for dust and can not be injured by soap and water, or even water applied with a hose.

Fermo.

Fermo will:

- (1) Accelerate the setting of concrete.
- (2) Prevent concrete from freezing at low temperatures.
- (3) Densify concrete and reduce its permeability.
- (4) Produce a smooth, workable concrete mass which is much more easily troweled than ordinary cement.

Lignophol, the Preservative of Wooden Floors.

New floors will be protected from splintering and decay; old floors will be revived and their life prolonged.

LIGNOPHOL
FOR WOODEN FLOORS
TRADE-MARK

Lignopholed floors last longer, are dustless, smooth and sanitary.

Further Information.

The following printed matter will be sent on request: Booklet, "Concrete and Lapidolith," and Scientific Test Reports.

Booklet, "Why Lapidolize?"

Specification booklet covering Lapidolith, also Cemcoat, Hydrocide, Fermo, Lignophol and other Sonneborn products.

Samples, flask of Lapidolith and hardened block of concrete.

THE VITRIFYX COMPANY

Concrete Hardeners, Liquid Waterproofings and Wood Floor Preservatives

2526 Congress Street
CHICAGO, ILL.

TELEPHONE:
SEELEY 7041-7042

BRANCHES AND AGENTS IN ALL PRINCIPAL CITIES OF THE UNITED STATES

Products.

VITRIFYX, a Liquid Floor Hardener for surface application.

VITRIMIX, a Liquid Concrete Densifier.

HYDROLITHIC, a Liquid for Integrally Waterproofing Concrete.

VITRIFYL, a Wood Preservative for floors.

Services.

We are building conservation specialists.

We make positively certain that floors get the full value of Vitri-fyx treatment by applying it ourselves or seeing that it is applied under supervision of our floor engineers.

We make expert diagnosis of new and old concrete floors and prescribe the correct methods for rendering them permanently stable and waterproof.

Vitri-fyx.

A clear liquid chemical which, when applied to the surface of old or new concrete floors, penetrates into the floor body, and converts the soft, chalky, limelike mass into an insoluble silicate, granite-hard. It fills the pores; binds all free particles and converts the unhydrated cement; and gives a smooth, non-abrasive surface that will wear indefinitely and increase in strength with age.

Covering Capacity—One gallon will cover from 70 to 100 sq. ft. with three applications, according to directions.

Tests—Many tests have been conducted in leading universities and laboratories. These have proved that Vitri-fyxed concrete is from 12 to 16 times as hard or wear resisting as untreated concrete. Tests also show an almost perfect resistance to water penetration; also, that oils and acids have no disintegrating or chemical effect upon "Vitri-fyxed" concrete.

Specifications—All finished concrete floors, stairs, treads, landings, etc., throughout the building shall be treated with Vitri-fyx, manufactured by THE VITRIFYX COMPANY, Chicago, Ill. It is to be applied in accordance with their directions, under their supervision or under the supervision of their authorized representative. All floors are to be prepared to receive Vitri-fyx by first being broom cleaned from all dirt, dust and cement deposits, and thoroughly dried.

Send for literature to complete specification list.

References—A few of those who have used and heartily endorse Vitri-fyx products:

E. I. du Pont de Nemours & Co.; Stewart-



TRADE-MARK
(Reg. U. S. Pat. Off.)

Warner Speedometer Corp.; International Harvester Co.; American Sugar Refining Co.; Bartlett Hayward Co.; Owens Bottle Machine Co.; Mitchell Motors Co.; L. G. Hallberg & Co.; E. D. Jackson Construction Co.; General Motors Corp.; Youngstown Sheet & Tube Co.; Central Ohio Paper Co.; Sperry Flour Mills; Carnation Milk Products Co.; Cole Automobile Co.; Stone & Webster; The Texas Company.

Thousands of users throughout the United

States in every line of industry for every kind of structure. Names for any line of work in any locality submitted on request.

Vitrimix.

A liquid chemical concrete densifier, which is integrally incorporated into the mix of the cement. Its purpose is to build hardness, and water-, oil-, and acid-proofness into the concrete. Used wherever concrete is used. Vitrimix is absolutely free from alum, acid, greases, and oils. This insures its 100% effectiveness.

Vitrimix prevents freezing; accelerates the set of cement; eliminates costly overtime; lessens porosity; increases tensile and compressive strength; and, by making the ideal "fatty" mix, produces better troweling conditions. It is easy to use; merely add 1 gal. Vitrimix to the mixing water for each barrel of cement.

Hydrolithic.

A liquid chemical concentrate used integrally to waterproof and dampproof all kinds of cement or concrete structures and substructures.

Hydrolithic is the original concrete waterproofing. The first genuinely waterproof concrete structures erected in this country were completed over 20 years ago with the use of Hydrolithic portland cement as manufactured by THE VITRIFYX COMPANY. Hydrolithic is now furnished in concentrated liquid form, so that any contractor can make Hydrolithic cement on the job.

Vitri-fyl.

An amber liquid chemical that protects wood floors from moist decay, (especially when floors are laid over concrete), prevents dry rotting, eliminates splintering and slivering. Makes wood more resilient and resistant to wear from all kinds of traffic. Easily and quickly applied; clear, clean, sanitary and water-shedding. Seals pores against injurious foreign substances.

The cost is small and covering capacity great; 1 gal. covers about 500 sq. ft. Send for detailed information.



STEWART-WARNER SPEEDOMETER CORPORATION, CHICAGO
Concrete floors Vitri-fyx-treated and made as permanent as the building itself. This concern is a carload user of Vitri-fyx

AMERICAN ENAMELED BRICK & TILE CO.

INCORPORATED 1893

Manufacturers of Enameled and Fire Brick

TELEPHONES:
8787-8788 MURRAY HILL

52 Vanderbilt Avenue
NEW YORK, N. Y.

CABLE ADDRESS:
"AMEREBRICK"

Products.

ENAMELED BRICK, White, Mottled and Standard Colors, in Standard Sizes and Ornamental Shapes.

Also manufacturers of Fire Brick, Standard 9-in. and 9-in. Series Shapes (as adopted by the Members of the Refractories Manufacturers Association), and Special Shapes; Fire Clay, packed in bags or in bulk; Face Brick, all textures.

Territory.

The business operations of this firm cover North and South America, Europe, Asia and Australia.

Personal Representatives.

For the convenience of our customers in the United States and Canada, we have, in order to keep in closer touch with them, located representatives in all the principal cities to attend personally to inquiries, orders and deliveries.

Dispatch of Shipments.

Factory and office are in constant telephone connection with each other, and we have a local telephone exchange connecting every department of the factory for quick and systematic dispatch of business.

Facilities.

We are the largest manufacturers of this commodity in North and South America.

Shipping—Our works, located but an hour's travel from the New York office, are situated so as to enable shipping over two of the largest railroads, viz., the Pennsylvania and the Central of New Jersey, and their connecting lines.

We are also situated on tide water, so that shipments can be made by vessel for the coastwise and export trade.

Capacity.

Our present capacity is 12,000,000 brick per annum, which will be increased as occasioned by the demand.

Stock.

The average stock on hand at our factory is more than 2,000,000 brick, giving a large assortment for immediate delivery.

Illustrations of Stock Designs of Enameled Brick.

Much delay is saved by use of stock designs of moulded brick. We try to keep a stock of these on hand, in standard colors.

These designs are chosen to reduce manufacturing difficulties and delays to a minimum; to enable composite mouldings to be made up; and to enable prompt filling of orders.

Colors—Bright, Medium or Matt Finish.

In addition to our regular white and standard

colors, such as our sage green, red brown, etc., we have made a specialty of mottles in the following colors:

Gray, brown, black, blue and blue brown, which give a very fine appearance for both interior and exterior work, having a finish more on the type of marble than enameled brick.

If you have in mind, at any time, a particular color, shade or finish of enameled brick for interior or exterior purposes, advise us of your ideas and requirements and we will be pleased to submit samples.

Uniformity of Shade of Enameled Brick.

We guarantee uniformity of shade in all first quality deliveries to the limit of practicability. Colors and effects giving most uniform results are, in order of degree of uniformity, white, mottled gray, mottled brown, mottled black, sage green and red brown. Other colors follow in irregular positions.

We will try on orders of moderate size, or on larger orders, if ample time be given, to match in shade the moulded and stretcher stock, but can not always guarantee to uniformly shade shipments of specials, particularly on rush shipments.

Special Features and Advantages of Our Enameled Brick.

In making our product we follow the English and Scotch systems, working by the soft mud process. This is without question the only process which insures durability and the closest relation of bond obtainable between body and glaze.

Our brick are burnt in but one fire, thus making the chemical change in the body and the glaze simultaneous. We use hard and durable glazes; not soft lead glazes frequently seen on inferior grades of enameled brick and tile.

There has not been a single case during our twenty-seven years of business where any peeling or discoloring has been seen or reported.

This is better than any guarantee which we might be asked to give, as it covers a distributed output of over 120,000,000 brick, located all over the United States, Canada, South America and elsewhere, subject to all varieties of climatic conditions.

Cleaning.

Enameled brick are best cleaned with some alkaline solution, such as caustic soda or sodium carbonate. This cleans the enamel and does not affect the cement or lime mortar.

Acids.

Sulphuric, nitric or hydrochloric acids, even in concentrated form, will not affect our glazes; but if used as a wash, even when diluted, they will attack the cement or lime mortar.

The only commercial acids which will attack and destroy our enamel are hydrofluoric and hydrofluosilicic.

THE HOCKING VALLEY FIRE CLAY CO.

Manufacturers of Salt Glazed Brick

NELSONVILLE, OHIO

SALES AGENCIES IN ALL PRINCIPAL CITIES OF UNITED STATES AND CANADA

Products.

ATHENA SALT GLAZED BRICK.
SANITARY FLOOR BRICK.
EVERWEAR PAVING TILE.

Athena Salt Glazed Brick.

Size—8 by 2¼ by 3¾ in.

Shade Numbers, etc.—Made in beautiful shades of mahogany (105), brown (106), golden (107), buff (108), thoroughly vitrified and salt glazed on both faces and ends, and rich in both color and glaze. All standard shapes carried in stock and special shapes made on order.

Interior Uses—For facing entire interior walls or wainscot work wherever sanitary conditions are desired. Principal places: schools, hospitals, gymnasiums, swimming pools, stables, garages; office, factory and warehouse buildings; prisons, power plants, city market houses, acid rooms and vats, fire engine houses, packing plants; subways, passenger and freight depots.

FEW IMPORTANT JOBS (INTERIOR)—

World's Largest Electric Generating Station, United Electric Light & Power Co., 201st Street, New York City (see illustration)

Lincoln Park Lion House, Chicago, Ill.

Roseland & Mayfair Pumping Stations, Chicago, Ill.

Twin Market Houses, Pittsburgh, Pa.

Fire Engine Houses, Chicago, New York and Boston

General Chemical Co. Plants (many parts of United States)

Swift & Armour Packing Plants (various places)

Pennsylvania Railroad Stations and Tunnels

Ohio Penitentiary, Columbus, Ohio

Both High and Grade Schools in all principal cities of United States and Canada

Exterior Uses—For facing all exterior walls where a beautiful sanitary and permanent wall is desired, as it is not affected by acids or the elements.

FEW IMPORTANT JOBS (EXTERIOR)—

6-story Moose Building in Loop District, Chicago, Ill.

Apartment Buildings in all principal cities

3-story Business Block, Dr. J. E. Pickett, Minersville, Pa.

3-story Business Block, Marvin DeMaine, Pomeroy, Ohio

These brick have been furnished for exterior facing in almost every conceivable class of building

Sanitary Floor Brick.

Size—Size, 8¼ by 4 by 1¾ in.

Uses—This product is usually embedded in cement and adapted to practically the same class of floors as those named for our Everwear paving tile, but where the desire is for lighter weight material. Especially desirable in packing house floors, and is being used extensively for such purposes. Only one side is glazed and either side can be turned up as desired.

FEW SPECIAL JOBS—

Cincinnati Abattoir Co., Cincinnati, Ohio

Detroit Edison Co., Detroit, Mich.

Wm. Davies, Ltd. (Packing Plant), Toronto, Ont.

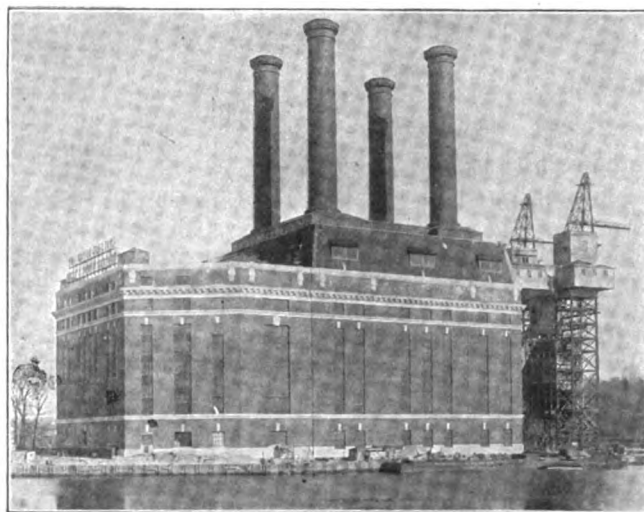
Swift & Co., Chicago, Ill.

Armour & Co., Chicago, Ill.

Everwear Paving Tile.

Size—Size 10 by 5 by 2¼ in.

Uses—Extensively used for paving floors of engine



201ST STREET GENERATING STATION, UNITED ELECTRIC LIGHT & POWER CO., NEW YORK, N. Y.

W. E. McCov, Engineer

F. F. NESBIT & Co., Contractors

650,000 brick used, shades 103 and 102 (interior)

and boiler rooms, power and industrial plants; basements of public buildings, schools, warehouses and battery rooms; paving around electric and steam railway passenger and freight depots. Thoroughly vitrified and only one side glazed, and unsurpassed for beauty and wearing qualities. They save 50% over cement floors on original cost, and have many times the life of a cement floor.

These tile have been upon the floors of boiler and engine rooms of the New York Life Insurance Building, New York, for 20 years and show scarcely any wear.

FEW OF MANY CONCERNS USING SAME—

Chicago Edison Electric Co., Chicago, Ill.

Cleveland Electric Railway Co., Cleveland, Ohio

Cincinnati Gas & Electric Co., Cincinnati, Ohio

Ford Motor Co., Detroit, Mich.

Aluminum Castings Co., Detroit, Mich.

Hocking Valley Railway Co., Columbus, Ohio

General Qualities of Salt Glazed Material.

All shades of the standard brick and two classes of floor brick are burned to about 2200° Fahr.; it is thoroughly vitrified and salt glazed; non-absorbent of moisture; absolutely acidproof; will not craze, crack or peel; withstands all the elements of the air besides heavy crushing strain, and always looks fresh and clean.

Samples.

Communicate with this company and the nearest sales agency will be directed to submit samples and prices at once.

Facilities.

With a daily capacity of 50,000 brick, or approximately 15,000,000 annually, and a large and well selected stock for quick shipment, all business is given prompt attention.

DENISON LOAD BEARING TILE

PATENTS OWNED BY AMERICAN TILE ENGINEERING CO., MASON CITY, IOWA

LICENSED MANUFACTURERS

MASON CITY BRICK & TILE CO., Mason City, Iowa
AUGUSTA CLAY PRODUCTS CO., Augusta, Ga.

GOODWIN TILE & BRICK CO., Des Moines, Iowa
REDFIELD BRICK AND TILE WORKS, INC., Redfield, Iowa

GENERAL SALES AGENTS

MASON CITY, IOWA, DENISON FIREPROOFING CO.
MINNEAPOLIS, MINN., HYDRAULIC PRESSED BRICK CO.
AUGUSTA, GA., GEORGIA-CAROLINA BRICK CO.

ST. PAUL, MINN., CORNING-DONOHUE CO.
OMAHA, NEBR., SUNDERLAND BROS. CO.

Sold Through the Best Building Material Dealers in Every Town

Product.

LOAD BEARING TILE.

Patents and License.

The manufacture and use of Denison Load Bearing Tile is licensed under the "Wilson System Bearing Wall Construction," patented; patents (owned by AMERICAN TILE ENGINEERING CO.) as follows: United States patents: May 24, 1904; March 7, 1905; Feb. 15, 1916; July 31, 1917; Dec. 18, 1917. Canadian patents: Oct. 4, 1913; Aug. 14, 1917. Other domestic and foreign patents pending.

Advantages of Load Bearing Tile.

(1) All vertical bearing webs are in perfect alignment to carry all load pressures. This gives a wall with the greatest load carrying capacity. (2) This tile produces two or more hollow walls with air spaces between them. It is so designed that it makes the most perfect insulating structural material on the market. (Test: apply blowtorch flame to middle of one face; after four hours, take temperature in air cells.) (3) Two separate mortar beds, at the top and the bottom, lying in the same horizontal planes. (4) Dead air insulates the space between these two horizontal mortar beds in the same manner as the body of the tile is insulated, thus preventing the formation of frost or moisture lines on the inside of the wall. (5) Closed trough in the top of the tile insures against the conduction of moisture

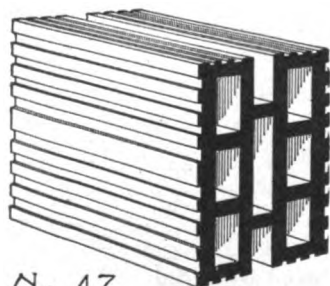
through the wall. (6) Works out to the same thicknesses and heights as common brick, thus is adaptable to any height of cornice, window ledge, etc., or to any thickness of wall. (7) Because of the discontinuous or insulated mortar joint, plaster may be applied direct to the wall without the use of furring tile. (8) The tile is completely symmetrical, thereby facilitating the laying of it. (9) It is a complete unit which will stand on its own base in a stable condition when stood on either face, or end, thus facilitating piling and handling. (10) Dimension tile of fractional lengths furnished to facilitate the laying of any length wall. (11) Corner tile of this series permit turning inside or outside corners without destroying the insulating efficiency of the wall at these points. (12) Jamb and half-jamb tile are furnished for either standard or box frame openings, which form a weatherproof union with these frames, and which maintain the insulating efficiency of the wall.

Specifications.

Specify the use of this tile by including in the specifications this reference: "To be laid according to the standard specifications for Wilson System Bearing Wall Construction," copies of which may be had on request to any licensed manufacturer.

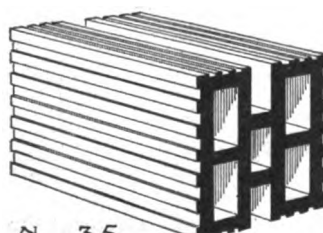
Working Drawings.

A portfolio containing a complete set of detail and working drawings also furnished on request to any manufacturer.



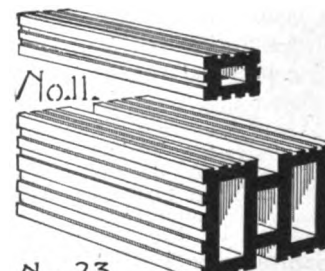
No. 47.

No. 47— $8\frac{1}{4}" \times 10\frac{1}{4}" \times 12"$
4 brick and 3 mortar joints high



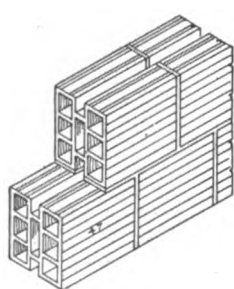
No. 35.

No. 35— $8\frac{1}{4}" \times 7\frac{1}{4}" \times 12"$
3 brick and 2 mortar joints high
DENISON LOAD BEARING TILE

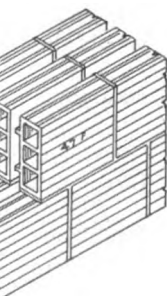


No. 23.

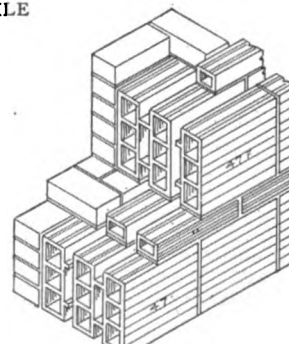
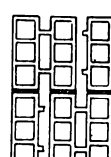
No. 23— $8\frac{1}{4}" \times 5" \times 12"$
2 brick and 1 mortar joint high



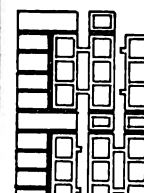
8 1/4" Tile Wall



13" Tile Wall



17" Brick Veneer Tile Wall



ISOMETRIC DETAILS OF DENISON LOAD BEARING TILE WALL CONSTRUCTION

1/2-in. scale

THE HUMPHREY BRICK & TILE CO.

Hollow Terra Cotta Blocks

BROOKVILLE, PA.

Products.

Manufacturers of 6-CELL SCORED and SMOOTH HOLLOW TERRA COTTA LOAD BEARING BLOCKS.

Also Partition Blocks, Hollow Brick and Back-up Blocks will be manufactured when factory conditions permit.

Facilities.

This plant is located in a section where special advantages for the manufacture of terra cotta blocks, etc., are obtained—such as an abundance of material and water, railroad and shipping facilities and cheap fuel. All motive power in the plant is supplied by gas engines, natural gas being used exclusively for power and fuel, this company operating its own gas wells.

The plant is constructed entirely of terra cotta blocks and is under ownership management, assuring owners' personal attention to all orders.

This company is devoting its entire plant to the exclusive manufacture of the 6-chambered 8 by 12 by 12-in. terra cotta wall block both scored and smooth.

Fully 75% of all hollow tile requirements can be met by this block as either an 8-in. or a 12-in. wall can be built with this one size.

This plan of concentrating on one design will naturally result in an increased output and superior quality and the advantages of purchasing this material from a plant making one run are apparent.

Range of Utility.

The inherent fireproof and dampproof qualities of Humphrey hollow terra cotta blocks extend the scope of their use over a large, growing field. They are eminently adapted for the economical construction of walls, floors, and ceilings for residences, public service, industrial, farm and other buildings, due to the fact that their design facilitates rapid handling and their enduring qualities assure rigid, permanent masonry construction.

Advantages of Hollow Terra Cotta Blocks.

The following advantages are insured by hollow terra cotta construction:

(1) Absolutely indestructible by fire—due to the process of intense burning resulting in a dense, extremely hard substantial product.

(2) Low percentage of absorption gives dryness, warmth and insulation to walls exposed to the weather where resistance to moisture, cold and heat are of paramount importance.

(3) Positive saving in construction as compared with brick or stone.

(4) Continuous, permanent saving in heating costs.

(5) The hollow construction minimizes the weight on walls.

(6) Positive insurance against mice and vermin in walls or other hollow tile construction.

(7) The use of metal lath is obviated—nothing to rust or corrode.

(8) The use of wood lath is done away with—nothing to rot or burn.

(9) No furring strips to give trouble.

(10) Saves space occupied by furring and lath.

(11) Being symmetrically accurate in design they facilitate laying.

(12) Each block is a separate unit and will stand on face or end assuring easy, rapid handling and stacking.

(13) Perfect alignment of webs and walls of the block assure maximum load bearing capacity.

Strength Test.

Tests conducted by the United States Government Arsenal at Watertown, Mass., showed Humphrey 6-cell wall blocks to have an ultimate crushing strength of over 111 tons per sq. ft. of 8-in. wall. As this is many times the weight that could be put on any ordinary wall, ample strength of material is assured.

Scored Special 6-Chamber Wall Block.

The increase in the growing application of hollow terra cotta blocks to wall and other construction made many improvements in their design and manufacture necessary. One of the vital improvements that made the hollow terra cotta block the universal favorite was the scoring of the surface with longitudinal ribs which serve as a bond for stucco, concrete or similar material applied thereto. This feature made possible the use of hard burned block, superior in strength to the soft burned block and more impervious to water, which is the reason why hollow terra cotta construction is the dryest of any known masonry construction.

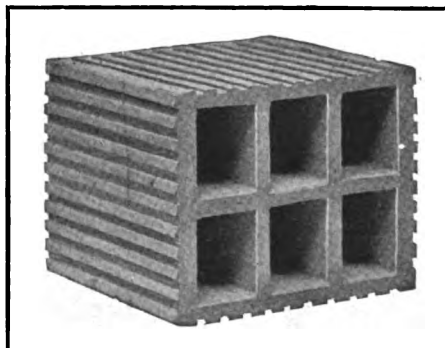
Humphrey scored 6-chamber blocks are recommended for exterior walls, floor arches, back-ups, pillars, or work where a specially strong block is required.

Humphrey Smooth Faced Block.

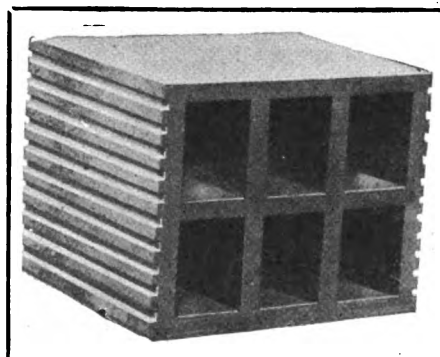
With these smooth face blocks a smooth wall of either 8-in. or 12-in. thickness for either outside or inside use can be constructed. They are supplied in mixed red shades, but if uniform color is desired they can be painted inside or outside as paint will last twice as long as on wood. Their use, in

nearly all cases, will cut the cost of even common brickwork in two, besides making a warmer, drier building.

They possess the same qualities of hardness, density and strength as the scored block and they are of precisely the same advantage where special conditions warrant their use.



SCORED SPECIAL 6-CHAMBER WALL BLOCK
8 x 12 x 12 in., 36 lbs.



HUMPHREY SMOOTH FACED BLOCK
8 x 12 x 12 in., 38 lbs.

NATIONAL FIRE PROOFING COMPANY

ORGANIZED 1889

Manufacturers of Hollow Tile

MAIN OFFICE
Fulton Building
PITTSBURGH, PA.

BRANCH OFFICES IN PRINCIPAL CITIES
Twenty-one factories in the United States and one at Hamilton, Ont.

Products and Services.

Manufacturers of DENSE and POROUS HOLLOW TILE for Fireproof Floors, Roofs, Ceilings, Partitions, Wall Furring, Column and Girder Coverings, and for Exterior Walls of all kinds, including barns, silos, and other farm buildings; NATCO LOCK JOINT SEWER TILE and NATCO FACE TILE in various types.

Trade-mark.

Look for the trade-mark "Natco" indelibly stamped on every piece of our product; it is protection against substitution.

Natco Advantages.

Natco hollow tile construction is superior in its moistureproofing, soundproofing, heat preserving (and conversely heat resisting), sanitary qualities, and from the standpoint of economy both initial and final.

Natco Floor Construction.

Floor arches of hollow tile can be set in winter, as the construction dries out in a few days. They are more nearly soundproof than solid construction. Following are illustrations and descriptions of some of the forms in common use. Only typical sections are given. Write for bulletin No. 171, "Natco Standard Fireproofing."

Natco Flat Arches.

The flat arch is the accepted type of standard fire-

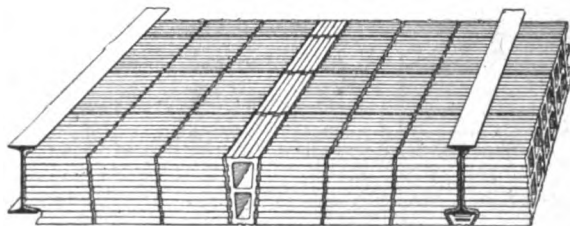


FIG. 1. PERSPECTIVE OF STANDARD NATCO FLAT ARCH

proof floor construction, meeting every requirement as to strength, fire protection, architectural appearance and minimum weight.

The Natco hollow tile flat arch construction, as illustrated above, has been developed as the company's standard for this type.

APPROXIMATE WEIGHTS AND SAFE SPANS NATCO FLAT ARCHES
(For designing purposes only)

Depth of arch, in.	Weight, lbs. per sq. ft.	Spans allowable between I-beams arch set flat, ft. in.	
6	26	4	0
7	30	4	6
8	32	5	0
9	36	6	0
10	38	6	6
12	44	8	0
14	50	9	0
15	54	9	6
16	55	10	0

The strength of any arch depends as largely upon workmanship as upon materials, therefore the maximum spans given can be used only where experienced workmen are employed and the work is guaranteed by a responsible contractor.

"Combination" System of Long Span Floor Slab.

Used without girders for clear spans up to 25 ft. Rows of tile 12 in. wide between reinforced concrete joists 4 to 6 in. wide monolithic with a concrete top

coat 2 in. thick mixed 1 part cement, 2 parts sand, and 4 parts gravel. Eliminates beam forms and requires one-third to one-half less flat centering, effecting great economy in erection.

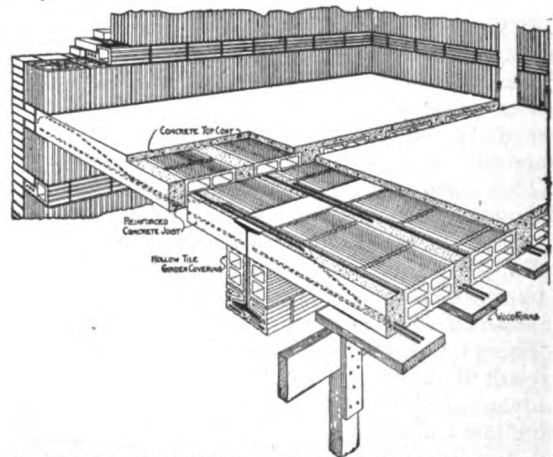


FIG. 2. PERSPECTIVE VIEW OF TYPICAL COMBINATION FLOOR
Note economical wood centering used; 2"x8" or 2"x10" under each joist is sufficient

"Natcoflor" System of Fireproof Construction.

An exceptionally light slab of wonderful strength designed to reduce the dead load of fireproof floor construction carried on girders, columns, and footings. A minimum of flat centering required and an all-tile ceiling surface dovetail-scored for plastering a feature.

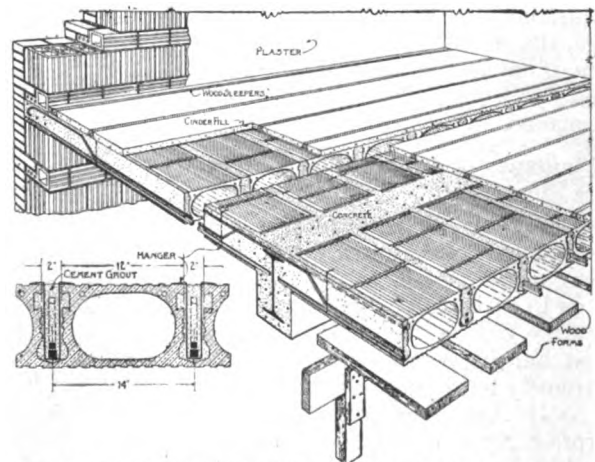


FIG. 3. PERSPECTIVE VIEW OF TYPICAL "NATCOFLOR"
Note simple method of reinforcing; also economical wood centering, 2"x8" under each joist is sufficient

Natco "Two-way" Floor System (Patented).

A later development of the "Combination" floor designed to carry loads to four sides in place of two, thus enabling designer to cut down thickness of slab and reduce depth of supporting girders. Most economical for bays, the ratio of whose sides does not exceed 1:1½; for long narrow spans "one-way" system is cheaper.

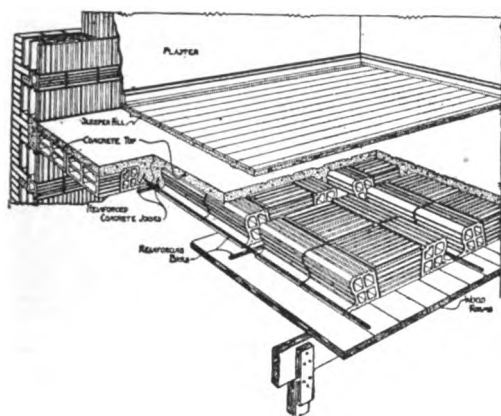


FIG. 4. PERSPECTIVE VIEW OF NATCO "TWO-WAY" FLOOR SYSTEM

Natco Segmental Arch.

Combining great strength with lightness and cheapness. Suitable for warehouses, lofts, factories, sidewalks or wherever a flat ceiling is not required. A flat suspended ceiling may be installed wherever deemed essential, such as used in the New York public schools, and in private houses, stores, etc. The 6-in. tile weighing approximately 27 lbs. per sq. ft. is the standard.

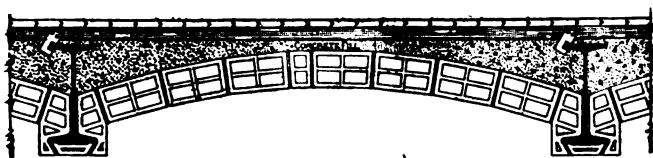


FIG. 5. TYPICAL SPAN OF NATCO SEGMENTAL ARCH

Natco Girder Covering.

Hollow tile beam and girder covering is made in various forms to fit the flanges of all standard steel beams and girders. It is self-supporting except where the width to be covered is more than 12 in.; then the soffit is supported by metal clips.

Note—See Fig. 2 for typical girder covering.

Natco Column Covering.

Steel and cast iron columns should be covered with at least 2 in. of semiporous hollow tile. Natco column covering can be furnished, both circular and square, for almost any type of column and from 2 to 4 in. in thickness. Covering for square columns can be made with rounded corners if necessary.

Natco Hollow Tile Partitions.

Fireproof, soundproof, easily erected, and the standard for stability, especially where called upon to support plumbing fixtures, heavy picture frames, shelving, etc. Stock sizes 2 to 12 in. thick, laying up 1 sq. ft. of wall surface. A reasonable percentage of short lengths also furnished on request.

Natco Face Tile.

For curtain or bearing walls of factories, warehouses, storage buildings, etc., Natco double shell tile in an 8-in. thickness, Natco smooth building tile and Natco XXX Tex tile in 3-, 4-, 6-, 8- and 10-in. thicknesses, with a reasonable percentage of corners, jambs, closures, sills, lintels and half-tile. When laid in a good cement mortar any one of these types produces an exterior surface of attractive finish without the addition of either stucco plaster or paint.

A post card request will bring a copy of the new bulletin No. 174, "Natco Wall Construction."

Natco XXX Hollow Tile.

For wall bearing and curtain wall construction—hard burned tile exposed or to be covered with cement stucco finish.

Natco XXX as compared with regular Natco merely represents added strength. Complete structural efficiency is realized in Natco XXX design in that every square inch of webs and shell is under direct compression when set in walls. Write for Bulletin No. 174, "Natco Wall Construction."

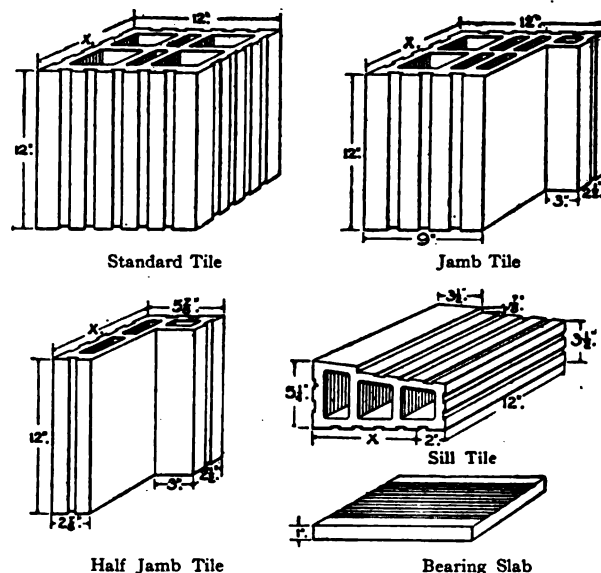
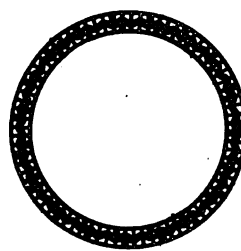
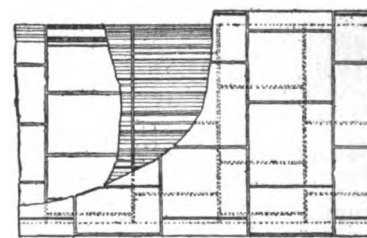


FIG. 6. TYPICAL SHAPES OF NATCO XXX HOLLOW TILE

Natco Lock Joint Sewer Tile.

Triple lock, hermetically sealed. Manufactured from a specially selected, carefully prepared, hard burned clay thoroughly salt glazed.

The recesses of the inner tile are designed to receive projections on each outer tile, which produces a continuous irregular mortar joint for entire length of sewer. The tile also lap 6 to 9 in. horizontally and 3 to 4 in. radially, thus eliminating "through mortar joints." Descriptive catalogue mailed anywhere.

FIG. 7. Cross Section
NATCO LOCK JOINT SEWER TILE CONSTRUCTIONFIG. 8. Longitudinal View
NATCO LOCK JOINT SEWER TILE CONSTRUCTION

APPROXIMATE WEIGHTS, DIMENSIONS, ETC.

Diam. sewer, in.	Number double tile in circumference of sewer	Thickness of sewer, in.	Thickness inside wearing surface, in.	Area of wearing surface inside tile, sq. in.	Approx. weight per foot of sewer, lbs.
30	7	6	3/4	235	410
33	8	6	3/4	226	450
36	8	6 1/4	3/4	247	480
39	9	6 1/4	3/4	238	540
42	10	6 1/4	3/4	230	560
45	10	6 1/4	3/4	247	585
48	11	6 1/4	3/4	240	610
54	12	6 1/4	3/4	247	650
60	13	8	1	254	970
66	14	8	1	259	1000
72	15	8	1	264	1140
78	16	8	1	268	1170
84	18	9	1	257	1290
90	18	9	1	275	1400
96	20	9	1	264	1530
102	21	9	1	267	1630
108	22	10	1	270	1790

INDIANA LIMESTONE

BEDFORD, IND.

BLOOMINGTON, IND.

INDIANA LIMESTONE QUARRYMEN'S ASSOCIATION, OFFICES, P. O. BOX 801, BEDFORD, IND.

MEMBERS AS FOLLOWS:

BLOOMINGTON-BEDFORD STONE CO., Bloomington, Ind.
CHICAGO & BLOOMINGTON STONE CO., Bloomington, Ind.
CONSOLIDATED STONE CO., Bedford, Ind.
CRESCENT STONE CO., Bloomington, Ind.
GEORGE DOYLE CORPORATION, Bedford, Ind.
EMPIRE STONE CO., Bloomington, Ind.
FURST-KERBER CUT STONE CO., Chicago, Ill.
J. HOADLEY & SONS CO., Bloomington, Ind.
HUNTER BROS. STONE CO., Bloomington, Ind.

IMPERIAL STONE CO., Bedford, Ind.
INDIANA QUARRIES CO., Chicago, Ill.
W. McMILLAN & SON, Chicago, Ill.
MATHERS STONE CO., Bloomington, Ind.
MONROE COUNTY OOLITIC STONE CO., Bloomington, Ind.
NATIONAL STONE CO., Bloomington, Ind.
PERRY STONE CO., Ellettsville, Ind.
SHEA & DONNELLY CO., Bedford, Ind.
STAR STONE CO., Chicago, Ill.

Product.

BUFF, GRAY ("Blue") and VARIEGATED ("Mixed") INDIANA LIMESTONE (formerly called "Bedford Stone").



brick wall and with but slight addition in cost of factory, powerhouse or other industrial structure.

Descriptive data and complete architectural specifications will be furnished

on application.

Structure and Chemistry.

Indiana Limestone is composed of shells and fragments of shells of microscopic and somewhat larger sizes, cemented together with a film of pure calcium carbonate. It is therefore a homogeneous, massive formation without cleavage planes and for practical purposes may be treated as a free stone and it is practically pure carbonate of lime.

Average chemical analysis follows:

Carbonate of lime.....	97.26%
Silica.....	1.69%
Oxide of iron.....	.49%
Magnesia.....	.37%
Water and loss.....	.19%

Durability.

Indiana Limestone is extremely durable. The oldest known structures built of it show the original tool marks and perfect arrises everywhere. Its great chemical purity, especially the negligible proportion of magnesia, makes it practically inert and unaffected by the corrosive gases of city atmosphere. Its wide use for railway stations has demonstrated this. It is practically untouched by weather erosion. Inspection of the outcroppings at the quarries, where natural, sharp arrises have been exposed for centuries, proves this.

Strength Plus Softness.

Indiana Limestone while comparatively a soft stone, has a strength sufficient for all practical purposes, placing it in the same class with granite, which is many times harder and more difficult to work. After quarrying and exposure Indiana Limestone becomes very hard, developing a crushing strength, in 2-in. cubes, of well over 10,000 lbs. per sq. in.—many times the strength needed for the heaviest structures.

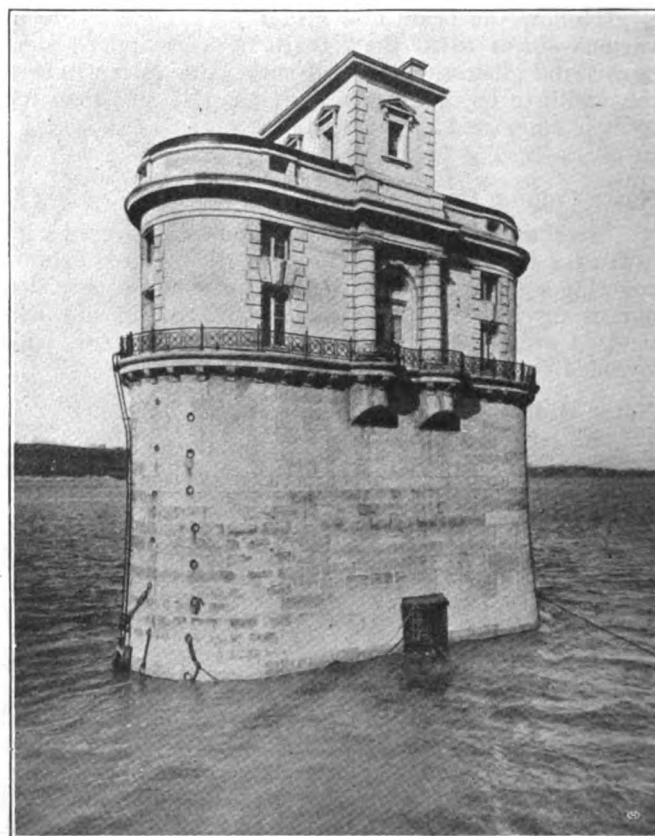
Engineering Uses.

Indiana Oolitic Limestone has many advantages for the construction of piers, abutments, retaining walls and other engineering works. It is especially adapted for use in mill and factory construction, and for sills, lintels and trim in industrial buildings, being strong, inexpensive, easy to get, and economical of labor in handling and setting. No steel reinforcement needed in sills and lintels is a further economy. A limited amount of Indiana Limestone trim will give character to a plain

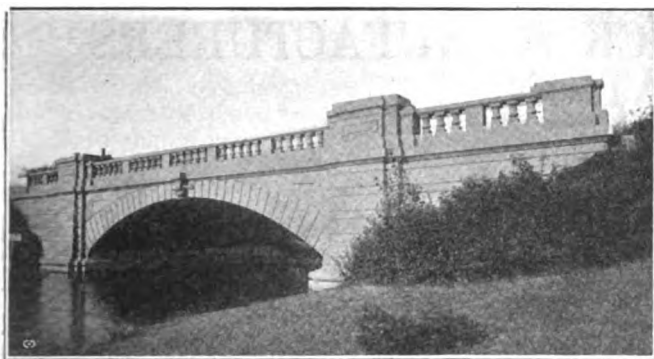
Service Bureau.

Representatives of Associated Service Bureau are prepared to discuss fully with any interested engineer the possibilities of Indiana Oolitic Limestone in any operation.

Impartial and practical advice relating to the uses of Indiana Limestone (including advice as to where it should not be used), samples, photographs and information regarding setting, handling, etc., gladly furnished, gratis, by our Service Bureau.



INTAKE TOWER, MISSISSIPPI RIVER WATER DEPARTMENT, CITY OF ST. LOUIS, MO.
ROTH & STODY, Architects, St. Louis, Mo.
Constructed of Indiana Limestone



LAKE ISLAND BRIDGE NO. 1, MINNEAPOLIS, MINN.
Of Indiana Limestone
C. B. CHAPMAN, Architect, Minneapolis, Minn.



RECREATION PIER, BALTIMORE, MD.
THEODORE WELLS PIETSCH, Architect



HYDRO-ELECTRIC PLANT OF THE IOWA RAILWAY & LIGHT COMPANY, CEDAR RAPIDS, IOWA
Indiana Limestone above base course



NOYES-BUICK BUILDING, BOSTON, MASS.



PUMPING STATION (STAPLES), SOUTH BEND, IND.
FREYMUTH & MAURER, Architects, South Bend, Ind.
BURNS & McDONNELL, Engineers, Kansas City, Mo.
Indiana Limestone trim



PUBLISHING BUILDING OF THE DETROIT NEWS, DETROIT, MICH.
ALBERT KAHN, Architect, Detroit, Mich.
A complete manufacturing plant. Faced entirely with Indiana Limestone



MICHIGAN STREET BRIDGE, SOUTH BEND, IND., BUILT OF REINFORCED CONCRETE FACED WITH INDIANA LIMESTONE
CHARLES W. COLE, Architect and Engineer, South Bend, Ind.

NATIONAL PAVING BRICK MANUFACTURERS ASSOCIATION

812 Engineers Building
CLEVELAND, OHIO

MEMBER ASSOCIATIONS

EASTERN PAVING BRICK MANUFACTURERS ASSOCIATION, Lincoln Building, Philadelphia, Pa.
ILLINOIS PAVING BRICK MANUFACTURERS ASSOCIATION, Chamber of Commerce Building, Chicago, Ill.
SOUTHERN PAVING BRICK MANUFACTURERS ASSOCIATION, Volunteer Building, Chattanooga, Tenn.

INDIANA PAVING BRICK MANUFACTURERS ASSOCIATION, Fidelity Trust Building, Indianapolis, Ind.
OHIO PAVING BRICK MANUFACTURERS ASSOCIATION, Hartman Building, Columbus, Ohio

Products.

VITRIFIED PAVING BRICK and other Vitrified Brick.

Uses.

Vitrified paving brick are used for the surfacing of city streets and country highways, alleys, driveways, walks and sidewalks, railway tracks, railway station platforms, factory floors, areas and drives about manufacturing plants, barn floors, and stock feeding platforms. Adapted for paving anywhere that extreme resistance to wear and tear are essential, or where imperviousness to moisture, acids, etc., is necessary.

They are also frequently used in the construction of sewers and conduits, as well as in buildings such as factories, garages, dwellings and warehouses; also in foundations of all kinds, including engine beds; tanks, silos and similar structures.

Vitrified paving brick may be used for all the purposes enumerated. For uses other than paving, off-grades—those brick that are not entirely suitable for paving by reason of being a little out of shape or perhaps too regular in shape, owing to extremes of the burning process, maximum and minimum, respectively—are specified with entire satisfaction and economy.

Only Number One pavers should be specified for street and highway paving.

Sizes.

The standard size of vitrified paving brick of the NATIONAL PAVING BRICK MANUFACTURERS ASSOCIATION is 3 by 4 by 8½ in. Brick in this size are made chiefly



TRADE-MARK

in the plain wire-cut form. 36 are required for each square yard of paving when the brick are laid flat, 3-in. depth; 48 to the square yard when laid on edge, 4-in. depth. Brick of the standard size weigh approximately 4.1 tons per thousand.

Joints in a plain wire-cut brick wearing surface are usually filled with asphalt filler, according to the prevailing engineering practice.

Other brick are manufactured, with lugs wire-cut, in these sizes: 3½ by 4 by 8½ in., 3½ by 3½ by 8½ in., 3½ by 3 by 8½ in. Brick with lugs are laid with the 3½ by 8½ in. area uppermost. 40 bricks are required to lay a square yard. Brick 3½ by 4 by 8½ in. weigh approximately 5 tons per thousand; other sizes enumerated weigh in proportion to this size.

Joints between brick with lugs are usually filled with cement grout filler although asphalt filler may be used. The selection of filler will depend upon the uses to which the product is being put.



A BRICK PAVED COUNTRY HIGHWAY



THE RENKERT BUILDING, CANTON, OHIO, FACED WITH VITRIFIED PAVING BRICK

Lug-brick may be furnished, on order, in the repressed form.

Practically all other types and sizes of brick than those enumerated above are furnished as specials.

Many manufacturers of vitrified paving brick also make vitrified brick 2½ by 4 by 8½ in. in size for sewer, conduit, building and similar construction, and some produce plain wire-cut paving brick in the size of 3½ by 4 by 8½-in.

Specifications.

The NATIONAL PAVING BRICK MANUFACTURERS ASSOCIATION will furnish, through its Member Associations, paving specifications on request. The following list of specifications are available in a bound volume, or they will be furnished singly if requested, or in collections to form specifications for any type of brick pavement desired.

These specifications may be followed in factory floor, driveway, area and platform paving or under other comparable conditions.

- (1) Subgrade:
 1. Underdrainage
 2. Grading
- (2) Materials:
 1. Concrete Materials and Mixing
- (3) Longitudinal Expansion Cushion:
 1. Premolded Type
 2. Poured Type
- (4) Curbing:
 1. Stone Curb and Header
 2. Concrete Curb and Header
 3. Integral Concrete Curb
- (5) Artificial Base:
 1. Rolled Gravel Base
 2. Rolled Gravel Base and Shoulders (Country Highway)
 3. Rolled Stone Base
 4. Rolled Stone Base and Shoulders (Country Highway)
 5. Rolled Slag Base
 6. Rolled Slag Base and Shoulders (Country Highway)
 7. Rolled Stone or Slag Base, Coal Tar Binder
 8. Rolled Stone or Slag Base and Shoulders, Coal Tar Binder (Country Highway)
 9. Concrete Base
 10. Green Concrete Base (Monolithic Type)
 11. Worn Macadam or Gravel Base
 12. Worn Concrete Pavement Base
- (6) Beddings:
 1. Sand Bedding
 2. Stone Screenings or Granulated Slag Bedding
 3. Cement-Sand Bedding (Semi-Monolithic Type)
- (7) Vitrified Paving Brick:
 1. Standard Size—Plain Wire-cut
 2. Block Size—Plain Wire-cut
 3. Block Size—With Lugs
- (8) Joint Fillers:
 1. Oil Asphalt Filler, Squeegee Method
 2. Cement Grout Filler, Machine Mix
 3. Sand Filler

Merits.

Vitrified brick pavements are known as "Tax-payers' Value" pavements on account of their unexcelled wearing qualities, low repair and maintenance cost, extreme durability under severest use and their long-run economy.

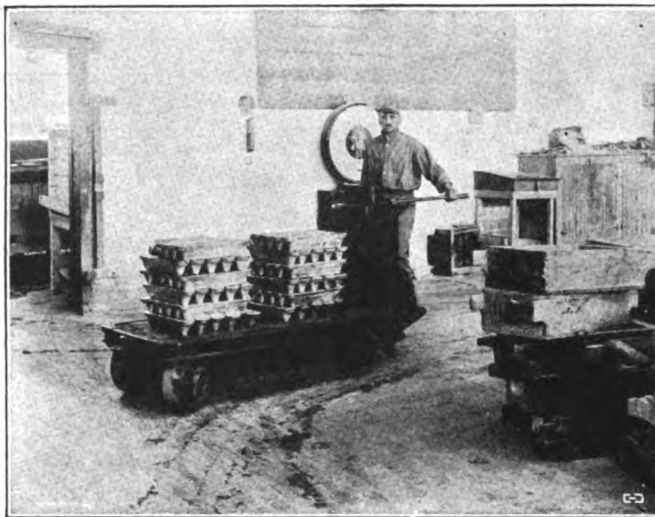
Prices.

Requests for price quotations made to any of the Associations listed above will be referred to individual manufacturers from whom quotations may be obtained.

Co-operative Service.

The offices of the NATIONAL PAVING BRICK MANUFACTURERS ASSOCIATION and its Member Associations are always ready to consult with engineers and architects concerning vitrified paving brick and their uses.

These offices will be glad to furnish all detailed information within their power, and in general to be as helpful as possible in solving any problem.



VITRIFIED PAVING BRICK FLOOR IN WILLARD STORAGE BATTERY COMPANY PLANT
Note weight of pig lead being trucked



ENORMOUS WEIGHT OF PIG LEAD STACKED ON VITRIFIED PAVING BRICK FLOOR IN WILLARD STORAGE BATTERY COMPANY'S PLANT



BRIDGE PAVED WITH VITRIFIED PAVING BRICK

CARTER BLOXONEND FLOORING CO.

SALES OFFICES

KANSAS CITY, MO., 1303 R. A. Long Building

Telephone, Main 1177

CHICAGO, ILL., 332 So. Michigan Avenue

Telephone, Harrison 6491

BOSTON, MASS., 914 Broad Exchange Building—Telephone, Fort Hill 2390

MILL: KENSETT, ARK.

CLEVELAND, OHIO, 406 Electric Building

Telephone, Main 961

NEW YORK, N. Y., 501 Fifth Avenue.

Telephone, Murray Hill 558

Product.

BLOXONEND FLOORING, a Wood Block Flooring.

Uses.

A high grade, heavy service floor for factories; warehouses, shipping rooms, loading platforms, shops, freight houses, baggage, mail and express rooms, railroad stations, baggage, mail and express cars, assembly rooms, industrial schools, elevator and scale platforms, and all surfaces subjected to trucking (hand or power), or concentrated footwear.

Advantages.

Durability. Resilience. Smoothness. Adds to volume and efficiency of production. Absorbs vibration. Insulates. Warm. Quiet. Comfortable. Smooth but not slippery. Firm, safe foothold. A soft bed for tools or materials dropped. Advantages of good block pavement, with greater smoothness and adaptability of best matched flooring to building work, whether steel, concrete or wood structure, new or old.

Construction.

Built up at our plant in flooring sections approximately 8 ft. long (Fig. 1). (Should not be confused with loose paving blocks.) Blocks of selected Southern pine, on end, are dovetailed to horizontal baseboards, presenting end of grain to wear, forming flooring sections which are finished to uniform height and grooved in the sides for heavy splines (slip tongues). Splines are used to break joints, giving support to end joints and keeping flooring sections in alignment.

Size.

After exhaustive experiments and practical use, Bloxonend is made in one standard size, 2-in. blocks on base made from 1 in., making sections finish $2\frac{1}{8}$ in. thick by $3\frac{1}{2}$ -in. face, in lengths up to 8 ft. Not made in specified lengths.

Application.

(1) **Over Concrete, Standard (Fig. 2)**—Laid at right angles on and nailed to beveled sleepers either bedded in slab or laid over slab and filled flush, breaking joints on sleepers as far as possible and shimming with shingles at points where the concrete does not furnish firm level support. 2- by 4-in. sleepers at $15\frac{3}{4}$ -in. centers are standard. Size of sleepers can be increased and centers reduced for extra heavy or exposed service or other special conditions. Advice for such special conditions furnished on receipt of details.

(2) **Over Concrete, Alternate (Fig. 3)**—Over neat concrete slab or old concrete floors grouted smooth, Bloxonend may be laid at right angles on flat strips not bedded. Strips should practically cover slab except for slight air space between. 1- by 6-in. strips (SIS) are standard for this type. Start nails at joint between blocks and base of Bloxonend. Nail through base into every alternate strip at such angle that nail will not pierce the lower face of same, forming whole into compact floating floor or mat. This type is desirable only for strictly dry locations and occupations, and particularly where height or weight of sleepers and fill are objectionable.

(3) **Over Wood Structure**—Over joists or open sleepers Bloxonend should be laid on

substantial subfloor of assured proper thickness to furnish firm level support without deflection according to spans and loads contemplated, allowing for Bloxonend itself tensile strength of a good inch floor. Where structural conditions admit and service requires, sub-floor laid diagonally at not less than 45° to supports (or better 60° or 75°) and Bloxonend at right angles to supports will preserve maximum strength and stiffness of both.

(4) **Nailing**—Bloxonend may be toe-nailed through base before inserting splines, blind nailed in groove or nailed through splines after same are inserted, according to location and use of floor. Nails will vary in gauge and length with location and method of nailing. More detailed instructions for laying specific jobs will be furnished on application.

Treatment.

Bloxonend can be treated before shipment where specified. Treatment is essential for exposed use and desirable in other places where the nature of occupation does not make it objectionable and maximum life is essential.

Information.

List of installations of interest and details desired furnished on request. In writing for prices and other information, advise areas to be covered, use of floors and nature of construction.



FIG. 1. SHORT SECTION OF BLOXONEND

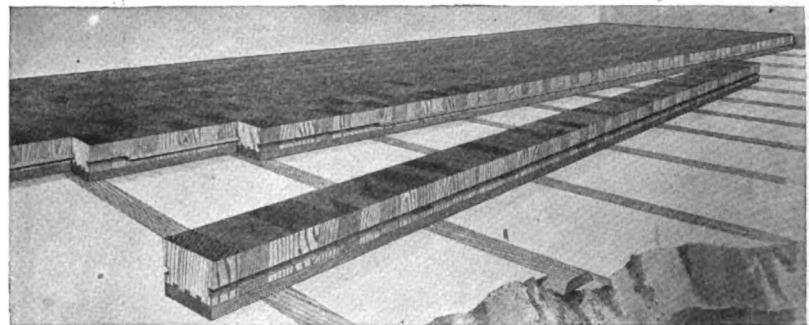


FIG. 2. BLOXONEND ON BEVELED SLEEPERS IN CONCRETE

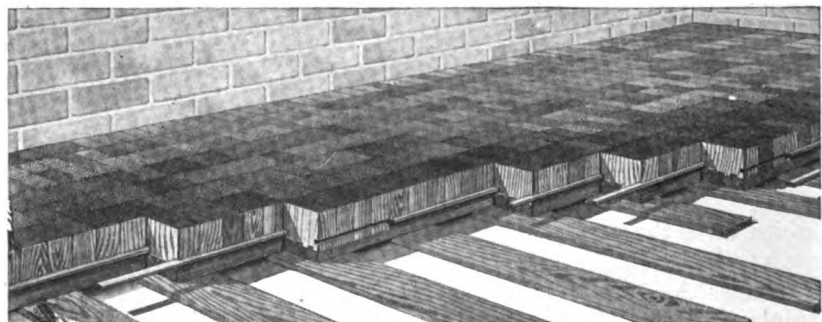


FIG. 3. BLOXONEND ON FLAT STRIPS OVER NEAT CONCRETE

THE JENNISON-WRIGHT COMPANY

Manufacturers of Kreolite Wood Block Floors

2480 Broadway
TOLEDO, OHIO

BRANCH OFFICES

PHILADELPHIA, Crozer Building
ALBANY, 36 State Street
CHICAGO, 138 N. LaSalle Street
BOSTON, 6 Beacon Street
DETROIT, Builders Exchange

CLEVELAND, Builders Exchange
COLUMBUS, 379 Linwood Avenue
SYRACUSE, 215 Union Building
ST. LOUIS, Ry. Exchange Building
PITTSBURGH, Chamber of Commerce Building

MINNEAPOLIS, Plymouth Building
ROCHESTER, Insurance Building
CINCINNATI, 534 Main Street
LOUISVILLE, 659 South 38th Street
TORONTO, Post Office Box 267

Products and Services.

KREOLITE WOOD BLOCK FLOORS and PAVEMENTS.

This company maintains a corps of expert superintendents who are sent out to instruct purchasers how to properly install Kreolite wood block floors, or to supervise the construction; or, if preferred, they can arrange to install the floors.

Use.

Kreolite wood block floors are used in factories, machineshops, warerooms, loading platforms, annealing rooms, foundries, pickling rooms, dye rooms, glass factories, paper mills, rubber tire plants, garages and stables.

General Description of Kreolite Wood Blocks.

Manufactured in various designs to meet special conditions. They are rectangular in shape, surfaced on two sides and one end to a uniform size, 3 to 4 in. in width and from 2 to 4 in. in depth depending on the severity of service. All blocks are furnished of the same width and depth for any one job.

Material—All blocks are manufactured from carefully selected Southern long leaf yellow pine, thoroughly air seasoned and free from bark, loose or rotten knots or other injurious defects.

Treatment—All blocks for interior floors are treated in airtight cylinders by the Kreolite pressure and vacuum process, as much Kreolite creosote oil being forced by hydraulic pressure into the timber as it is possible to inject under safe temperatures and pressures, but in no case leaving less than 6 lbs. of oil per cu. ft. of timber.

Blocks that are to be used for exterior purposes, such as driveway, loading platforms and court pavements, or that are subjected to much moisture, are treated by the Kreolite "two-stage" process which consists of a second application of hot Kreolite oil injected to insure a more thorough waterproofing of the blocks.

A pure grade of Kreolite creosote oil is used.

Conspicuous Features—In the average machineshop or iron working plant where sharp heavy castings are handled or where trucking is done, Kreolite wood blocks will outwear any other type of floor except iron plates. United States Government experts rank wood blocks just slightly below granite blocks in point of durability. The dropping of iron castings or the constant passing of heavy trucks on Kreolite wood blocks has the

Kreolite Wood Block Floors
They outlast the factory

TRADE-MARK

tendency to further compress the fibers, making the blocks tougher and harder.

After a Kreolite wood block floor is once laid there will be no expense for repairs for many years to come. As the blocks are not ground by wear, there is no dust to get into the bearings of valuable machinery. They are non-conductors of heat and very easy on the workmen's feet.

Specifications for Installing Kreolite Block Floors.

The following method of laying Kreolite blocks is recommended for the average floor. Special specifications will be gladly furnished for unusual conditions.

Concrete Foundations—(Concrete foundations are recommended to be used wherever practicable). The minimum thickness of concrete base shall be not less than 4 in. and shall increase in thickness, depending upon load the floor is designed to carry. Under extremely heavy loads and impact where settling of the subgrade is liable to occur, reinforcements shall be placed to distribute the load. The concrete base shall be composed of 1 part portland cement, 3 parts sand and 6 parts stone or gravel, or hard, clean cinders. The top of the concrete foundation shall be brought to a true, smooth and even surface exactly the depth of the block below top of finished floor.

Pitch Cushion—After the concrete has thoroughly dried out, it shall be given a thin and even coating of Kreolite bituminous cement about $\frac{1}{8}$ in. in thickness, which shall be allowed to harden before laying of the blocks.

Alternate Dry Mortar Cement—If the concrete is not finished smooth or level enough to permit the block to be laid directly thereon, it shall be brought to a true and even surface with dry cement mortar, mixed 1 part portland cement and 4 parts sand. This should be mixed dry and well sprinkled with water just before the blocks are laid.

Manner of Laying—The blocks shall then be laid tightly together, with grain vertical directly upon the cushion as prepared, with their length at right angle to line of traffic, care being taken to break joints by at least 2 in. After every 4 rows of blocks shall have been laid in place, the courses shall be lined up and driven together as tightly as possible by means of a 2 by 4 plank laid alongside the outside edge of the blocks. The blocks in each separate row shall also be tightened lengthwise by forcing them together from the end with a lever, pick or other instrument. When the dry mortar cushion has been used the blocks shall be rolled or tamped until they are brought to a smooth surface immediately after laying.

Application of Filler—After the blocks have been laid in place and brought to as true and level a surface as possible, the joints between the blocks shall be filled with Kreolite bituminous filler, applied hot. The filler should be applied by flushing over the surface of the floor, using a rubber-edged squeegee to force it into the joints. Care must be taken to see that the filler penetrates the full depth of the blocks and that the joints are completely filled at the time of application. Dry sand shall then be swept over the floor, completely covering the blocks, same to be left there until the blocks are well set.

Expansion Joints—Against walls on all sides of the floor, as well as around all columns and other obstructions, there shall be laid a bituminous expansion joint 1 in. in width.

Solution of Various Floor Problems.

Hundreds of metal working concerns, textile mills, paper mills and various other plants now have Kreolite wood block floors, which are withstanding service under varying conditions. The fact that 85% of these concerns are sending in repeat orders, is the best evidence that their managers and factory engineers regard Kreolite floors as a good investment.



KREOLITE GROOVED BLOCK
For dry conditions



KREOLITE LUG BLOCK
For wet conditions

THE SOUTHERN WOOD PRESERVING CO.

THE RODD COMPANY

Creosoted Materials

805 Century Building
PITTSBURGH, PA.

Products.

CREOLIGNUM WOOD BLOCK FLOORS.

Also Creosoted Cross Arms, Conduit,
Lumber, etc.

Service.

Engineering service to determine the best treatment and method of installation for Creolignum floors. THE SOUTHERN WOOD PRESERVING CO. has a complete and experienced organization for superintending and installing Creolignum floors.

A Really Good Floor Does Not Mean Low First Cost.

A good floor stands surface wear and tear, reduces expansion and contraction to a negligible minimum, is resilient and comfortable under foot of workmen, is easily cleaned, is non-conducting both of heat and cold, lends itself readily to plumbing, wiring and other floor repair work, is sanitary and will not create dust, minimizes traffic noise, is easy to install, will last indefinitely, and bears the lowest per year cost on its calculated life.

Is It Floor Material or Floor Satisfaction the User Wants?

The floor buyer wants floor satisfaction, rather than materials or specifications by which floors are made, and it is *floor satisfaction* that THE SOUTHERN WOOD PRESERVING CO. *guarantees*.

Technical hodge podge and clever advertising have made it a serious matter to separate the sheep from the goats, therefore many of the largest industrials maintain research departments which investigate and prepare specifications covering materials they purchase. Perhaps the best way out of a bad business; but far from ideal. If anyone should know what materials, qualities and methods make a good wood block floor, it is the man who has spent years in the business of manufacturing and installing them, and has seen hundreds of situations where they have made good or failed.

He is then dishonest if he recommends his material for use where it is unsuited, or fails to stand behind it when it has been used in accordance with his recommendations. It is, after all, the company, more than the material, which determines the worth of a purchase.

Remember, it is absolute *floor satisfaction* that THE SOUTHERN WOOD PRESERVING CO. *offers and guarantees* in Creolignum floors, and the company is at all times ready to go into detailed specifications of treatment and lumber.

Why Creolignum Floors Give Floor Satisfaction.

Creolignum stands for, first, the finest quality of creosoted yellow pine blocks, manufactured to meet the special conditions of each floor; and second, an engineering service, the result of wide and complete experience of different problems of floor construction—above all, for heavy duty and long service. Creolignum floors are unexcelled for comfort, durability and economy for machineshops, warehouses, shipping rooms, roundhouses, freight platforms, etc.; also for dairies, and stables. Where there is more or less trucking, Creolignum floors make the ideal surface. No dust and minimum noise.

Creolignum

TRADE-MARK

Creolignum Floors Embrace the Following Floor Factors.

- (1) Best lumber suitable for the purpose.
- (2) Correct manufacture and correct sizes of blocks for service required.
- (3) The best creosote available and suitable for the purpose.
- (4) Proper treatment to preserve against decay under prevailing conditions.
- (5) Correct installation.

Lumber—Long leaf yellow pine has become established as the most suitable and durable wood for heavy service floors. Its close grained structure and strength joined to the fact that it readily accepts a thorough treatment of creosote makes it an ideal material.

Short leaf yellow pine takes treatment even better than long leaf, but is somewhat lower in strength. Under lighter conditions of service, however, it is equally as satisfactory as long leaf and is somewhat lower in price.

Manufacture and Size—Uniformity being essential, great care is given to selecting the wood and cutting the blocks. Clean cuts with sharp saws are made, and blocks are not permitted to vary more than $\frac{1}{8}$ in. in width or $\frac{1}{8}$ in. in depth, averaging in size (varying according to conditions of service) 8 in. in length, 3 or 4 in. in width, and 3 in. in depth.

Creosote Oil—By the manufacture of coke and gas from coal, coal tar is produced as a by-product, the destructive distillation of which produces creosote oil, properly called tar oil. There are several grades of creosote in use, ranging from the water gas tars to the pure distillate oils, and much controversy as to the proper oil to use has arisen. Choice is made of the most economical or available creosote which can be guaranteed to do the work required with the treatment suitable to the purposes.

It would be obviously unsound to preserve a timber against decay for 30 years when its mechanical life might be only 15, and equally so to preserve wood for use under fairly dry and uniform conditions in the same manner as that which would be subjected to very stringent conditions. The best results have been secured with creosote oil as follows: Completely liquid at 38° C. and not more than 3% of water-free oil. Insoluble in chloroform or hot benzol. Specific gravity at 38° C. not less than 1.05 nor more than 1.14. When distilled as described in Bulletin No. 96 of the A. R. E. & M. W. Assn., distillate not to exceed the following:

To 200° C.....	no distillate
To 210° C.....	less than 5%
To 235° C.....	not more than 25%
To 315° C.....	not more than 50%
Oil not to contain more than 2% of water	

Treatment—The recognized method of treatment of wood block floors is by the "Rueping Process" which thoroughly impregnates the blocks with creosote, insuring complete preservation and at the same time leaving

the wood free from excess oil, which might bleed and render the floor unusable.

By this process the blocks are placed in an airtight treating cylinder and subjected to air pressure of from 40 to 80 lbs. per sq. in. depending on the condition of the wood. Preservative at a temperature of 160° Fahr. is then introduced into the cylinder, and additional oil pumped in until the cylinder is completely filled with the preservative and from 100 to 180 lbs. to the sq. in. is recorded in the gages. This pressure is maintained until the blocks are thoroughly impregnated, which as tests have shown, requires from 12 to 16 lbs. of creosote oil per cu. ft. of wood after which the pressure is released, the cylinder drained and the excess oil removed from the blocks. They are then Creolignum blocks and are ready for use.

Installation—Much depends on the installation. Floor satisfaction depends on conscientious and painstaking care through the numerous steps of installation and inspection. The following specifications indicate why Creolignum blocks and this company's engineering service and installation are responsible for floor satisfaction.

Specifications.

(1) **Material**—Blocks shall be Creolignum, manufactured in accordance with the specific recommendations of THE SOUTHERN WOOD PRESERVING CO. for particular service required.

(2) **Foundation**—(Installed by owner). A concrete base 4 to 6 in. thick, depending upon loads to which floors will be subjected, shall be prepared consisting of 1 part cement, 3 parts sand and 6 parts crushed stone or gravel, poured wet and floated to a true and uniform surface with a wooden float.

(3) **Laying the Cushion**—Upon finished concrete spread a heavy brushed or squeegeed coat of Creolignum Sealcoat, A, covering carefully the entire surface upon which Creolignum Blocks are to be laid.

(4) **Laying the Blocks**—The Creolignum Blocks shall be paved on the cushion with tight joints, in straight, parallel lines, breaking joints not less than 2 in., and using only whole blocks except to start and finish courses. After each 8 courses blocks shall be tightened by driving up.

(5) **Sand Filler**—After completion of the foregoing provisions the floor shall be covered with fine sharp sand, thoroughly dry, which shall then be brushed carefully into any small openings between the blocks and around walls and piers. The excess sand shall then be removed from the surface.

(6) **Filling Joints and Top Dressing**—Upon the surface of the blocks spread 1 heavy coat of Creolignum Top Coat, B, brushed, or preferably squeegeed carefully, covering the entire floor and squeegeeing all excess material into the joints.

(7) **Sand Covering**—The entire floor shall then be covered with dry sharp sand, which shall be allowed to remain 2 weeks if possible.

(8) **Inspection**—It shall be the contractor's duty to thoroughly inspect the completed floor in 3 months, and where there is any looseness of the blocks detrimental to the floor, he shall redress such portions requiring it in accordance with the provisions of sections 5, 6, and 7 of these specifications.

Specifications for Unusual Conditions.

The above specifications cover usual factory floor conditions. Unusual conditions call for minor changes.

Creolignum Sealcoat.

Through experiments extending over a long period, The Rodd Company has perfected a greatly improved asphaltic cushion for wood block floors. It is called the Creolignum Sealcoat cushion. It can be distributed evenly upon the concrete base without heating and hardens sufficiently to work upon in a short time.

Creolignum Sealcoat cushion is made in 2 grades: A, for cushioning and waterproofing the concrete base; B, for top coating and waterproofing the blocks after installation. The top coating of the finished floor is of vital importance. It prevents, first, the possibility of undue absorption of moisture, should the floor be suddenly flooded; second, it maintains the normal moisture content of the blocks, thereby preventing shrinkage and contraction of the blocks.

Eliminating Expansion and Contraction—Failures of floors, though rare, can be traced always to expansion or contraction, which comes from variation in the normal moisture content of blocks. Absorption of moisture takes place on surface of blocks. Sealcoat cushion and Sealcoat top dressing minimize the possibility of absorption.

Sealcoat cushion seals and waterproofs the concrete, fills and takes up irregularities of the surface, affords a firm, elastic cushion on which to install the blocks, and prevents the movement of the blocks on the base, holding them firmly in place. It forms a permanent bond between the blocks and the base.

Sealcoat top dressing permanently seals the pores of the wood. It prevents absorption of moisture by the blocks, eliminates expansion and swelling, controls undue evaporation of the normal moisture content of the block, and prevents shrinkage.

Old Wood Block Floors Renewed.

Floors of wood block laid before the present highly developed and scientific methods were brought into practical use, and now impaired, may be decidedly improved by the application of this company's special treatment for old floors.

Literature.

Send for a copy of "The Preservation of Wood." It thoroughly, yet briefly covers the subject of wood preservation from the angle of the information seeker, not that of the seller of preserved wood products.



CLOSE-UP VIEW OF CREOLIGNUM FLOOR BEFORE TOP-DRESSING WITH CREOLIGNUM SEALCOAT FILLER



CLOSE-UP VIEW OF CREOLIGNUM FLOOR AFTER APPLICATION OF CREOLIGNUM MOISTPROOF, ACIDPROOF SEAL-COAT FILLER

REPUBLIC CREOSOTING COMPANY

Manufacturers of Creosoted Wood Blocks and Pure Creosote Oils

1614 Merchants Bank Building
INDIANAPOLIS, IND.

BRANCH OFFICES

CHICAGO, ILL., 1015 Chamber of Commerce Building
PHILADELPHIA, PA., 834 Real Estate Trust Building
CLEVELAND, OHIO, 222 Society for Savings Building

DETROIT, MICH., 211 Hammond Building
BUFFALO, N. Y., 204 Erie County Bank Building
BOSTON, MASS., 14 Federal Street

TORONTO, CANADA, 152 Bay Street

PLANTS: INDIANAPOLIS, MINNEAPOLIS, MOBILE, SEATTLE, NORFOLK

Products.

KREODONE INTERIOR WOOD BLOCK FLOORS.

Also manufacturers of Creosoted Ties, Poles, Posts, Piling, and Lumber of all kinds.

Reilly's Improved Creosote Oil; Reilly's Wood Preservative Oil (R. W. P. O.)

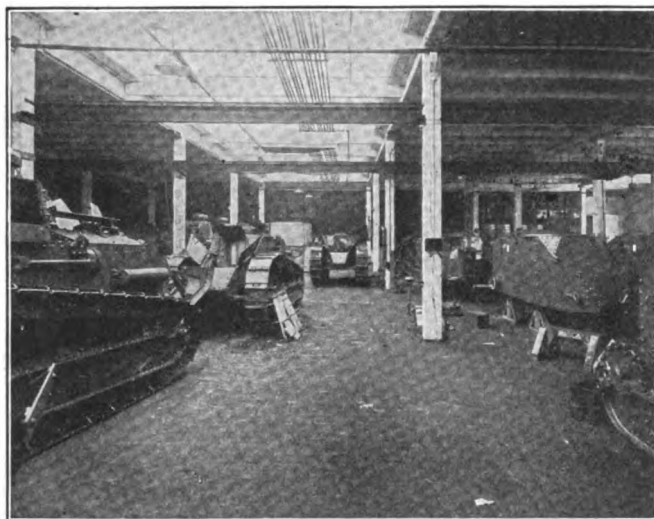
Wood Block Floors.

Kreodone interior wood block floors are superior to all other types where durability and economical upkeep are the prime requirements. They are unequalled for machineshops, foundries, metal and woodworking plants, bakeries, paper and textile mills, automobile plants, rolling mills, barns, loading platforms, freight depots, warehouses, railroad shops of all kinds, platforms, inside driveways, etc.

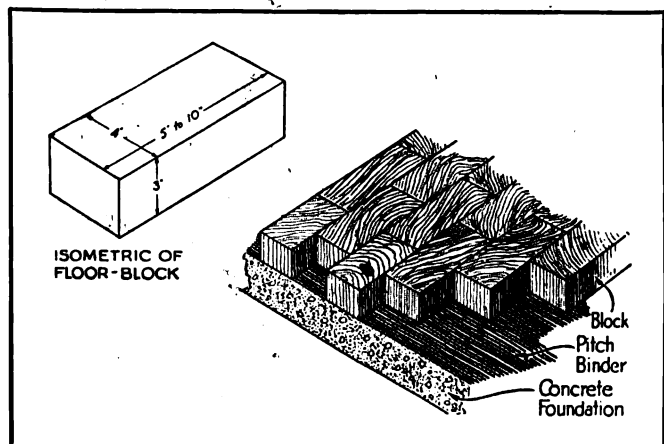
No other floor will withstand such heavy service or last so long without repairs. And no other floor can be so quickly taken up and relaid.

Construction—Kreodone interior wood block floors are made from long leaf yellow pine and then impregnated with Kreodone (pure, unadulterated creosote) oil.

These rectangular blocks are laid on a smooth concrete foundation over a binding cushion of pitch.



KREODONE WOOD BLOCK FLOOR LAID IN PLANT OF VANDORN IRON WORKS, CLEVELAND, OHIO



METHOD OF INSTALLING KREODONE WOOD BLOCK FLOORS

SWEET'S CATALOGUE

The grain of the wood is vertical and the blocks are rammed close together.

Advantages—The heaviest traffic has never worn out or produced ruts in a Kreodone floor. Hard service merely makes the floor smoother and more compact.

It affords a perfect trucking surface, as it is free from all "give" or traction wave, such as plank floors produce; the floor can not dust or crumble like concrete; it can not disintegrate under the action of water, steam, acids, and oils, like composition floors; and it can not form ruts or humps like asphalt.

It is warm, non-slippery, easy under foot, resilient, and free from vibration. The remarkable resiliency of this floor reduces the damage to falling objects.

The Kreodone oil with which the wood is preserved is a pure creosote oil, wholly free from coal tar or other adulterants. It gives the wood permanent, instead of temporary, preservation.

Cost—Prices furnished on application to any of the above sales offices. Figured in years of service and cost of upkeep, Kreodone interior wood block floors are far more economical than any other type of floor yet discovered.

Specifications—Complete printed specifications mailed on request. Our engineering department will gladly prepare specifications to meet unusual requirements.

Oil Specifications—(Condensed)—No wood block floor will give proper service unless treated with a pure heavy creosote oil, entirely free from coal tar and other adulterations. Following are very condensed specifications of Kreodone oil:

Oil shall be wholly an unadulterated distillate of coal tar.

Specific gravity at 38° C. not less than 1.09—not more than 1.12.

Must conform to following distillation test:

Not more than 2% shall distill at 200° C. Not less than 3% and not more than 5% at 210° C. Not less than 10% and not more than 20% at 235° C. Not less than 30% and not more than 40% at 315° C.

THE HASTINGS PAVEMENT COMPANY

TELEPHONE:
BROAD 1496

25 Broad Street
NEW YORK, N. Y.

WORKS
HASTINGS-ON-HUDSON, N. Y.

Products.

COMPRESSED ASPHALT FLOORING and PAVING BLOCKS.

Asphalt Blocks.

A scientifically manufactured material for the wearing surface of streets and roads, and of piers, warehouses, loading platforms, factory floors, bridges, driveways, courtyards, etc.

Manufactured at a large permanent plant; shipped in block form ready to lay; and always obtainable in any quantity for extension and repairs.

Composition—A properly proportioned mixture of natural asphalt, crushed rock and limestone dust is heated to 300° Fahr., and shaped into uniform blocks under a pressure of 6000 lbs. per sq. in.

SIZES AND WEIGHTS

Width, in.	Length, in.	Depth, in.	Weight, lbs.
5	12	2	11
5	12	2½	13½
4	8	1¼	3½ ("Eightfours")

A square foot of 2-in. block weighs 26 lbs.
A square foot of 1¼-in. "Eightfour" weighs 15½ lbs.
The specific gravity of asphalt block is 2.40.

"Eightfour" Blocks.

The "Eightfour" asphalt flooring block is designed especially to meet those conditions in which weight and thickness of flooring must be at a minimum consistent with durability under heavy traffic. The "Eightfour" is also suitable for roofs subject to traffic.

Advantages—Asphalt blocks are pleasing in appearance; smooth, noiseless, dustless, warm and easy under foot; sanitary, because non-absorbent; and next to granite, the most durable. They present a gritty, non-slippery, non-skiddable surface, and are easily taken up and relaid. They are non-expansive, odorless and free from exudations; and are not affected by standing loads, extremes of temperature, or by automobile oils. They are reasonable in cost, and are made to suit any climate and traffic conditions.

Method of Laying—Upon the surface of the concrete foundation there is spread a bed of portland cement mortar ½ in. thick, which is struck to a true and even surface. Upon this bed the blocks are immediately laid, with close joints and uniform top surface, the joints being broken 4 in. After being laid, the blocks are given a light coat of sharp, fine sand, well broomed into the joints. The joints of the "Eightfours" are grouted. Traffic is permitted in 4 or 5 days.



References.

MANUFACTURING PLANTS, ETC.

Quintard Iron Works, New York, N. Y.
Remington Arms Co., Bridgeport, Conn.
Otis Elevator Co., Harrison, N. J.
Westinghouse Electric & Manufacturing Co., Essington, Pa.
United States Navy Yards; Brooklyn, N. Y.; Boston, Mass.; Washington, D. C.
United States Naval Supply Base, Brooklyn, N. Y.
United States Naval Operating Base, Hampton Roads, Va.
Scovill Manufacturing Co., Waterbury, Conn.
Waclark Wire Co., Bayway, N. J.
Studebaker Corporation, South Bend, Ind.
Morgan Engineering Co., Alliance, Ohio
Standard Steel Works, Burnham, Pa.

PIERS

Bush Terminal Pier No. 6, Brooklyn, N. Y.
New York Dock Co. Piers Nos. 16, 18, 26 and 36, Brooklyn, N. Y.
Ocean Steamship Co. Piers, Savannah, Ga.
Pennsylvania Railroad Pier, Greenville, N. J.
Lampert & Holt Line Piers, Hoboken, N. J.
United States Army Supply Base Piers, Brooklyn, N. Y.

LOADING PLATFORMS

Arbuckle Building, Brooklyn, N. Y.
B. R. & P. Warehouse, Rochester, N. Y.
United States Army Supply Base, Brooklyn, N. Y.

BRIDGES

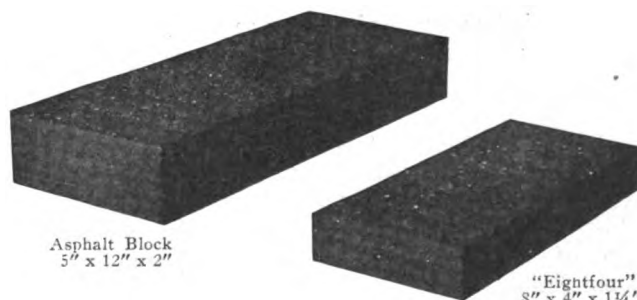
New York Central Railroad, New York & Westchester Co., N. Y.
Pennsylvania Railroad, Sunnyside Yards, New York, N. Y.
Long Island Railroad, Bay Ridge, Brooklyn, N. Y.

DRIVEWAYS AND COURTYARDS

Whitelaw Reid Residence, New York, N. Y.
Aphorp Apartments, New York, N. Y.
Greenwood Cemetery, Brooklyn, N. Y.
United Hospital, Port Chester, N. Y.
Biltmore Country Club, Rye, N. Y.
Cab Stand, Grand Central Station, New York, N. Y.

STREETS AND ROADS

Bronx and Pelham Parkway, New York, N. Y.
Albany Post Road, North Tarrytown, N. Y.
Boston Post Road, Rye, N. Y.
Bronx River Parkway Drive, Westchester Co., N. Y.
Nassau Street, Princeton, N. J.
Wyoming Avenue, Wyoming, Pa.
Broad Street, Richmond, Va.
Memorial Boulevard, Hillsborough Co., Fla.



COMPRESSED ASPHALT FLOORING AND PAVING BLOCKS

STANDARD OIL COMPANY

(INDIANA)

Manufacturers of Paving Asphalt, Asphaltic Road Oils and Binders

910 South Michigan Avenue
CHICAGO, ILL.

OFFICES FOR QUOTATIONS, ORDERS AND GENERAL INFORMATION

CHICAGO, ILL.	DAVENPORT, IOWA	EVANSVILLE, IND.	DULUTH, MINN.	SAGINAW, MICH.
DECATUR, ILL.	DES MOINES, IOWA	INDIANAPOLIS, IND.	MANKATO, MINN.	DETROIT, MICH.
JOLIET, ILL.	DUBUQUE, IOWA	SOUTH BEND, IND.	KANSAS CITY, MO.	GRAND RAPIDS, MICH.
PEORIA, ILL.	KEOKUK, IOWA	WICHITA, KANS.	ST. LOUIS, MO.	LA CROSSE, WIS.
QUINCY, ILL.	SIOUX CITY, IOWA	MINNEAPOLIS, MINN.	ST. JOSEPH, MO.	MILWAUKEE, WIS.
	HURON, S. D.		FARGO, N. D.	

Products.

STANOLIND PAVING ASPHALT.
STANOLIND PAVING FILLER.
ROOFING ASPHALTS.
SATURATING ASPHALTS.
BRIQUETTING ASPHALTS.
FLUXING ASPHALTUMS.
ASPHALTIC ROAD OILS.
NON-ASPHALTIC ROAD OILS.

Stanolind Paving Asphalts.

Grades—Made in four grades, differing in consistency only, not in quality.

GRADE "A"—For heavy traffic sheet asphalt pavements.

GRADE "B"—For sheet asphalt and asphaltic concrete pavements.

GRADE "C"—For asphalt macadam pavements (penetration method).

GRADE "D"—For surface treatment of roads and pavements.

Description—All asphalts (also called bitumen cements) come out of the ground. Some through crevices, cracks, or other natural openings in the earth's surface, some through pipes driven into the earth.

As secured from the earth, asphalts differ in degrees of consistency and in degrees of purity, and must be refined before they are adaptable to commercial use.

The value of asphalt is determined by its consistency, by its purity, by its bitumen content, and by its cementing power, ductility, stability, and low volatility.

It will therefore be readily seen how important it is that it should be refined properly in order that it may be brought to the right consistency, as free from impurities, and as nearly pure bitumen as it is possible to make it.

Stanolind paving asphalts are refined from asphaltic petroleum, through distillation and steam agitation, by an improved method in one of the largest refineries in the world.

Stanolind paving asphalts have all of the necessary qualities required of bitumen cement. In fact, they have a greater cementing strength than most of the asphalts on the market. They give perfect results in the wide range of climatic changes met with throughout the United States.

Stanolind Paving Filler.

Stanolind paving filler is manufactured for filling joints in brick and block pavements.

Briquetting Asphalts.

Stanolind briquetting asphalt is used in the manufacture of coal briquettes. It is a perfect cement and odorless when burning.

Roofing Asphalts.

The following grades and consistencies have ample range to fill all requirements of ready made roofing and asphalt shingle manufacturers:

Parolite—soft, medium and hard.
Stanolite—semihard, soft and hard.
Stanolind Saturating Asphalt.
Petroleum Tailings.
Fluxing Asphaltums.

Fluxing Asphaltum.

Grade 6 S is recommended for use in tempering both paving and roofing asphalt.

Asphaltic Road Oils.

Furnished in grades Nos. 3, 4, 5 and 6. No. 3 is the lightest, containing not less than 30% asphalt. No. 6 is the heaviest, containing not less than 60% asphalt at 100 penetration. No. 3 is recommended for laying dust and as a dust preventive. No. 4 and No. 5 are recommended as dust preventives and for waterproofing earth roads, macadam roads, and gravel roads. No. 6 is recommended for second or third treatment of roads.

Forty-eight page illustrated book on road oil and its uses sent free on request.

Non-asphaltic Road Oils.

For dust laying purposes on brick roads, bridle paths, park walks, tennis courts, etc.

Use of Asphalt.

We suggest to engineers and architects that when planning for the use of asphalt cement they use the following specifications:

Specifications for Asphalt for Asphaltic Cement to be Used in Sheet Asphalt and Asphaltic Concrete.

By the careful distillation of petroleum with steam agitation at a temperature not exceeding 700° Fahr. until the resulting residue has a consistency not harder than 30 penetration, the specific gravity of which shall at 77° Fahr. be not less than 1.0.

(a) The solid residue so obtained shall be soluble in carbon tetrachloride to the extent of 98½%.

(b) If the solubility in carbon tetrachloride of the solid residue is less than 99%, the bitumen shall yield upon ignition not more than 15% of fixed carbon; if the solubility is 99% or more, the bitumen shall yield upon ignition not more than 18% of fixed carbon.

(c) When 50 grams of the material are heated for 5 hours at a temperature of 325° Fahr. in a tin box 2½ in. in diameter by 1¾ in. deep, after the manner officially prescribed, it shall lose not over 5% by weight, nor shall the penetration after such heating be less than one-half the original penetration.

(d) When the refined asphalt is brought to a penetration of 50 by the use of the flux with which it is to be combined in making the asphaltic cement, or by heating at a temperature below 500° Fahr., it shall have a ductility of not less than 100 centimeters, test to be made at the rate of 60 centimeters per minute.

(e) The asphaltic cement shall show a cementing value of .25 of a kilogrammeter at 5° C. when tested at a penetration ranging from 50 to 70; test to be made as described on page 796, Vol. 6, Journal of Industrial and Engineering Chemistry.

(f) Asphaltic cement shall have a ductility of not less than 5 centimeters when tested at 5° C., test to be made at the rate of ¼ centimeter per minute.

The penetration of the asphalt used shall range between 40 and 65 and shall be within 5 points of such penetration as is deemed best for the particular work for which the specifications are drawn.

Our recommendations for repair work are from 35 to 45 penetration; for sheet asphalt on medium traffic streets, from 50 to 60 penetration, and for asphaltic concrete on medium traffic streets, from 55 to 65 penetration, when Stanolind paving asphalt is used.

Specifications for Asphaltic Cement to be Used in Asphalt Macadam Pavements (Penetration Method).

(a) The asphaltic cement shall have a specific gravity at 77° Fahr. of not less than 1.0.

(b) The bitumen of the asphaltic cement shall be soluble in carbon tetrachloride to the extent of at least 98½%.

(c) The fixed carbon of the asphaltic cement shall be not less than 8% nor more than 16%.

(d) The melting or softening point of the asphaltic cement shall be not less than 100° Fahr. nor more than 135° Fahr.

(e) The asphaltic cement shall have a penetration of from 80 to 150, which shall be varied within these limits to adapt it to the particular asphalt used, and to conditions of the streets.

(f) When 50 grams of the asphaltic cement of the consistency used in the paving mixture are heated for 5 hours at a temperature of 325° Fahr. in a tin box 2½ in. in diameter by 1¾ in. deep, there must not be volatilized more than 3% of the bitumen, nor shall the penetration after such heating be less than one-half the original penetration.

(g) A briquette of the asphaltic cement of a consistency equivalent to 80 penetration shall have a ductility of at least 100 centimeters, tests made at the rate of 60 centimeters per minute.

(h) The asphaltic cement shall show a cementing value of 0.15 kilogrammeters at 5° C. according to method of test described in Journal of Industrial and Engineering Chemistry, page 796, Vol. 6. Test for cementing value to be made at a penetration ranging from 90 to 110.

(i) Asphaltic cement shall have a ductility of not less than 5 centimeters when tested at 5° C., test to be made at the rate of ¼ centimeter per minute.

We recommend the penetration for Stanolind paving asphalt to be used on medium traffic (penetration work) at from 100 to 120.

Specifications for Asphaltic Cement for Surface Treatments on Brick, Concrete, Water Bonded Macadam or Gravel Roads, or Cinder Drives.

Specific Gravity—The specific gravity of the asphaltic cement at 77° Fahr. shall not be less than unity.

Loss by Volatilization—When 50 grams of the asphaltic cement are heated in a cylindrical vessel (tin box) 2½ in. in diameter by 1¾ in. deep at a temperature of 325° Fahr. for 5 hours, the loss in weight shall not be greater than 5%, nor shall the penetration at 77° Fahr. after heating be less than one-half the original penetration.

Penetration—The asphaltic cement shall have a penetration of from 175 to 225 when tested for 5 seconds at 77° Fahr. with a No. 2 needle weighted with 100 grams. Its penetration at 32° Fahr., when tested for one minute with a No. 2 needle under a weight of 200 grams, shall not be less than 20.

Fixed Carbon—The asphaltic cement shall not yield more than 16% of fixed carbon when a 1-gram sample in a platinum crucible 35 millimeters by 35 millimeters is heated for 7 minutes in the full flame of a No. 4 Meker burner, according to the method recommended by the American Society for Testing Materials for the determination of fixed carbon in coal.

Flash Point—It shall have a flash point of not less than 350° Fahr.

Paraffin Scale—It shall not contain more than 15% of paraffin scale by the Holde method.

Ductility—It shall have a ductility at 77° Fahr. of not less than 100 centimeters when a Dow mould is pulled at the rate of 60 centimeters per minute.

Soluble in Carbon Bisulphide—The asphaltic cement shall be soluble in chemically pure carbon tetrachloride to the extent of at least 98½%.

Soluble in Carbon Bisulphide—The asphaltic cement shall be soluble in chemically pure carbon bisulphide to the extent of at least 90%.

Viscosity—It shall have a viscosity at 32° Fahr. of not less than 0.55 gram; the viscosity of the asphaltic cement, by the terms of this specification, shall mean the number of grams of asphaltic cement that will in 4 hours be forced through a circular orifice 1 centimeter in diameter by a pressure equal to that exerted by a column of mercury 150 centimeters high. The asphaltic cement during this test shall be contained in an iron cylinder 42 millimeters in diameter, and 100 millimeters high, and the thickness of the plate through which the orifice is made shall not be more than 2 millimeters.

Residue—When 20 cubic centimeters of naphtha solution, obtained by treating 1 gram of the asphaltic cement with 100 cubic centimeters of cold naphtha, and filtering, is evaporated, the residue shall be adhesive, not merely oily.

The penetration we recommend for this class of work in most cases is from 190 to 210.

Booklet on "Specifications."

Furnished free on request.

In connection with the use of asphaltic cement in different kinds of pavements, we have published a Stanolind Paving Asphaltic Booklet that gives complete specifications for the different types of pavement in which asphalts are used and also for the different surface treatments. The specifications cover a wide range, including treatments for pavements of all the different kinds. It also includes recommendations on paving fillers, on expansion joints, etc. Useful tables and general information in regard to asphalt and in regard to paving construction in general are also included.

Shipments of Asphalt.

The asphalt products are shipped in iron drums, and also in bulk in tank cars. The drums for softer asphalts are especially heavy, double headed and tightly sealed.

Co-operative Service.

Special and prompt attention is given to all requests and inquiries for information regarding the various uses of our asphaltic products.

THE ASSOCIATED TILE MANUFACTURERS

Wall and Floor Tiles, Ceramic Mosaic, Faience

BEAVER FALLS, PA.

MEMBER FACTORIES

ALHAMBRA TILE CO.

Newport, Ky.

AMERICAN ENCAUSTIC TILING CO., LTD.

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BEAVER FALLS ART TILE CO.

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GRUEBY FAIENCE & TILE CO.

Perth Amboy, N. J.

MATAWAN TILE CO.

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NATIONAL TILE CO.

Anderson, Ind.

WHEELING TILE CO. Wheeling, W. Va.

OLD BRIDGE ENAMELED BRICK & TILE CO.

Old Bridge, N. J.

PERTH AMBOY TILE WORKS

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U. S. ENCAUSTIC TILE WORKS

Indianapolis, Ind.

Products.

VITREOUS, SEMIVITREOUS, CERAMIC MOSAIC, GLAZED, ENAMELED, FAIENCE and TRIM TILE of every kind and for every purpose; UNGLAZED or BRIGHT, SEMIMATT and DULL GLAZED in all colors; PLAIN or DECORATIVE.

Advantages.

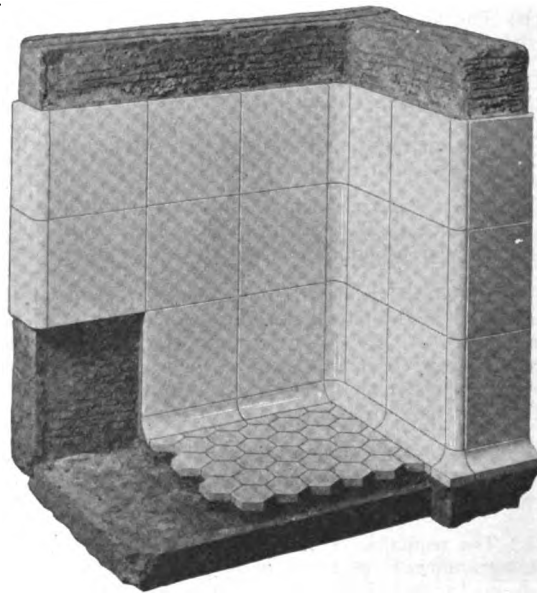
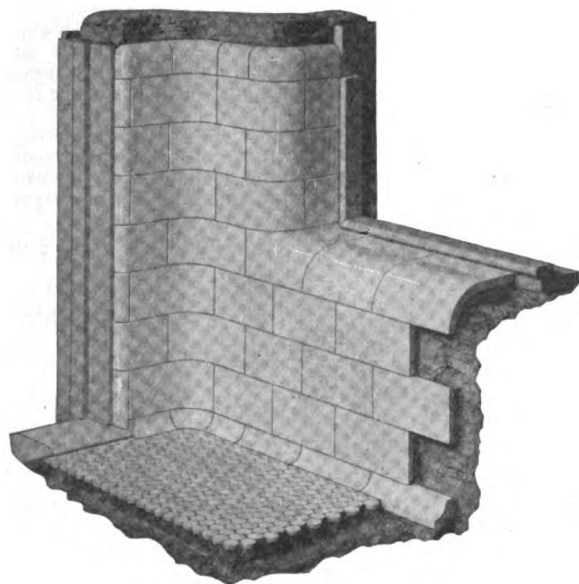
Non-porous; non-absorbent; proof against acid and alkaline reaction; serviceable for low or high temperature conditions; oilproof; easily cleansed; sanitary; attractive; permanent; light-reflecting glazes and colors.

Uses.

Suitable for the lining of chemical hoods, mixing and acid tanks, vats, agitators, reservoirs and similar containers requiring a non-porous, impermeable and easily cleaned lining material. Recommended for floors, walls, wainscots, ceilings, columns; in laboratories; workrooms; engine rooms; stairways; ramps; first-aid stations; sick wards; toilets; wash-up rooms; showers; swimming pools; cafeterias; dining rooms, etc.

Co-operative Service.

On request, our Service Department will make a special study of requirements and conditions where



FLOOR AND WALL SECTIONS SHOWING DIFFERENT STYLES OF WHITE TILING AND SANITARY FEATURES

An almost endless variety of styles can be produced

By the use of the proper tiles in workrooms of factories the efficacy of lighting can be increased considerably and maintained at a minimum cost for cleaning. Neither the color nor the brightness of the glazes deteriorates with age, or is affected by fumes or atmospheric corrosives.

Our tiles are extensively and successfully used for floors, walls and ceilings in dairies, creameries, food factories, laundries, bottling and refrigerating plants, packing houses and factory buildings of almost every kind where cleanliness, permanence and economy in maintenance are wanted.

necessary to submit proper recommendations, co-operate in selecting and specifying tiles best suited for any given purpose, and suggest special setting methods and means for special work. Information on the best practice and assistance in the solution of any problem involving tile work can always be obtained through this department.

Information on acid resisting cements used in connection with our tiles furnished on application. Samples of tiles for tests cheerfully sent on request. Please state intended use and conditions so that correct tiles can be sent at once. Correspondence invited.

E. N. BIEGLER MFG. CO.

SUCCESSORS TO MAS-OLEUM FLOOR MFG. CO.

Manufacturers of Mas-Oleum Mastic and Almada Cork Composition Floors

TELEPHONE:
HUMBOLDT 135

2734 North Rockwell Street
CHICAGO, ILL.

Products and Services.

MAS-OLEUM (Mastic Linoleum) SANITARY FLOORING and COVE BASE: Fiber Mastic Floor Covering, Composition Flooring, Rubber Flooring and Asphalt Mastic Flooring.

ALMADA CORK COMPOSITION FLOORING.

Also manufacturers of Waterproofed Linoleum Cement.

Contracts for Installation executed anywhere in the United States.

For Roofing, Waterproofing and Paint, see page 326.

Mas-Oleum Flooring.

Description—Mas-Oleum (mastic linoleum) is an asphalt mastic linoleum, a combination of hydrocarbons with mineral caoutchouc and asbestos fiber, to which has been added color pigments, and then sufficiently fluxed with mineral oil, permitting its use on weak and unsupported floors, where a heavy material would be prohibited.

Mas-Oleum can be nailed, sawed or drilled like wood. It contains no sand, slag cement or sawdust and is fireproof, waterproof and dustless.

Advantages—Mas-Oleum mastic is easily applied by trowel over a smooth surface and furnishes a sanitary, resilient, dust resisting and waterproof topping.

It is non-slippery and not affected by ordinary acids.

It bonds readily to the subfloor and becomes a permanent part of the building, thus differing from unsanitary and more expensive floor coverings.

It is laid without seams and joints, and a cove base can be extended up on the wall to any height desired, forming a hermetically sealed and perfectly sanitary floor.

Mas-Oleum mastic floors can be easily cleaned, being absolutely waterproof.

Application—Mas-Oleum is laid directly on any floor surface—wood, concrete, steel, tile, brick, asphalt or fabric surfaces.

It is laid in 5 or more thin coats trowelled or rolled and the 5 coats when completed should be $\frac{1}{8}$ in. in thickness. The first or primer coat is followed by 3 or more filler or body coats, with a finishing coat trowelled hard, which may be waxed, if desired.

Any ordinary workman, by following printed instructions furnished, can lay Mas-Oleum.

Scope of Use—For hospitals, churches, theaters, schools, warehouses, factories, dairies, hotels, comfort stations, jails, club houses, sanitariums, railroad stations, silos, bridges, tunnels, subways, track elevations, etc., on either floors, walls or ceilings, interior or exterior.

Also corridors and hallways, stair treads, landings, manual training rooms, gymnasiums, playrooms, toilets, locker rooms, damp basement floors, laundries, sidewalks, porches, etc.

Economy—Mas-Oleum is the cheapest permanent floor covering offered today; costs less than battleship linoleum, composition, and, in many cases, less than wood flooring.

Guarantee—This company guarantees every Mas-

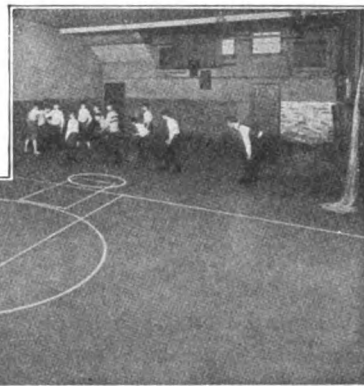
Oleum floor laid by them for a period of 2 years and will repair, without charge, any and all defects due to defective material or imperfect workmanship. Surety bond furnished when desired.

Specifications—OVER CEMENT OR METAL SURFACES—A cement subfloor or metal surface shall be provided by others. The cement surface shall be equal in construction to what is generally termed a sidewalk finish laid perfectly true and level. Either shall be recessed $\frac{1}{8}$ in. from finished floor level and be thoroughly dry before the mastic material is applied.

OVER WOOD SURFACES—Mas-Oleum Composition Scratch Coat should be used.

First apply metal lath or wire mesh securely over the wood boards, then install Mas-Oleum Composition Scratch Coat at least $\frac{3}{8}$ in. in thickness and allow this to set hard. Mas-Oleum mastic should then be applied. The total thickness of Mas-Oleum mastic floors with composition foundation over wood shall be $\frac{1}{2}$ in.

OVER STAIR TREADS—A smooth surface shall be provided by others, recessed $\frac{1}{8}$ in. from finished floor line. Suitable nosing shall also be furnished by others, same to extend $\frac{1}{8}$ in. above floor level.



MAS-OLEUM FLOOR, Y. M. C. A. NORTH SIDE BOYS' CLUB, CHICAGO

Almada Cork Composition Flooring.

Description—Almada cork composition flooring is a sanitary, seamless, fireproof, lightweight composition for floors, base, stair treads, etc.

All ingredients are scientifically compounded so as to assure a fireproof, non-slippery, non-dusting and sanitary floor suitable for the varied types of floor service.

Color—Generally red is used, owing to its permanency, although black, green, yellow, and natural can be had.

Where color effect is desired a varied number of color schemes can be installed, such as borders in a different color than the field.

Installation—The E. N. BIEGLER MFG. CO. contracts to execute work anywhere in the United States and is also in position to furnish Almada composition with complete instructions for the mixing and installation of the same, so that it can be laid by local plasterers or cement finishers if desired. This is a special advantage for small areas.

Co-operative Service and References.

Mas-Oleum and Almada floors have been used in hundreds of buildings successfully. Names of engineers, architects and contractors, also list of buildings in which Mas-Oleum floors and Almada cork composition floors have been used will be furnished on request. Also circulars describing the features of the two different floors will be furnished on request, including specifications and samples.

CHENEY & COMPANY, INC.

Owners and Manufacturers of Troegerlith Composition Flooring
and Fibercote Magnesite Stucco

TELEPHONE:

BRYANT 2640

110 West 40th Street

NEW YORK, N. Y.

Products.

TROEGERLITH COMPOSITION, a Plastic Tile for flooring, base, stair treads, risers.

FIBERCOTE, a Magnesite Asbestos Stucco for exterior walls.

Also Pollo Oil for the care of Troegerlith.

Troegerlith Composition Flooring.

Troegerlith composition is a magnesium-oxy-chloride cement, consisting mainly of commercial magnesite, long fiber asbestos, mineral colors, and magnesium chloride.

All materials are standard, thoroughly tested and mixed with the utmost care and precision.

The finished floor is warm, resilient, fireproof and sanitary, of strength and durability.

Troegerlith absolutely will not dust; it does not contain either portland cement, sand or lime products.

Installation—Troegerlith is laid in plastic form and finished by troweling to a perfectly smooth, close grained, even surface without seams, cracks or joints, in one,

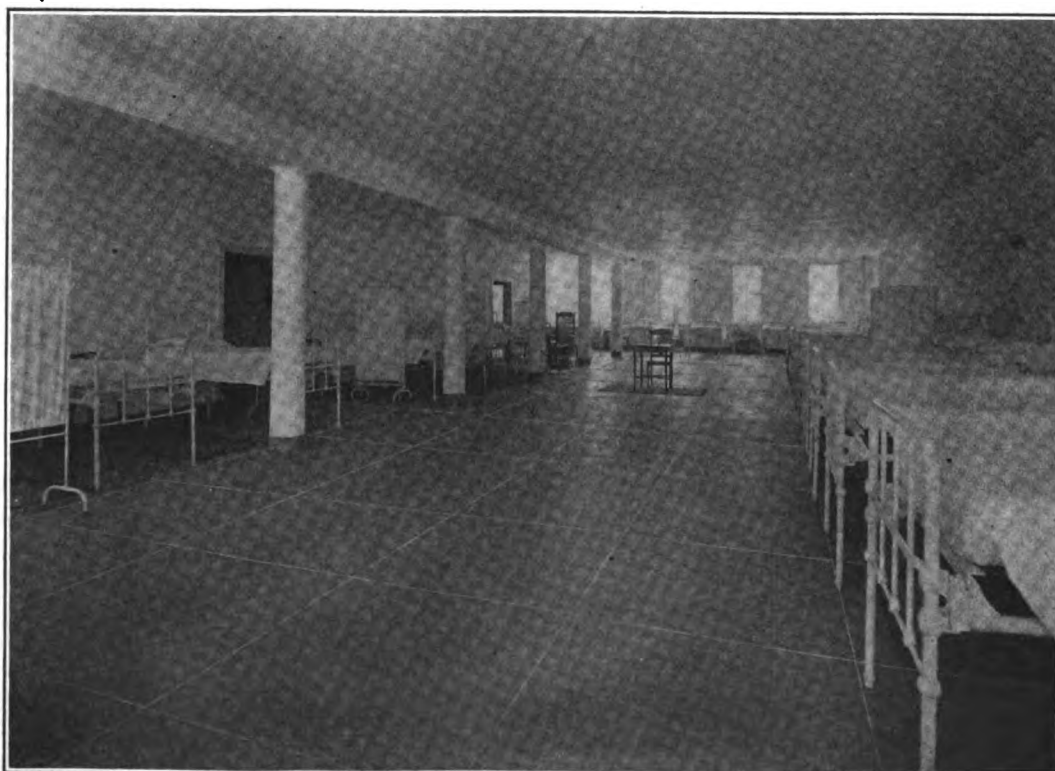
two or more layers (minimum thickness $\frac{1}{2}$ in.) depending on the type and condition of foundation and the service to which the floor will be subjected.

This material bonds firmly to new or old wood, cement or steel foundation. It is quickly and easily installed and the floor may be used in 24 hours after completion.

Metal reinforcement, if required for any special condition or purpose, may be used with perfect result.

Adaptability—Troegerlith floors are giving eminently satisfactory service through entire buildings; are appropriate for all classes of buildings and are especially suitable where a clean, dustless and warm flooring of pleasing appearance is desired, such as in banks, offices, hotels, schools, dormitories, hospitals, apartment houses, and industrial buildings.

This material is an important factor, and extensively used in factory construction, being especially and scientifically built to give the maximum service to fill all requirements of the heavy duty prevailing in this type of construction.



PUBLIC WARD IN ONE OF NEW YORK'S LARGEST HOSPITALS



TROEGERLITH FLOORS ADD ATMOSPHERE AND TONE TO AN OFFICE

Attractiveness—Troegerlith is equalled by few, if any, flooring materials.

It may be installed in a number of colors, or combination of colors.

Border and panel effects are most attractive and widely used. The floor may be scored to represent tile, or produced to give the effect of marble or quarry tile floors.

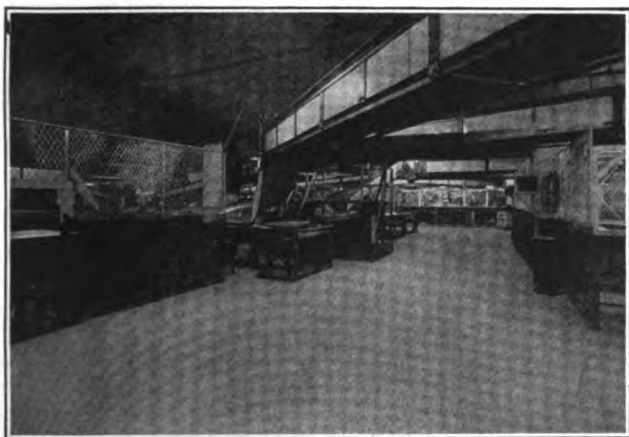
Guarantee—CHENEY & COMPANY, INC., squarely and fully guarantee their products against defects of material and workmanship.

References—Performance has proved the superior quality and durability of Troegerlith floors.

List of installations will be furnished on request. Write for Catalogue S-6.

Service—CHENEY & COMPANY, INC., have offices and warehouses in many of the larger cities, where complete organizations are ready to render prompt and efficient service to engineer, builder and owner.

All installations of Troegerlith are made under the direct supervision of the local office. This service insures perfect work at a minimum cost.



THIS TROEGERLITH FLOOR HAS WITHSTOOD HEAVY HAND TRUCKING FOR A LONG TERM OF YEARS

Fibercote Stucco.

Fibercote is a magnesite asbestos stucco for exterior walls of all types of buildings, a material adapted to the various styles of modern architecture. It has withstood most exacting scientific tests and has proved a superior material for outer wall treatment of new construction, and for overcoating and renewing old buildings.

Cost is no greater than that of any other standard wall material, and it requires practically no upkeep expense. It is successfully used in intensely hot or extremely cold climates, or where sudden temperature changes are common.

One of the most valuable characteristics of Fibercote stucco is its bonding or adhesive property. It does not depend on a key to hold its place. The material will adhere and bond so tenaciously to a surface that the two become practically inseparable. Wood lath, hollow tile, brick, galvanized or painted, expanded metal lath, and a variety of patented stucco backings are successfully used as reinforcements for Fibercote stucco.

Fibercote is waterproof. An all-day driving rain does not affect it in the least. No unsanitary dampness can penetrate its surface and linger between inner and outer wall construction.

Fibercote, while very dense, fibrous and tough, is elastic and therefore can not crack. It has no measurable expansion and contraction and is not affected by temperature changes. When it has hardened and set, it attains a great tensile strength not found in ordinary exterior plasters. It is absolutely fireproof.

Fibercote does not freeze. When applied during or below freezing temperatures, materials are not injured. Stucco work can be safely carried on without regard to season.

Application—Fibercote is prepared and shipped ready for use. The handling and mixing of the material is simple, easy and inexpensive. Application is made in 2 coats, both of the one standard quality of material. No inferior scratch coat is ever used with Fibercote. The usual and average covering capacity is from 45 to 60 sq. yds. to the ton. Work can be done by any competent plasterer.

Beautiful color effects are created by using one of the many granite and marble dry dash finishes, which may be made to harmonize with the architectural scheme. The dash is cast against the finish coat before it has set and hardened, becoming firmly embedded to remain permanent when set. This is the most practical finish for Fibercote magnesite stucco and is so recommended.

Directions—CHENEY & COMPANY, INC., guarantee the quality of Fibercote stucco. They supply specifications for preparing walls, also concise directions for mixing and applying the material. Descriptive circulars, samples and price list furnished on request.

GENERAL KOMPOLITE CO.

Composition Floors and Wainscots, Mastic Floors, Plastic Floor Compounds Calciners and Grinders of Magnesite

TELEPHONE:
HUNTERS POINT 5361, 5362

325-327 Borden Avenue
LONG ISLAND CITY, N. Y. .

Products.

"KOMPOLITE," a Monoplastic, Sanitary, Seamless Composition Floor and Wainscot.

"MASTOLITH," a Mastic, Plastic Flooring.

"Kompolite."

"Kompolite" is a magnesium asbestos composition made in many attractive colors. It is sanitary, seamless, fireproof, sound deadening, water repelling, easy under foot, germproof and dustproof. For heavy service and hard wear. Applied in plastic form on concrete, wood or iron, in new or old buildings.

It is light in weight, so that it can be used on weak structures where heavier material can not be employed. It is in daily use in places where wood, cement, asphalt, concrete, slate, marble, etc., have not been satisfactory.

Fifteen years of successful application and millions of feet of it in daily satisfactory use attest to the value of "Kompolite."

It has proved wonderfully durable under the most severe conditions. A floor now in use nearly 12 years, over which loads of 2 to 4 tons are drawn and sharp shod horses are driven, shows hardly any sign of wear. Another floor, over which 60,000 to 80,000 people have passed each day, has been in uninterrupted use for over 8 years.

Nearly 250,000 ft. of "Kompolite" have been installed in a public institution and after almost 6 years of use not a single foot was removed, repaired or relaid because of defective or unsatisfactory material or workmanship. After 2 years of test and service and in comparison with many other composition floors, "Kompolite" was accepted by the architects of the Grand Central Terminal, New York, and is the only composition floor laid in that great railroad station.

After careful, scientific test and numerous experiments by the Bureau of Standards, Washington, "Kompolite" was installed in many of the United States Post Offices, Government Printing Offices, the Capitol of the United States and other public buildings.

"Kompolite" has been laid in fine residences, tenements, hotels, restaurants, factories, stores, railroad stations, hospitals, schools, churches, office and loft

buildings, theaters, clubs, etc. In all it has been satisfactory.

Every foot is guaranteed by a contract which has never been questioned and has always been carried out to the satisfaction of architect, contractor or owner.

"Kompolite" is specified by leading architects, endorsed by noted contractors, and approved by property owners as the solution of many floor troubles.

Being calciners and grinders of magnesite this company can guarantee the quality of the most important materials used in every composition floor installation.

"Mastolith."

"Mastolith" is a plastic, seamless surface made from mineral gum with vulcanized oil and asbestos fiber. It has the advantages of light grade battleship linoleum without any of its disadvantages.

It is furnished in a medium red, chocolate brown and dark gray, laid $\frac{1}{8}$ in. to $\frac{3}{4}$ in. thick. It sets rapidly and may be used for foot traffic within 24 hours.

"Mastolith" is waterproof and is not affected by foot usage or trucks in warehouses.

It deadens noise and is agreeable to the tread.

It is absolutely sanitary and non-absorbent.

It will not crack or loosen from the underflooring.

It can be repaired perfectly with little trouble.

It retains its elasticity and always presents an attractive appearance.

"Mastolith," used as a covering, bonds excellently to concrete or wood floors, either old or new, concrete roofs, porches, walks, stair treads, or is used to protect concrete floors from dusting or from wear.

It forms an ideal floor for schools, churches, hospitals, asylums, jails, and for theaters, restaurants and all public or private buildings.

References.

"Kompolite" and "Mastolith" have been subjected to most severe tests in practical use. References will be given to architects, engineers, or contractors to prove that "Kompolite" and "Mastolith" are the most reliable and, quality considered, the most moderate priced monoplatic floors and wainscots now made.

THOMAS MOULDING BRICK COMPANY

T-M-B Flooring

133 West Washington Street
CHICAGO, ILL.

REPRESENTED BY AGENCIES IN PRINCIPAL CITIES

Products.

T-M-B FLOORING.

Also Mouldstone Flooring, a Magnesite Composition Floor.

T-M-B Flooring.

A tough, resilient covering and wearing surface for cement floors, old wood floors, mill construction floors, steel surfaces (such as stair treads), decks of boats, etc.

Qualities of T-M-B Flooring.

Durable, warm, resilient, quiet, non-slippery and dustless. Non-absorbent, waterproof, acidproof, a non-conductor of electricity, and unaffected by heat or cold. Will not crack, wrinkle or come loose; easily, effectively and economically repaired. Of low initial cost and requires a minimum of care.

T-M-B outwears most floor coverings and a repair vulcanizes perfectly with original floor, leaving an invisible patch.

Adaptability.

Especially suitable for schools, hospitals, offices, theaters, churches, banks, libraries, residences, stores, factories, gymnasiums, boats and railroad coaches.

A waterproof floor for roofs, soda fountains, etc.

Dance floor for roof gardens.

Acidproof floor for chemical laboratories.

Non-conductor of electricity in front of switchboards.

Non-slip floor around swimming pools.

A covering for cork insulation on both walls and ceilings.

Brief Specifications.

Thickness over cement, $\frac{1}{8}$ in.; over wood, $\frac{3}{8}$ in. A concrete subfloor must be level and trowelled to a smooth, hard, finished cement surface. A wood subfloor must be tight, firm and level. Mouldstone Cove Base is used with T-M-B flats in preference to T-M-B Cove Base.

For stair treads, stairs must be provided with a metal nosing.

Estimates, Service and Guarantee.

Estimates, samples and literature on request. The THOMAS MOULDING BRICK COMPANY and their agents will install floors anywhere, and will furnish instructions for installing when material alone is purchased.

T-M-B Flooring is guaranteed for a period of two years not to crack, come loose, or disintegrate.

References and Typical Floor Installations.

HOSPITALS

Grant Hospital, Chicago, Ill.
Michael Reese Hospital, Chicago, Ill.
Blessing Hospital, Quincy, Ill.
Fordham Hospital, New York, N. Y.
Tuberculosis Dispensary, Columbus, Ohio



SCHOOLS

Bancroft Hall, U. S. Naval Academy, Annapolis, Md.
New Trier Township High School, Winnetka, Ill.
Lincolnwood School, Evanston, Ill.
Williamsville High School, Williamsville, Ill.
St. Mels High School, Chicago, Ill.
New Henry School, Grand Rapids, Mich.
Culver Military Academy, Culver, Ind.

OFFICES

E. I. du Pont de Nemours & Co., Wilmington, Del.
City Hall, Chicago, Ill.
Meadows Mfg. Co., Bloomington, Ill.
Central Bag Co., Chicago, Ill.
Crane Co., Chicago, Ill.

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St. Paul's Church, Riverside, Ill.
St. Mark's Church, Detroit, Mich.
Sacred Heart Church, Grand Rapids, Mich.

BANKS

First National Bank, Kenosha, Wis.
Keenan's Bank, Le Roy, Ill.
Cosmopolitan State Bank, Chicago, Ill.
Albany Park National Bank, Chicago, Ill.

RESIDENCES

200 homes for Mark Mfg. Co., Indiana Harbor, Ind.

THEATERS

Plumb Theater, Streator, Ill.
Riviera Theater, La Crosse, Wis.

ROOF GARDENS

Powhatan Hotel, Washington, D. C.
Arlington Hotel, Washington, D. C.
Elks Club, Washington, D. C.
Delaware Springs Sanitarium, Delaware, Ohio

LABORATORIES

Bureau of Standards, Washington, D. C.
Inland Steel Co., Indiana Harbor, Ind.
Safe-Cabinet Co., Marietta, Ohio

POWER PLANTS

Substations Commonwealth Edison Co., Chicago, Ill.

STORES

Owl Drug Co., Chicago, Ill.
L. S. Ayres Department Store, Indianapolis, Ind.

NATATORIUMS

Chicago Heights Natatorium, Chicago Heights, Ill.
Bloomington High School, Bloomington, Ill.

A Few Architects who Specify T-M-B Flooring.

Perkins, Fellows & Hamilton, Chicago, Ill.
Coolidge & Hodgdon, Chicago, Ill.
Richard E. Schmidt, Garden & Martin, Chicago, Ill.
Pond & Pond, Chicago, Ill.
Arthur Foster, Chicago, Ill.
J. C. Llewellyn, Chicago, Ill.
Eric E. Hall, Chicago, Ill.
Harry L. Mead, Grand Rapids, Mich.
Donaldson Q. Meier, Detroit, Mich.
Joseph Scheitler, Chicago, Ill.
Arthur Bennett, Chicago, Ill.
Smith, Hinchman & Grylls, Detroit, Mich.

THE MARBLELOID COMPANY

Manufacturers of and Contractors for Magnesite Products

461 Eighth Avenue at Thirty-fourth Street
NEW YORK, N. Y.

FACTORY, NEW DURHAM, N. J.

BRANCH OFFICES

*PITTSBURGH, PA., 6624 Hamilton Avenue
*PHILADELPHIA, PA., 1524 Chestnut Street
*CLEVELAND, OHIO, 528 Erie Building
*DETROIT, MICH., 1333 Dime Bank Building
*BOSTON, MASS., 200 Devonshire Street
MONTREAL, CANADA, 908 New Burks Building

CINCINNATI, OHIO, 507 Mercantile Library Building
NORFOLK, VA., 905 National Bank of Commerce Building
KNOXVILLE, TENN., 407 Burwell Building
WASHINGTON, D. C., 1121 Vermont Avenue
MINNEAPOLIS, MINN., 1115 Metropolitan Life Building
ST. LOUIS, MO., 1723 Missouri Avenue

Products.

"MARBLELOID" FIREPROOF PLASTIC FLOORING, a Magnesite Composition for Floors, Coved Sanitary Base, Wainscot, Trim, Treads, etc.

Also manufacturers of "Marbleloid" Magnesite Stucco, a Magnesite Cement Stucco and Plaster for exterior and interior work; "Tredlite" Tiling made from the highest quality of imported (Scottish) linoleum.

Marbleloid Flooring.

Physical Characteristics, Properties and Advantages—Marbleloid is a sanitary, standardized, permanent, light weight, fireproof and resilient composition. It is installed in a plastic state, $\frac{1}{2}$ in. thick, and sets in a few hours into a seamless, tough, elastic body, presenting a fine grained, smooth surface.

The fact that it is jointless, remarkably free from a tendency to crack and practically non-absorbent gives it unusual sanitary value. It is easily kept clean; it is quiet to the tread; it is non-dusting, offering high resistance to abrasion; it is not slippery. Owing to its elasticity, it is not fatiguing; it is a non-conductor of heat, and therefore, never cold; it has great crushing and structural strength and does not contract nor expand to any appreciable degree.

Marbleloid adheres firmly to wood, concrete or iron, and may be installed over old flooring, base or wainscot, as well as upon new construction. It is made in all colors, offering possibilities in the working out of any desired color scheme. Only inert mineral colors are used.

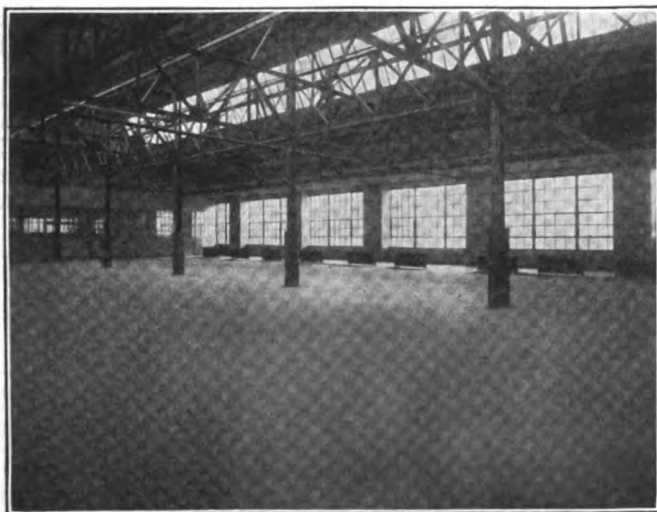
Adaptability—Marbleloid has been in use for the past seventeen years and is constantly being installed in almost every type of building. Because of the advantages enumerated, it is used to a very large extent in offices, institutions, schools, public buildings, churches, restaurants, clubs, hotels, theaters, libraries, banks, industrial plants, residences, apartment houses, laboratories, stores, garages, and in railroad cars, railroad stations, and steamships. Approximately 2,000,000 sq. ft. of Marbleloid are annually installed in the United States and Canada.

Physical Tests—Marbleloid weighs approximately 3 lbs. to the sq. ft.; it has a very low percentage of absorption; its compressive strength is over 6000 lbs. per sq. in.; it has a tensile strength of from 800 lbs. to 1100 lbs. per sq. in. It has great resistance to abrasion and will stand under light trucking.

Marbleloid has been tested and approved by the Bureau of Buildings, Borough of Manhattan, New York City, as *fireproof material*. Copies of this report and other physical tests made by Prof. Woolson at Columbia University may be had on request.

Marbleloid Service—THE MARBLELOID COMPANY maintains thoroughly trained and skilled workmen at the principal building centers of the country, and is, therefore, unusually well equipped to perform work in any section with its usual high standard of excellence.

Owing to the fact that installations are unsuccessful when made by local cement masons, inexperienced in the handling of material of this nature, Marbleloid floor-



INTERIOR EVENING NEWS BUILDING, DETROIT, MICH.
ALBERT KAHN, Architect

*Indicates warehouse



MARBLELOID INSTALLED THROUGHOUT OFFICE OF
AMERICAN PULLEY COMPANY, PHILADELPHIA, PA.

HEACOCK & HOKANSON, Architects

ing is not sold in bulk. *All work is installed by the Marbleloid organization and is rigidly guaranteed.*

Before actually beginning the installation of the Marbleloid material, a preliminary inspection is made by an engineer thoroughly familiar with all phases of building construction.

At the plant and in the field, Marbleloid facilities are such that the company is always prepared to handle all work, no matter how large, with the utmost dispatch and efficiency.

In order to maintain the superior merit of its product, THE MARBLELOID COMPANY carefully tests all raw materials before acceptance at the factory. All shipments which do not come within the Marbleloid standard are rejected. The laboratory is equipped to make both chemical analyses and complete standard physical tests.

This practice of subjecting all raw materials to rigid tests is of vital importance to the purchaser of magnesite composition as in no other way, under present conditions, can there be assurance of obtaining a material of uniform standard.

Relative Low Cost—Marbleloid is a permanent flooring which requires no unusual or expensive foundation. It may be put into service 24 hours after it has been installed. It may be used just as readily over wood flooring (finished or under) as it can be over concrete fill or finished cement floor. Thus in alteration work, both the time and expense of the preparation of a special foundation may be eliminated. In the larger areas it costs a little less than the best grade of hardwood flooring and but a little more than linoleum—Marbleloid outwearing many applications of the latter.

Marbleloid Specifications.

Before drawing up specifications covering the use of Marbleloid, the company suggests that engineers or architects secure a copy of this company's Standard Specification Sheet, giving detailed drawings showing construction of sanitary base, iron stair tread construction, etc. This Specification Sheet con-

tains foundation requirements and other data that is essential for securing satisfactory results.

The price of Marbleloid flooring, sanitary coved base, wainscoting, stair work, etc., varies, naturally, with the area involved, nature of the foundation (wood, concrete, or iron) and location. With crews of Marbleloid mechanics in the various building centers of the country, economy and efficiency are assured.

Upon receipt of data giving information regarding nature of foundation, the area of floor and wainscot, lineal extent of sanitary base, treads, etc., a definite proposal for the work completely installed will be furnished.

Guarantee.

THE MARBLELOID COMPANY rigidly guarantees the quality of its material and all work performed by its workmen, and will repair, free of charge, all defects due to the use of improper materials or workmanship.

Samples, etc.

Samples and color card, together with full literature including booklet, Standard Specification, etc., will be gladly mailed on request.

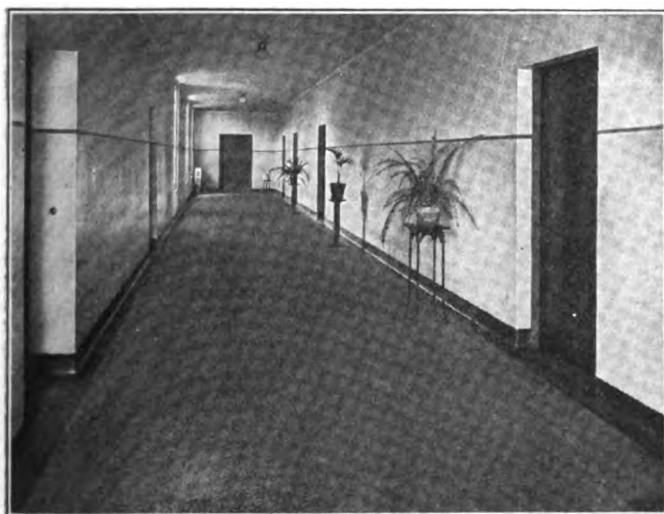
References.

As an indication of the merits of Marbleloid flooring, a portion of a list, giving the names of nationally known corporations for whom repeated installations of this material have been placed is printed below:

FIRM	CONTRACTS
American Sheet & Tin Plate Co.	11
Atlas Powder Co.	14
Bethlehem Shipbuilding Corp.	8
Bethlehem Steel Co.	12
Carnegie Steel Co.	26
Crucible Steel Co.	12
Frankford Arsenal.	14
General Chemical Co.	9
General Electric Co.	20
Metropolitan Stores, Inc.	17
New Jersey, State of.	19
New York, City of.	55
New York Edison Co.	19
New York, State of.	11
Pennsylvania R. R.	28
Pennsylvania, State of.	18
Philadelphia, City of.	5
Pittsburgh, City of.	16
Standard Oil Co.	11
Yale & Towne Mfg. Co.	7



MARBLELOID FLOOR INSTALLED IN CAFETERIA OF STUDEBAKER PLANT, SOUTH BEND, IND.



FLOOR AND SANITARY BASE IN TWO-COLOR DESIGN
One of the many Marbleloid hospital installations



INSTALLATION OF MARBLELOID FLOORING WITH SANITARY COVED BASE UNDER WAY AT CHEVROLET PLANT, FLINT, MICH.

SPECIAL SERVICE FLOORING CORPORATION

Composition and Asphalt Industrial Floors; Engineers and Contractors

2035 Grand Central Terminal
NEW YORK, N. Y.

PACIFIC COAST OFFICE: SAN DIEGO, CAL., 38 Sefton Building CANADIAN OFFICE: MONTREAL, QUE., Read Building

FACTORIES, MAMARONECK, N. Y. and SAN DIEGO, CAL.
WAREHOUSES AND BRANCH OFFICES IN PRINCIPAL CITIES

Products and Services.

SPECIAL SERVICE FLOORINGS: Magnesite Composition, Asphalt Mastic, Acidproof Mastic; Cold Mastic; Floorings for all sorts of Special Conditions.

Also Special Service Non-slip Tile, Concrete Hardener, Colored Cement.

FLOORING ENGINEERS and CONTRACTORS, assuming the entire flooring problem. Our engineers study the requirements the floor must meet, and suggest the one of the many types of Special Service Floors that will best fulfill the conditions. The flooring materials are then manufactured at the factory expressly for the special service to which the new floor is to be subjected, and are installed by our own force of skilled mechanics.

Special Service Floors.

Twelve years' experience of installing Special Service floors in all types of buildings in all sections of the country enables us to note carefully the results of different formulae and methods, and thus to choose the proper floor for each particular requirement. This policy, together with the careful selection of materials, with analysis at time of purchase, before manufacturing, and after shipment, doubly insures a floor which will render real service.

Installation—A force of skilled mechanics, located in the principal industrial centers of the United States and Canada, is always ready to install Special Service floors. Each installation is specially supervised by an engineer sent from the general offices of SPECIAL SERVICE FLOORING CORPORATION.

Guarantee—All products which we install are guaranteed against all defects of materials and workmanship.

Special Service Magnesite Composition Flooring.

This type of material can be installed over wood, concrete, or metal, and is generally laid plastic, $\frac{1}{2}$ in. thick, in 2 coats; a fibrous undercoat, $\frac{1}{8}$ in. thick, of great strength and pliability, and a top coat $\frac{1}{8}$ in. thick of exceeding fine grained texture, highly immune to abrasive wear under the most severe conditions.

It is fireproof, smooth, and sanitary, and since it has the quality of springiness, does not tire a person standing on it. It does not dust, and thus can be used where the absence of dust is necessary. Made in all colors.

References—It is significant that a great number of these installations are repeat orders:

Aluminum Co. of America; American Can Co.; American Locomotive Co.; American Thread Co.; American Woolen Co.;

Barrett Co.; Brooklyn Rapid Transit Co.; Clark Biscuit Co.; Cleveland Metal Products Co.; Dayton Power & Light Co.; Edgewater Power Co.; Thomas A. Edison Co.; Elyria Iron & Steel Co.; Elyria Memorial Hospital; Filene Co.; General Chemical Co.; General Electric Co.; International Harvester Co.; Johnson & Johnson; Kelly Tire & Tubber Co.; Montreal Light, Heat & Power Co.

National Carbon Co.; National Screw & Tack Co.; New York Central R. R.; New York Edison Co.; New York Telephone Co.; Proctor & Gamble; Sprague Electric Works; Turner Falls Power & Electric Co.; U. S. Marine Base (San Diego, Cal.); U. S. Military Academy (West Point); U. S. Naval Hospitals at Brooklyn, Pelham, and Ward's Island, N. Y.; Vacuum Co.; Westinghouse Electric & Mfg. Co.; White Tar Co.; Wm. Wrigley, Jr. Co.; Worthington Ball Co.

Special Service Asphaltic Floorings.

Asphalt Mastic Flooring—Guaranteed not to creep, and has been successfully used in factories, warehouses, naval vessels, recreation roofs, and other places where an extremely resilient, durable, and waterproof floor or decking is required. Usually laid from $\frac{3}{4}$ to $1\frac{1}{2}$ in. thick over wood, concrete or steel, in black only.

Acidproof Mastic Flooring—By the use of acid-proof aggregates of various sizes so graded as to produce a dense mixture, and bituminous binders specially selected for their acid resisting qualities, a floor is obtained that can be used successfully in metal pickling rooms, battery plants, and silver and other plating works. Usually installed 1 to 2 in. thick over wood, concrete, or steel. Laid only in black.

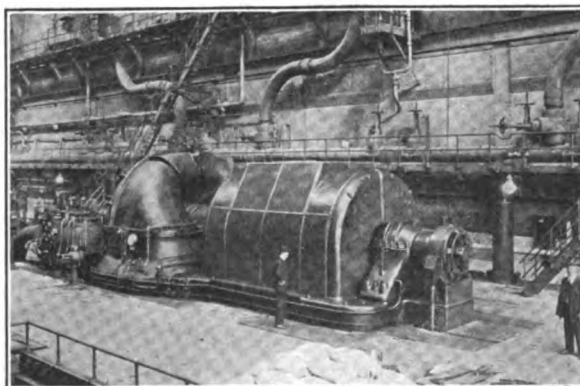
Cold Mastic Flooring—Resilient, flashproof, and a good thermal insulator; presents a pleasing appearance. Built up in 4 layers, usually to a thickness of $\frac{1}{8}$ in. Is laid over concrete, composition, steel or wood, in brown, black, red and green.

References—Important industrial installations of Special Service mastic floorings:

Aeolian Co. plant at Garwood, N. J.; American Ever Ready Works of National Carbon Co., Cleveland, Ohio; Botany Worsted Mills, Passaic, N. J.; Buffalo Dry Docks Co.; Curtis Engineering Co.; Electro Dynamic Co.; General Electric Co.; Lang Body Co.; Linde Air Products Co.; Lewis County Condensed Milk Co.; New Departure Manufacturing Co.; New York State Chronic Hospital; Tweedy Silk Mills, Danbury, Conn.; U. S. Naval Camp, Pelham Bay, N. Y.; U. S. Naval Operating Base, Hampton Roads, Va.; U. S. Submarine Base, Newport, P. I.; Warren Garage, Oneonta, N. Y.; White Co. (Service Station), Pittsburgh, Pa.; Worthington Pump & Machinery Co.

Specifications, Estimates, etc.

A catalogue containing complete specifications will be mailed to engineers and architects on request. Samples and estimates furnished promptly.



INSTALLATION OF SPECIAL SERVICE MAGNESITE COMPOSITION FLOORING

Being laid at Waterside Station No. 1 of the New York Edison Co., next to a 35,000 kw. turbine

SOLRY TILE MANUFACTURING CO., INC.

The 100% Non-slip Composition Tile

334 Fifth Avenue
NEW YORK, N. Y.

SAN FRANCISCO, CAL.
MONTREAL, QUE.

AGENCIES
INDIANAPOLIS, IND.

WASHINGTON, D. C.
TORONTO, ONT.

Product.

SOLRY, 100% NON-SLIP TILE.

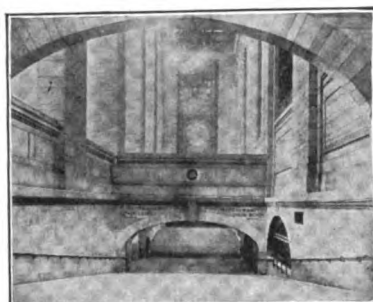
Description and Advantages.

Solry is a flooring composition applied over a concrete, metal or other bonding foundation in the form of manufactured tiles; or it may be laid in plastic form and cut to any desired size or pattern. It is furnished in a variety of attractive colors.

Solry meets in a most satisfactory manner, the three vital requirements of any efficient travel surface:

(1) **Non-slip and Safe**—Solry provides an absolutely safe footing for pedestrian traffic. The non-slipping quality is produced and permanently maintained by the distribution of an abrasive material throughout the entire thickness of the tile, so that Solry always presents a non-slip surface and can never wear down slippery.

Solry 100% Non-slip surface applied over ramps (Grand Central Terminal, New York, N. Y.) subjected to a daily pedestrian traffic of 60,000 persons, has maintained a uniformly non-slip quality through 6 years of uninterrupted wear.



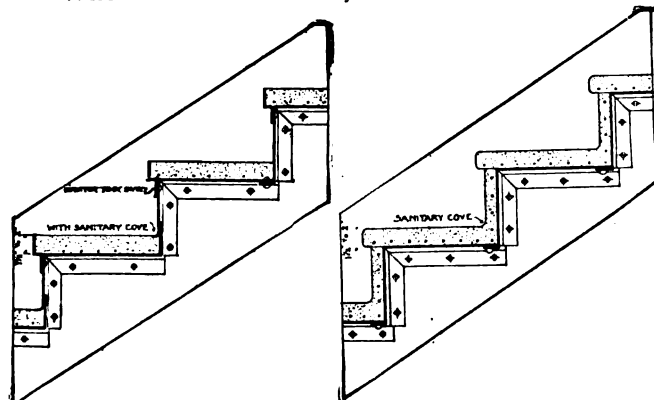
RAMP IN GRAND CENTRAL
TERMINAL, NEW YORK
Traffic, 60,000 persons daily

(2) **Wear Resisting**—Due to its closely packed composition, Solry wears uniformly and with no change in its non-slip quality. It is also resilient, giving a pleasant touch to the tread by holding the step, but not with the sensation of a sudden grip.

(3) **Sanitary**—Solry 100% Non-slip surface tile, unlike concrete, does not dust or crumble and is therefore impervious to moisture, since the absorption of moisture usually precedes disintegration. This establishes the sanitary merits of Solry.

Scope of Utility.

Wherever traffic is heavy or where local conditions



On Metal Treads with Z-bar
Nosing
Tread and Riser—Separate Pieces
with Sanitary Cove on Riser
APPLICATION OF 100% NON-SLIP COMPOSITION

render any area smooth, slippery and unsafe, Solry 100% Non-slip Composition is the ideal safe travel surface to apply.

It has been proved remarkably efficient on expansive ramps, corridor floors, stair treads and landings, kitchen and pantry floors, engine room and factory floors, bathroom and swimming pool floors, hospital and school floors, elevator floors and approaches, platforms and sidewalks.

Specifications.

The 100% Non-slip Composition shall be laid in the manner specified or directed by the manufacturer for the best work with the 100% absolutely Non-slip Composition.

Concrete foundations shall be graded to a true and even surface within 2 in. of the finished floor.

Between the foundation and the 100% Non-slip Composition shall be laid an underbed of 1 in. thick, in proportion of 1 of cement, 3 of clean, coarse and sharp sand, and 4 of 1/4-in. clean, sound gravel.

The 100% Non-slip Composition surface shall be 1 in. thick, the entire surface shall be marked off any size shown on plans by cutting a joint through the 1-in. wearing surface from 1/4 in. to 3/8 in. wide.

The joints shall be well trimmed and filled in with same composition, or proportion of 1 of cement, 1 of sand, and colored if desired.

After the surface and joints are thoroughly dry, the surface shall be rubbed with an electric surfacing machine or by hand.

NOTE—If it is desired that 100% Non-slip Composition be installed on any other than concrete foundation, write for consultation or specification.

Stair treads can be made and set same as marble and slate treads.

100% Non-slip Composition can be cast on stairs in place, and surfaces rubbed with an electric machine or by hand.

Installations and References.

Interborough Rapid Transit Co., New York, N. Y.

New Washington Hotel, Washington, D. C.

Commodore Hotel, New York, N. Y.

Hotel Pennsylvania, New York, N. Y.

Union Station, Indianapolis Union Railway Co., Indianapolis, Ind.

Hotel Astor, 45th Street and Broadway, New York, N. Y.

Goodyear Tire & Rubber Co., Akron, Ohio

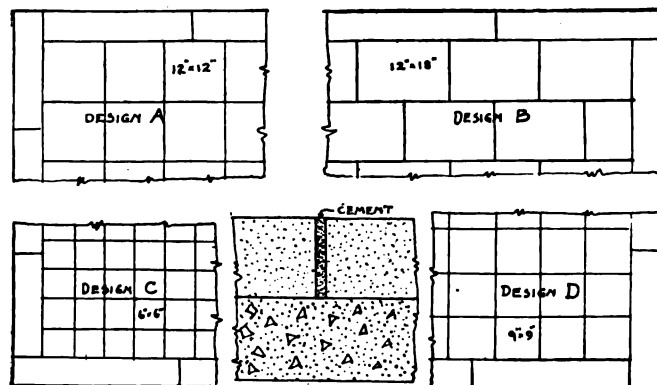
Grand Central Post Office, New York, N. Y.

R. H. Macy, New York, N. Y.

Hotel Biltmore, New York, N. Y.

Grand Central Terminal, New York, N. Y.

Toronto Union Station, Toronto, Ont.



TYPICAL DESIGNS AND SECTION THROUGH JOINT OF SOLRY
FLOOR TILE

AMERICAN BAR-LOCK CO.

Sidewalk Lights, Floor Lights and Roof Lights

MAIN OFFICE AND WORKS

327-329 Jackson Avenue

LONG ISLAND CITY, N. Y.

BRANCH OFFICES OR REPRESENTATIVES IN ALL LARGE CITIES

Products.

Specialists in highest quality VAULT LIGHTS, FLOOR LIGHTS, SKYLIGHTS and ROOF LIGHTS.

Also Sidewalk Doors of all descriptions.

Adaptability of American Bar-Lock System.

The "American Bar-Lock" systems are comprehensive in meeting every need. They are mechanically correct and all make use of the perfect "Lazalite" glass. The purpose of a roof light is to provide daylight. These constructions make possible all of the advantages of a light shaft without the sacrifice of valuable space. They are built to support the loads required in all types of buildings and are made to be walked on. No protecting screens are required.

Especially adapted for use in buildings where *permanence, freedom from leakage and maintenance charges* are equally important.

Methods of Construction.

This system is manufactured in our own factory by skilled mechanics (men who have grown up with the business) in semifinished, double reinforced concrete slabs which are delivered to the building operation ready to receive the Lazalite lenses and the cement top-finish; or in the form of completed, factory-made slabs ready to lay over the openings over which they are to be used.

The material is shipped ready to be installed by local labor or we will send our own mechanics, if preferred, anywhere in the United States.

SIZES OF GLASS UNITS

Glass No.	Size, in.	Glass area, per cent.	Thickness of construction, in.
71B	6½ x 6½	66½	2¾
31A	4 x 4	71	2½
61-3	3½ x 3½	54	2½

Average weight of finished construction is 25 lbs. per sq. ft.

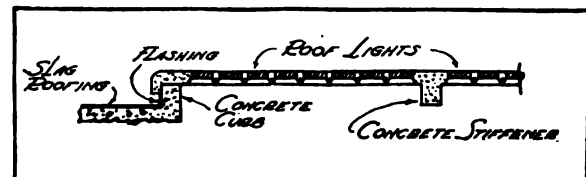


TYPICAL INSTALLATION, AMERICAN BAR-LOCK CONSTRUCTION

Showing concrete skylights over platforms of D. L. & W. R. R. terminal, Buffalo, N. Y.

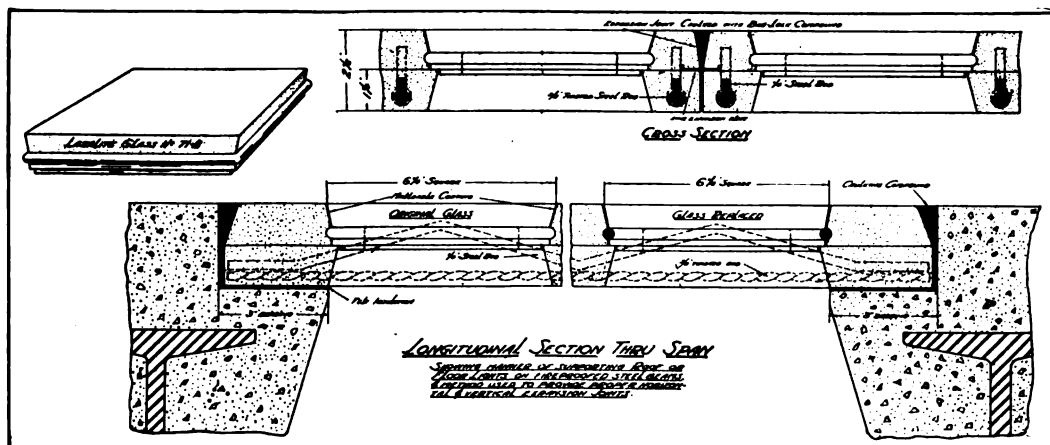
Guarantee.

All work is executed in the best mechanical and workmanlike manner and is guaranteed against all defects in workmanship and materials and against glass breakage for a period of two years.



RAISED TYPE ROOFING CONSTRUCTION

Recommended if slag roofing adjoins roof lights, in order to provide a thoroughly watertight connection with roofing. No leakage, no exposed metal on top or underneath to rust, no glass breakage from expansion or contraction



CONSTRUCTION DETAILS OF AMERICAN BAR-LOCK SYSTEM

THE PHILIP CAREY COMPANY

Expansion Joint

GENERAL OFFICES AND FACTORIES
LOCKLAND, CINCINNATI, OHIO

BRANCHES AND DISTRIBUTING POINTS

ATLANTA	BALTIMORE	BIRMINGHAM	BOSTON	TACOMA	CHARLOTTE
CHATTANOOGA	CHICAGO	CLEVELAND	DALLAS	BUFFALO	DENVER
HAVANA, CUBA	HOUSTON	JACKSONVILLE	KANSAS CITY	DETROIT	LITTLE ROCK
LOS ANGELES	LOUISVILLE	MEMPHIS	MINNEAPOLIS	KNOXVILLE	NASHVILLE
NEW ORLEANS	NEW YORK	OKLAHOMA CITY	OMAHA	MONTREAL	PITTSBURGH
SAN ANTONIO	SAN FRANCISCO	ST. LOUIS	SEATTLE	PHILADELPHIA	TORONTO
WASHINGTON	SIoux CITY	VANCOUVER	PORTLAND, ORE.	TAMPA	WHEELING
LINCOLN	SPOKANE		SALT LAKE CITY	WINNIPEG	

Products.

CAREY ELASTITE EXPANSION JOINT.

Also manufacturers of Carey Flexible Cement Roofing, Asphalt Slate Shingles, Pipe Covering, Waterproofing and Asbestos Products.

Adaptability.

The Carey Elastite expansion joint is installed in all classes of street paving, and in any construction work where provision must be made for the expansion of materials:

(1) In brick pavements, used longitudinally between gutter or curb and paving; (2) in wood block and granite block streets, concrete roads, cement sidewalk construction, it is laid down both longitudinally and transversely; (3) its application is universal in concrete bridges, walls, piers, viaducts, reservoirs, dams, etc.

Description.

The Carey Elastite expansion joint consists of a heavy body of special asphalt compound "sandwiched" between two layers of a special grade asphalt-saturated wool felt, the whole being firmly bonded together by the Carey combining process.

Thickness is uniform. Compound is evenly distributed between outside wool felts from top to bottom and end to end. Its melting point is high, and the material readily responds to any expansion.

Features.

Carey Elastite expansion joints provide for all temperature changes. They do not melt or ooze out in hot weather, retain their elasticity in the coldest weather, and keep cracks filled watertight when paving surface is contracted. They take up all expansion stresses; prevent buckling and cracking of paving surface; absorb longitudinal and trans-

verse stresses in cement sidewalks, and insure absolute perfection and uniformity in every joint, from surface of pavement to base.

They make a better job than a poured joint. They cost less to install and nothing to maintain.

They save labor and material; no tar or kettle gang, or spacing strips are required. They save time, being installed by same man who lays pavement.

Special Features—The asphalt used in joint meets the following requirements:

Melting point.....	250° F.
Penetration (100 grams weight No. 2 needle, 5 seconds)	2.8 mm
Solubility in carbon bi-sulphide.....	98.5%
Solubility in carbon tetrachloride.....	99.6%
Solubility in carbon 74° naphtha.....	67%

Form.

Joints are sectional in form, or, when desired, are furnished cut to crown. They extend through entire thickness of pavement (perpendicular to its surface).

Width and Location.

Where joint is 1 in. thick or less, filler is provided in single thickness; if joint is over 1 in. thick, filler consists of several layers of equal thickness, a single layer in any case not exceeding 1 in. in thickness.

In concrete pavements (Fig. 2), transverse joints are not less than $\frac{1}{4}$ in. nor more than $\frac{3}{8}$ to $\frac{3}{4}$ in. in width, and are placed across pavement (perpendicular to center line), not more than 30 to 35 ft. apart; and longitudinal joint (between curb and pavement) is not less than $\frac{1}{4}$ in. wide, nor more than $\frac{1}{2}$ to 1 in. in width.

Thickness and depth of joint in all cases made to correspond with required dimensions shown on engineers' plans or specifications.

References.

List of engineers and contractors who have installed Carey Elastite expansion joints, throughout the United States, sent on request.



FIG. 1. CAREY ELASTITE EXPANSION JOINT

"The Sandwich Joint"

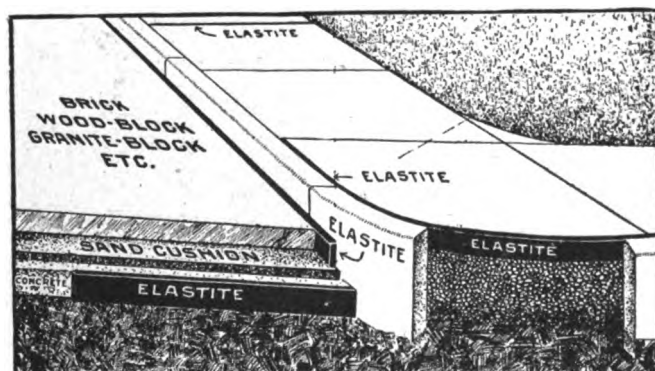


FIG. 2. CAREY ELASTITE EXPANSION JOINT SHOWING INSTALLATION



SERVICISED PRODUCTS COMPANY

(Not Incorporated)

Expansion Paving Joints

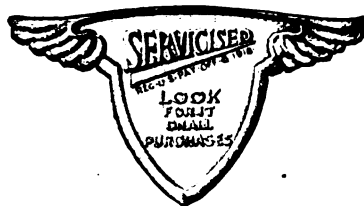
TELEPHONE:
RANDOLPH 755

MAIN OFFICE
First National Bank Building
CHICAGO, ILL.

Products.

Manufacturers of EXPANSION PAVING JOINTS and EXPANSION JOINT TAPES.

Also Prepared Roofing, Asbestos Fiber, Pipe Covering and Insulation, Asphalt, Slate and Cement Shingles, "Everstick" Asphalt Shingles, Burlap for Road purposes, Lap Cement Tapes for Prepared Roofing, Asphalt and Tar.



TRADE-MARK

Thickness.

Joints are finished in any required thickness, $\frac{1}{8}$ to $1\frac{1}{2}$ in. Thickness and depth of joints in all cases made to correspond with required dimensions shown on engineers' plans or specifications.

References.

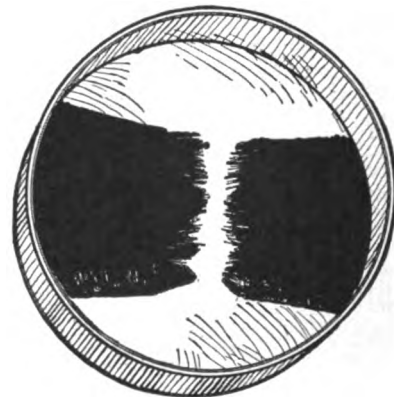
Will be furnished on request.

Adaptability of Expansion Paving Joints.

Type A, "Feather" Joint (Patents Pending)—Particularly adapted to all paving where straight lengths can be used. It is installed according to engineers' specification in concrete, grouted brick, granite and wood block pavements.

Type B, "Servicised Fibrated" Joint—Installed the same as Type A, but it is better adapted to curved surfaces, bridges, walls, piers, viaducts, reservoirs, dams, etc.

Type C, "Joint Tapes"—Made especially for sidewalk purposes, alley work, inside curb construction and all paving work requiring joint up to $\frac{1}{2}$ -in. width. Tapes come in rolls; all light weight, 100-ft. lengths; $\frac{1}{8}$ -in. and heavier, 42-ft. lengths.



TYPE B, FIBRATED JOINT

Description.

Type A, "Feather" Joint—Constructed so as to weigh as much as two-thirds less than other joints. It is an insulation and filler in one. It is crowned with solid bitumen for a depth of 2 in. This crown takes up the wear, packs the crevice and tamps the body into the crevice. It can not ooze out. It can not freeze. It insulates the joint with its myriads of cells, thus preventing frost entering at vital points. This joint can also be made completely enveloped in asphalt.

Type B, "Servicised Fibrated" Joint—A flexible structure of bitumen and millions of fibers pressed uniformly together into joints. Non-sticky, easy to handle; can not freeze, can not ooze out.

Type C, "Joint Tapes"—These tapes are plain or coated felts, sticky or non-sticky according to specifications. Packed in rolls in single or multiple strips, 42- and 100-ft lengths. Manufactured especially for close spacing and light work.

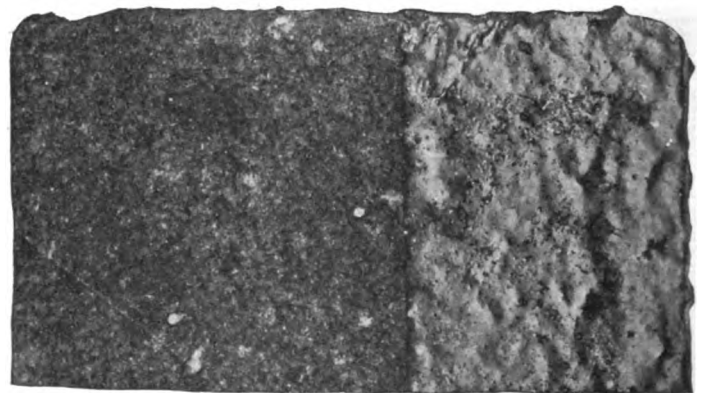
Details.

All fibrous matter is fully protected by bitumens, meeting engineers' specifications for joint, having been in service 6 or 7 years. No raw felts are exposed.

Type A fibrous matter consists of a waterproofed mineral fiber and peat with a 2-in. crown of bitumen—materials which will outlast the pavement. No raw or saturated felt exposed.

Form; Patents Pending.

All joints are prepared sectional. Joint tapes are prepared in rolls or sectional. Joint tapes on special application and preferred specification made according to engineers' requirements, full width of street cut to crown.



TYPE A, "FEATHER" JOINT



TYPE C, JOINT TAPES

THE SAMUEL J. CRESWELL IRON WORKS

Twenty-third and Cherry Streets
PHILADELPHIA, PA.

Products.

CAST and WROUGHT IRON ENGINEERING SPECIALTIES and GENERAL FOUNDRY WORK, including Columns, Spiral Stairs, Wheel Guards, Manhole Doors and Frames, Roadway Drain Grates and Frames, Vault Plates and Frames, Ash Pit Doors and Frames, Trench Covers and Frames, Post Caps, etc.

Facilities.

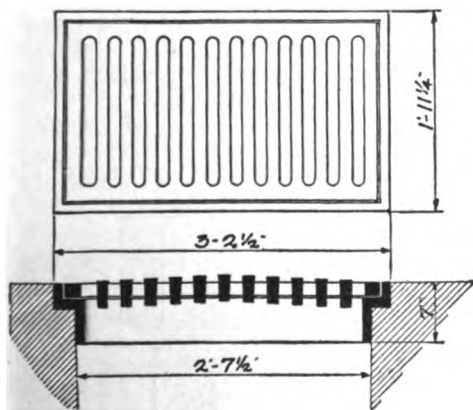
The SAMUEL J. CRESWELL IRON WORKS is one of the best equipped and largest plants in the vicinity of Philadelphia for the production of the various kinds of wrought and cast iron work mentioned above. Furthermore, this company is prepared to submit estimates, or designs and estimates, for any ornamental work for large or small buildings, etc., on short notice.

Stock Specialties.

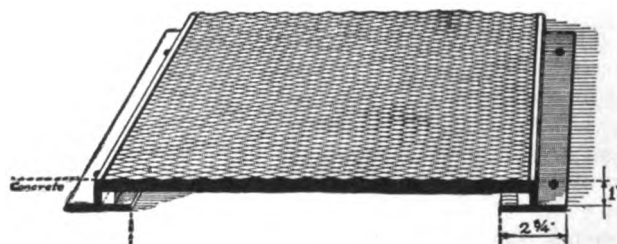
The accompanying illustrations show a few specialties regularly carried in stock. The prices quoted are f.o.b. Philadelphia.

Catalogue.

A catalogue illustrating the entire line of manufacture will be sent on request.



NO. 3 SEWER INLET
Price, \$22.00

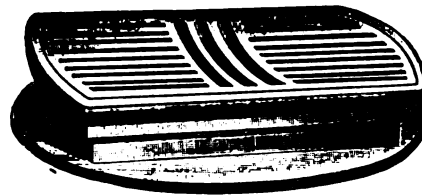


COVER AND CURBING FOR DUCTS OR TRENCHES
Plates made to suit conditions. Curbing carried in stock.
Prices on application



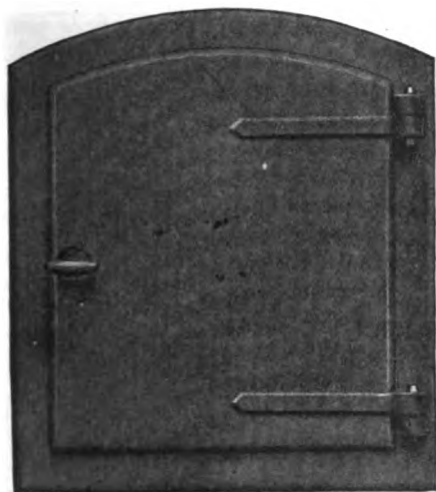
NO. 11 ROADWAY DRAIN GRATE AND FRAME

11" x 22 1/4" grating..... \$6.00
8 1/4" x 17 1/4" grating..... 4.00



NO. 10 ROADWAY DRAIN GRATE AND FRAME

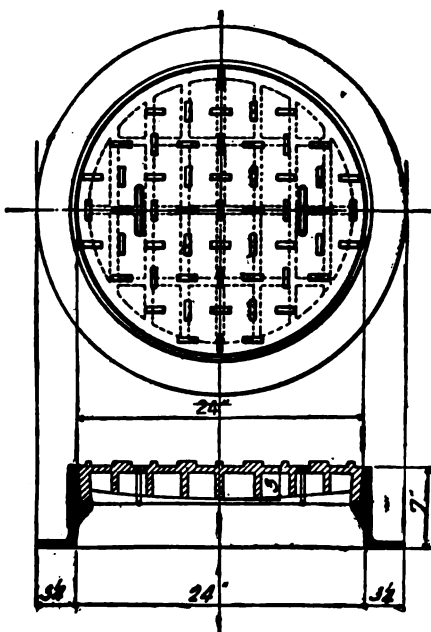
13 1/4" x 24 1/4" grating..... \$7.00
12" x 18" grating..... 6.00



NO. 1 MANHOLE DOOR AND FRAME

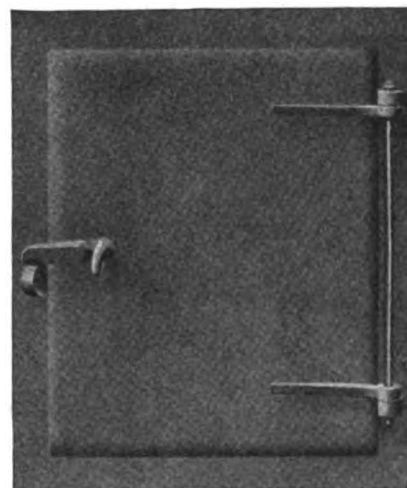
Width	Height	Price	Width	Height	Price
36"	36"	\$30.00	24"	30"	\$11.75
33"	49"	30.00	24"	24"	11.00
24"	48"	20.00	20"	24"	10.00
24"	36"	12.50	18"	24"	8.50

All manhole doors and frames have return flanges 4 in. deep



NO. 19 MANHOLE COVER

Extra heavy for city use..... \$17.00
With concrete or asphalt filled cover..... 22.00



NO. 3 MANHOLE DOOR AND FRAME

Width	Height	Price	Width	Height	Price
24"	24"	\$11.00	16"	20"	\$7.25
18"	24"	8.50	12"	16"	4.50
18"	18"	7.50	12"	12"	4.00
16"	24"	8.00	12"	10"	3.50
			12"	8"	2.50

OLNEY J. DEAN & CO.

Manufacturers of Scuppers

TELEPHONE:
STATE 5940, 5941

179 West Washington Street
CHICAGO, ILL.

Products.

DEAN'S CHICAGO TYPE SCUPPERS.

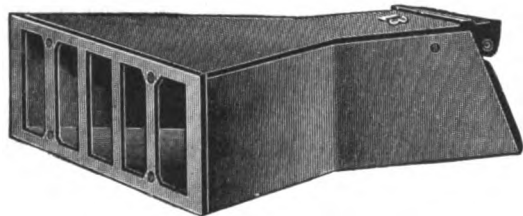
Advantages.

These scuppers are windproof and rainproof, and meet the fire underwriters' requirements and the recommendations of the National Fire Protective Association in all respects.

Because of this, buildings properly equipped with Dean's Chicago scuppers are much more easily rented, as the tenant's rate of insurance is reduced from 3% to 5% on the contents of the building. In addition, the tenant has the assurance of minimum water loss and slight interruption to his business in case of fire.

Construction.

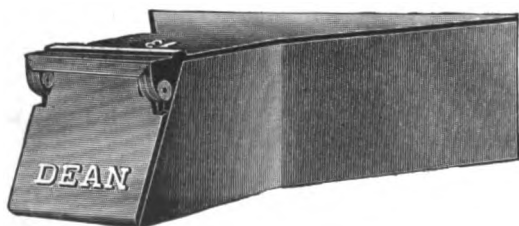
The Chicago scupper has 48-sq. in. capacity at the inlet and 16-sq. in. capacity at the outlet. The wide inlet allows maximum amount of water to flow into scupper and increases water pressure on valve at the outlet. This valve is hung on bronze pins at such an



INSIDE VIEW OF DEAN'S CHICAGO SCUPPER

angle that its weight holds it snug against the walls of the scupper making it windproof and watertight from outside, yet permitting the slightest flow of water from within to open it.

The cover projecting from the outside upper portion of the scupper protects the hinges and the valve and absolutely prevents them from becoming clogged with dirt, snow, and ice. Inside opening of scupper is protected by



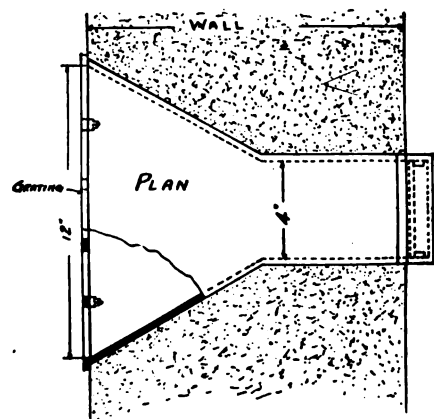
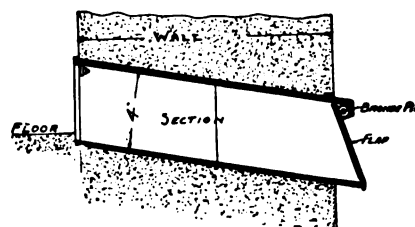
OUTSIDE VIEW OF DEAN'S CHICAGO SCUPPER

a grating which prevents articles large enough to clog scupper from entering, but allows small particles to flow through.

Scuppers are made in proper size for any thickness of wall from 6 to 26 in.

Installation.

The National Fire Protective Association recommends, under ordinary conditions, one Dean Chicago scupper to every 1000 sq. ft. of floor, or in a building equipped with a sprinkler system, one to every 500 sq. ft. of floor.



SECTION AND PLAN OF DEAN'S CHICAGO SCUPPER

Specification.

The mason contractor shall provide and set 1 Dean Chicago Type Scupper as manufactured by OLNEY J. DEAN & Co., 179 West Washington Street, Chicago, Ill., in each bay of the exterior walls as shown on plans.

The scuppers are to fill the recommendations of the National Fire Protective Association and the Fire Underwriters Laboratories. They shall be set in the masonry walls at each floor level above the ground as shown on details. Care must be taken in setting the scuppers to see that the pitch is not less than 2 in. in 12 in., that their lower inside edges are set 1 in. below finished floor line, and that they are set true to wall lines and are not sprung or broken during construction work.

On completion of the job, valves and all parts exposed to the weather are to be cleaned and given a heavy coat of paint.

Service.

A complete stock of all sizes is kept in the Chicago warehouse. Chicago being centrally located with exceptionally good package car service on all railroads, delivery can be made within a few days time to all points.

This is an important consideration in regard to scuppers, as they are very often forgotten until actually needed on the job.

OWEGO FOUNDRY AND MACHINE CO.

PIERRE DUVINAGE, OWNER

Manufacturers of Spiral Stairs and Cast Iron Work for Buildings

TELEPHONE CONNECTION

OWEGO, TIOGA CO., N. Y.

Products.

DUVINAGE IRON SPIRAL STAIRS, POST CAPS, WALL PLATES, PIER PLATES and BRACKETS, SILL PLATES, WOOD ROOF TRUSS CASTINGS and RODS.

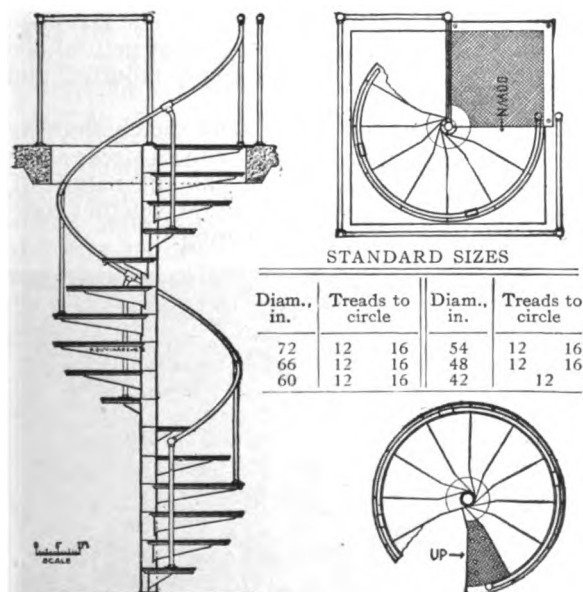
Also manufacturers of Cast Iron Work, Trussed Girder Rods and Struts, Bases and Plates, Wheel Guards, Jamb Guards, Saddles or Sills, Shutter Eyes, Cast Iron Clean-out Doors, Trap Pit Covers, Lintels; Special Castings; Special Cast Iron and Fittings for sewage disposal plants, water works, and power-houses; Revolving Domes for astronomical observatories; Machinery Castings.

Duvinage Iron Spiral Stairs (Patented Feb. 13, 1917).

Duvinage spiral stairs have been erected and approved for their simple, durable construction as well as their economy in floor space, in offices, stores, mezzanines, boiler rooms, sewage disposal pumping wells, power plants, gas houses, water towers, etc.

They are made of the best grade of iron; have single 1-in. pipe railing on stairs and around well; and center pipe is 3 or 4 in., according to size and height of stairs.

The regular stock treads of these stairs are made so that they can be used either right- or left-hand (illustration shows right-hand) and 12 or 16 treads to the circle, as tabulated. Modifications in riser heights are affected by height between floors.



ELEVATION AND PLANS OF PIERRE DUVINAGE SPIRAL STAIRS

To provide sufficient headroom under top platform, the risers should not be less than $8\frac{1}{4}$ in. high. By calculating the number of risers required, the relative positions of starting and landing points can be determined, so as to decide whether a right- or left-hand stair would be best suited.

Prices, catalogue and further information on application. In ordering, give diameter, distance between

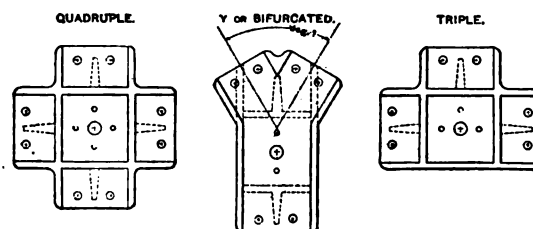
floors, starting point and position of landings desired.

References—Among the many purchasers of Duvinage spiral stair may be mentioned:

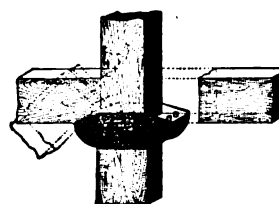
Consolidated Gas Co., Boiler House, Highbridge, N. Y.
125th Street Theater, New York, N. Y.
J. C. Greenleaf, Architect, Farm Building, Lenox, Mass.
Army Department U. S. Government, Storage Building, Mill Rock, East River, New York, N. Y.
Sterling Piano Co.'s Building, Gust. Ericsson, Contractor, Brooklyn, N. Y.
City of Albany, N. Y., Sewage Disposal Plant
Lehigh Valley R. R., Pier 44, East River, New York, N. Y.
Department of Health, City of New York, Otisville, N. Y.
Lackawanna Railroad, Signal Tower, Buffalo, N. Y.
Wm. Flanagan, Contractor, Store, 430 Pearl Street, New York, N. Y.
Vacuum Oil Co., Powerhouse, Paulsboro, N. J.
Southern Cotton Oil Co., Factory, Bayonne, N. J.
Architectural League of New York, N. Y.
Henry-Wright Manufacturing Co., Hartford, Conn.
Brooklyn Rapid Transit Substation, Ridgewood, Brooklyn, N. Y.
Cosmopolitan Club, 133 East 40th Street, New York, N. Y.
Hotel Woodstock, 127 West 43d Street, New York, N. Y.
Thompson & Binger, Syracuse, N. Y.
Bullard Machine Tool Co., Bridgeport, Conn.
Kings County Courthouse, Frank Quinby, Architect, Brooklyn, N. Y., and several hundred more.

Duvinage System of Anchoring.

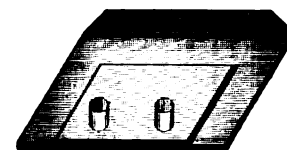
The Duvinage system for anchoring of buildings consists of post caps, wall plates, pier plates, brackets, sill plates and roof truss castings having projecting hubs which fit into holes bored in beams.



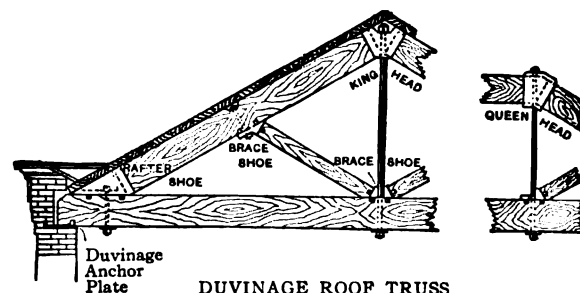
DUVINAGE POST CAPS FOR SELF-RELEASING BEAMS



DUVINAGE POST CAP



DUVINAGE SINGLE ANCHOR WALL PLATE



DUVINAGE ROOF TRUSS

ESTABLISHED 1884

WISCONSIN IRON & WIRE WORKS

Fire Escapes, Stairs and Miscellaneous Iron

TELEPHONE:
EDGEWOOD 1030

1640 Booth Street
MILWAUKEE, WIS.

Products.

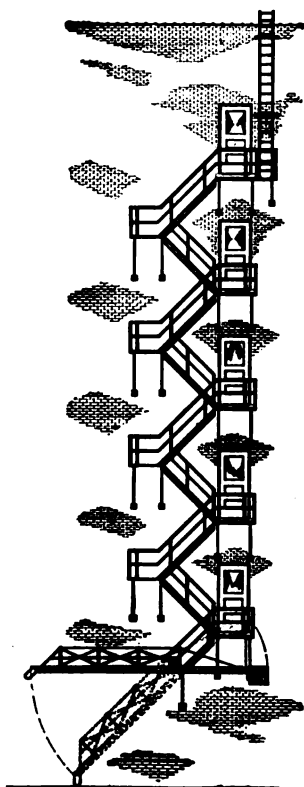
FIRE ESCAPES; STAIRS;
COLLAPSIBLE GATES; WOVEN
WIRE WORK.

Also Ornamental Bronze
and Iron Work and a large
and miscellaneous list of Iron
and Wire Work, including
Machine Guards.

Fire Escapes.

Manufactured in ac-
cordance with the state laws
and local ordinance require-
ments.

When writing for esti-
mates, etc., give sketch, with
elevation of building to
which fire escape is to be at-
tached; distance from fin-
ished floor to finished floor;
thickness and nature of floor
and wall construction; size
and location of all windows
and door openings.



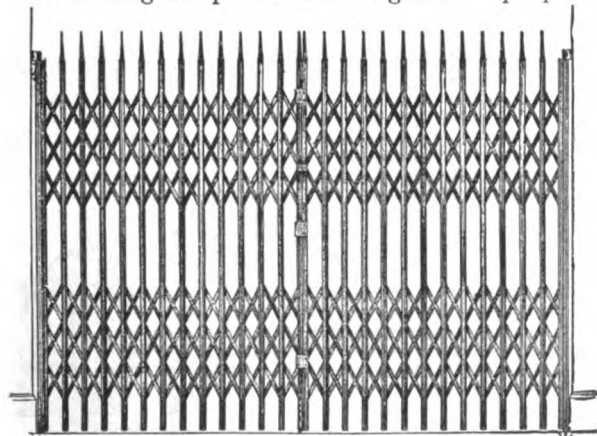
FIRE ESCAPE

Collapsible Gates.

A very valuable protective device manufactured in a variety of designs and sizes to meet any particular purpose and condition. Collapsible gates are being used very widely for the protection of entrances where it is imperative that the passageway and the wall space shall not be obstructed when the gates are open. They are frequently used in connection with the guarding of machines where the collapsible feature permits easy access for repairing and oiling.

Also used to advantage on delivery trucks and wagons.

In writing for prices and designs state purpose in-



COLLAPSIBLE GATE

tended, also size of opening and whether or not an over-
head track can be used and height the track must clear.

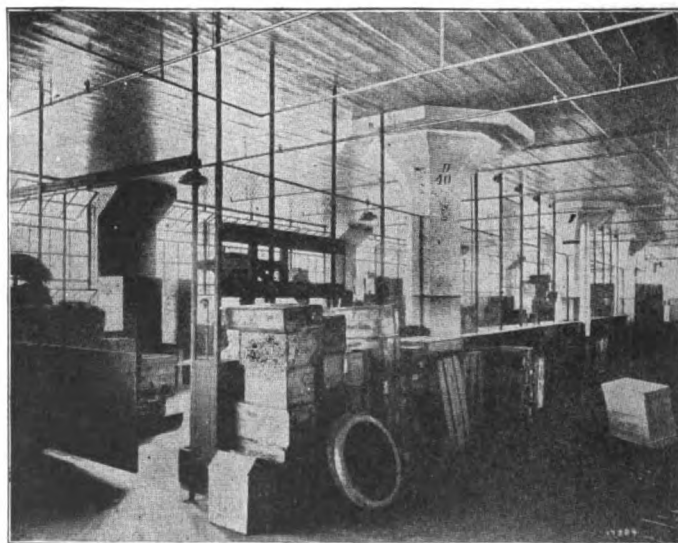
Woven Wire Partitions.

Afford a very economical means of subdividing space in industrial plants. In addition to their low cost they have the advantage of simplifying the lighting, heating and ventilating problems, since they permit the unrestricted passage of light, heat and air. They are easily installed, and any space subdivided can be readily diminished or increased according to the existing requirements, simply by the removal or addition of separate panels. They are neat in appearance, strong, require practically no upkeep, and occupy but very little space in themselves. They afford protection and promote cleanliness and orderliness. Used very extensively for tool rooms, stock-rooms, machine rooms, cashier cages, etc.

These partitions are manufactured in either the square mesh or diamond mesh. The square mesh panel is lower in cost than the diamond, due to the fact that the cloth is machinemade. The diamond mesh is hand woven and is usually preferred where considerations of strength, appearance and durability are important.

Standard panels are 4 by 8 ft., No. 10 wire, 1½-in. mesh, and are interchangeable. These partitions are manufactured to suit requirements. Where desired, the base section can be made of sheet metal with sheet metal countertops. Window and door openings can be arranged to swing or slide in direction desired. The framing likewise can be made of either pipe or structural shapes, depending upon the degree of rigidity required, and the conditions existing.

When writing for prices, send sketch showing the general floor layout, giving approximate sizes; also state height finished floor to ceiling, and the nature of the floor, column and ceiling construction, whether concrete, tile, wood or plaster on metal furring.



WOVEN WIRE PARTITION IN STOREROOM, FORD MOTOR
SERVICE STATION, MILWAUKEE, WIS.

AMERICAN ABRASIVE METALS CO.

Manufacturers of Antislip Treads

TELEPHONE:

CORTLANDT 7444, 7445

Hudson Terminal Building, 50 Church Street
NEW YORK, N. Y.

Products.

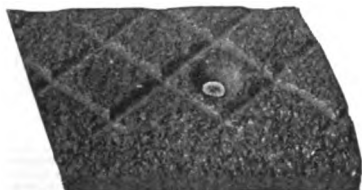
FERALUN and VULCALUN ANTISLIP TREADS.
FERALUN BRAKE SHOES.

Feralun.

A non-porous metal with abrasive grit embedded in the wearing surface to provide an approved durable and effective antislip tread.

This grit, embedded at the time of casting, projects slightly and bites, so that slipping is prevented, and in hardness is excelled only by the diamond. Being firmly held by the metal partly surrounding each grain the abrasive grit gives to Feralun its extreme durability.

Feralun treads are more durable than treads having lead, cement or asphalt as the body. They do not deteriorate through corrosion, as they do not have a steel base.

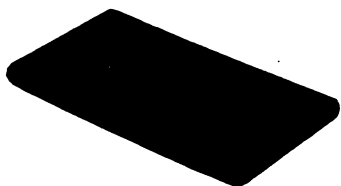


FERALUN ANTISLIP TREAD
Note the antislip nosing and absence of grooves parallel to it

Vulcalun.

A mixture of rubber and abrasive grit vulcanized to a steel reinforcing plate contained entirely within a pure rubber base.

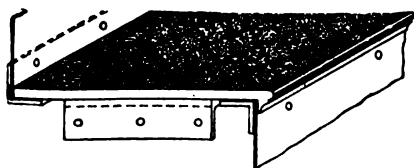
Its outstanding advantages are: (1) High dielectric strength showing no leakage up to 7500 volts and flash over not occurring until 20,000 volts. It is therefore desirable for walkway surfaces around switchboards, etc. (2) Light weight—about 3½ lbs. per sq. ft., making it desirable for elevator car floors, automobile running boards, car steps, etc. (3) Does not corrode and therefore can be used on marble and elsewhere. Is not absorbent and does not disintegrate nor discolor. (4) Is obtainable in any size sheets up to 48 by 24 in.



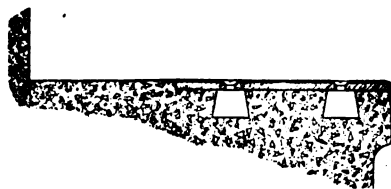
VULCALUN WALKWAY SURFACE

Antislip Stair Treads.

Feralun and Vulcalun antislip stair treads are fire-proof and slipproof, lasting much longer than iron, steel, slate or marble. They have no dangerous, slippery nosing edge or heel catching grooves. A plain or hatched abrasive surface, with the antislip element carried down over the nosing, makes these stair treads unequaled as a preventive of stair accidents.



STYLE "O" FERALUN ONE-PIECE
ANTISLIP TREAD, REQUIRING
NO SUBTREAD



APPROVED CONCRETE STEP CON-
STRUCTION, WITH STYLE "A"
FERALUN INSERT 6 IN. WIDE

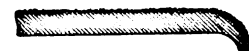


APPROVED METHOD OF REPAIRING
WORN STEPS

SWEET'S CATALOGUE

Sizes and Designs of Feralun.

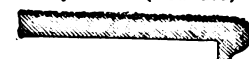
Made in any form in which it is possible to cast metal. Styles "A" and "B" are $\frac{1}{8}$ in. thick. Other designs are made $\frac{3}{8}$ in. thick, but are generally $\frac{1}{2}$ in. or $\frac{5}{8}$ in. thick.



Style "A" (Lipped)



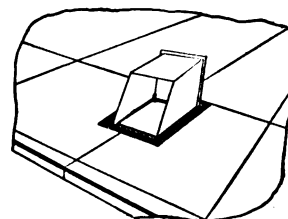
Style "B" (Rounded)



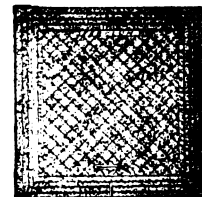
Style "C" (Ornamental)
FERALUN TREAD
NOSINGS

Feralun Approved Coalhole Cover.

The Feralun cover conforms to the new requirements in New York City, and is being rapidly adopted as standard by other municipalities.



Open



Closed

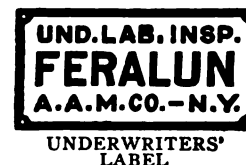
FERALUN SAFETY COALHOLE COVER

Other Forms.

Floor plates, door saddles, trench covers, drainage gratings, and other walkway surfaces, where steel and cast iron have proved unsatisfactory and dangerous by becoming slippery, are made of Feralun and Vulcalun. Slippery sidewalks, ramps and vault lights are made slipproof by Feralun strips, crosses or buttons.

Awards and Approval.

Feralun antislip treads are approved without qualifications as a fire safe and antislip tread by the Underwriters' Laboratories, Inc.

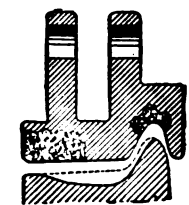


UNDERWRITERS'
LABEL

Feralun Brake Shoes.

Feralun brake shoes not only keep new wheels from double flanging but are the only shoes effectively removing the false flange on worn wheels. This saves the expense of taking off and replacing wheels because of false flanges, turning down tires, temporary loss of engine and wear on frogs and switches.

Made for all standard makes of locomotives and all wheel diameters and widths. Also special sizes and shapes.



SECTION OF FERALUN
BRAKE SHOE
Showing location of
cutting abrasive and
part on wheel flange
to be cut down

AMERICAN MASON SAFETY TREAD CO.

LOWELL, MASS.

BRANCH OFFICES

PHILADELPHIA, PA., 900 Widener Building

KANSAS CITY, MO., 604 Ridge Building

NEW YORK, N. Y., Grand Central Palace, 480 Lexington Avenue

GENERAL WESTERN DISTRIBUTERS: JOSEPH T. RYERSON & SON, CHICAGO, ILL., ST. LOUIS, MO., PITTSBURGH, PA., DETROIT, MICH., MINNEAPOLIS, MINN.

Products.

MASON SAFETY TREAD (lead or carborundum filled); MASON SAFETY TREAD and CORK COMPOSITION; STANWOOD TREAD; STANWOOD STEP and TREAD; KARBOLITH FLOORING; MASON NON-SLIP LADDER SHOES.

Also manufacturers of Mason Safety Sidewalk or Vault Lights, Mason Safety Coalhole and Ash Lift Covers.

Uses of Mason Safety Treads.

These are adaptable to all of the many situations, inside and outside of a building, where the surface with which the foot comes in contact is liable to become slippery.

Manufacturing concerns and others employing labor should equip the stairs of mills, factories and other buildings with Mason safety treads; thresholds of doors and elevators, elevator floors, fire door thresholds, inclined passageways, vestibules, floors around engines or machinery, and elsewhere where there is likelihood of grease or oil deposits. This practice has been observed in many hundred instances.

They are adaptable to granite, marble, slate, cement, iron or wood; to old, partly worn or new surfaces; to straight or curved lines; and can be installed in a building already completed or during the course of construction.

Insurance.

Accident insurance companies expect and demand reasonable endeavor on the policy holder's part toward making the plant safe.

The Accident and Liability Department of the Aetna Life Insurance Co., in their book "Safeguards," refers to Mason safety tread as the proper device for dangerous stairs.

The AMERICAN MASON SAFETY TREAD CO. knows of no case where damages have been claimed for injuries from slipping that has been lost to the defendant when Mason safety treads have been used as a preventive, and the company has a long record of such cases decided in the defendants' favor.

Mason safety treads have been used constantly for many years and 90% of the safety treads in use are Mason make.

Description of Mason Safety Treads.

Metal surfaces devised to provide an absolutely sure footing, to prevent accidents caused by slipping. Not superficial safety surfaces, but of a protective quality coextensive with the life of the tread, and continuously effective during the wearing down process.

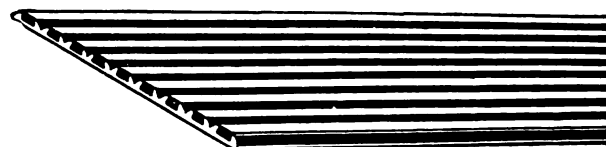
Lead or Carborundum Filled Mason Safety Tread.

Made of rolled steel or extruded hard brass of substantial thickness ($\frac{1}{4}$ in.) with alternate dovetailed and U-shaped grooves. The dovetailed grooves are filled

either with lead or a mixture containing a large proportion of carborundum and other abrasive substances as is desired, and in combination with the open U-shaped grooves produce a surface, the continuous supports of which wear evenly, that can be readily swept or washed out, and whose slip resisting parts remain intact during the entire life of the tread.

With this tread there can be no filling of open grooves from mushrooming or creeping lead, no jagged edges for the retention of filth or germs and no abrasive top dressing to wear off, leaving a polished, dangerous, slip inviting surface.

The efficiency always equals the life in the lead or in the carborundum filled treads.



MASON SAFETY TREAD
Lead or carborundum filled

Standard Sizes—STEEL BASE: Width, $2\frac{1}{2}$, $3\frac{3}{4}$, 4, $4\frac{3}{4}$ and 6 in. flat; 3 in. with nosing or overhang and square back and $3\frac{1}{2}$ in. with nosing and beveled back. These sizes in combination (with the exception of the 3-in. width with nosing having a square back) will produce any desired width. Cut to order with necessary countersunk holes and with anchors when used in connection with cement.

HARD BRASS BASE: Width, 2, $2\frac{1}{4}$, $2\frac{1}{2}$, $2\frac{3}{4}$, 3, $3\frac{1}{2}$, 4, and 6 in. flat; with nosings similar to that of steel base in widths of $2\frac{1}{8}$ and $3\frac{1}{2}$ in. and with deep nosings in widths of 2 and $2\frac{3}{4}$ in. See details on following page.

Mason Safety Tread and Cork Composition.

A combination suited to many interior conditions, particularly to long inclines and corridors. The cork composition is especially tough and springy and has long life under constant traffic.

Strips of cork composition are alternated with strips of lead or carborundum filled Mason safety tread as shown in details on following page.

Combination Mats—Mason safety treads and cork composition in movable sections. These are particularly adaptable to floors under revolving doors receiving a concentrated traffic which show wear quickly. This is particularly unsightly when the doors are removed during the summer.

The sections of these combination mats are interchangeable so that the wear may be equally distributed. Alternate strips are fastened to a heavy backing and the mats are fastened in place by screws.

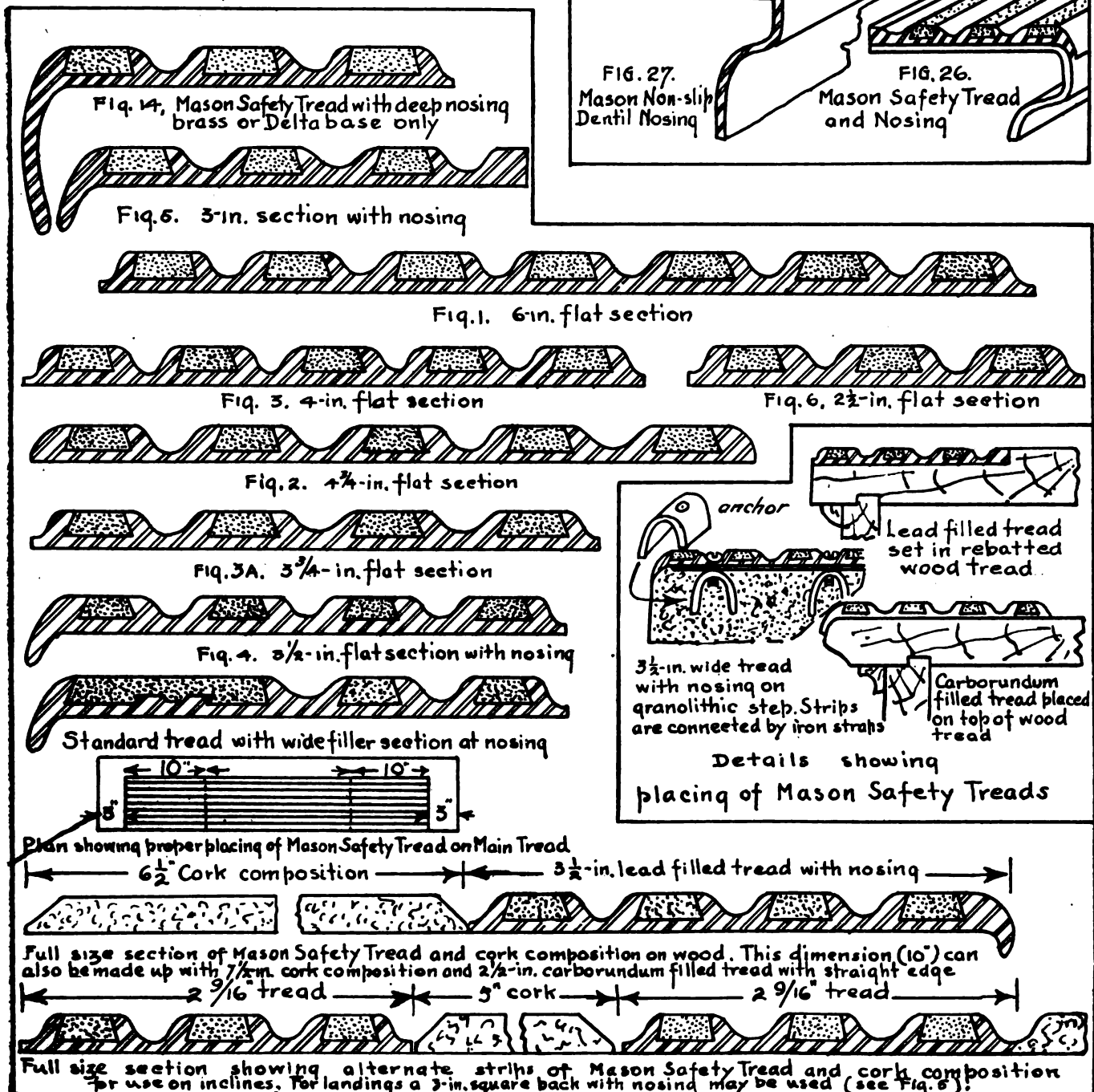
Brass Nosings.

For use in connection with flat strips on Mason safety tread (Figs. 15 and 16). They have also been used in connection with cork composition. Brass nosing (Fig. 20) has a deeper top flange and is used for tile, concrete, Karbolith or other composition treads.

Dentil Nosings.

Furnished in the combination Mason tread and nosing (Fig. 26) the safety tread being welded to a steel plate, or as in Fig. 27, where a carborundum cement filling is firmly secured to a base plate.

The construction of this nosing prevents the foot slipping forward over the extreme edge of the nosing, and sidewise as well, for which anchors are attached as shown in detail below. Both types are especially suited for use with concrete, asphalt, or composition filling.

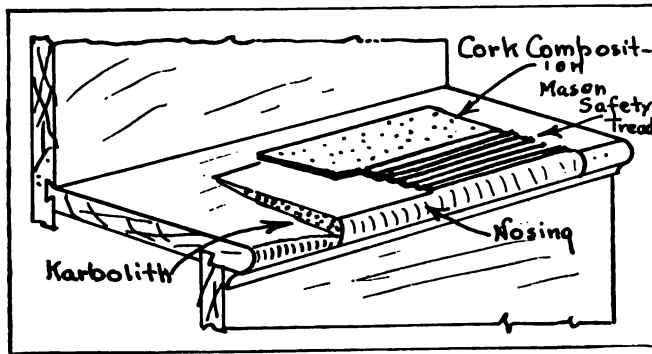


DETAILS OF MASON SAFETY TREAD
(Lead or Carborundum Filled)

Repairing Worn Stairs.

Badly worn stairs are brought to a finished condition by the use of Karbolith filling which forms a bed for Mason safety tread and cork composition. The width of the safety tread is determined by the worn condition of the step. The 3-in. piece with square back is made expressly for this condition.

All evidence of repair is concealed by the use of hard brass nosings (Fig. 16).



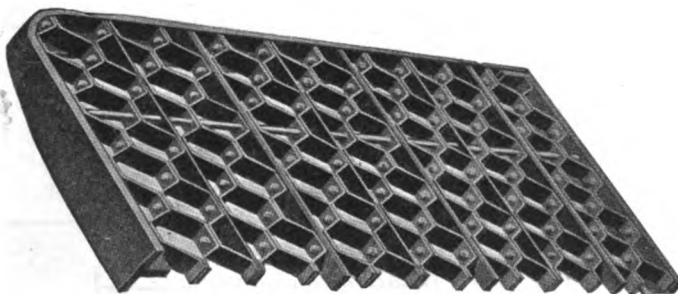
REPAIRING WORN STAIRS

The Hard Brass Type.

The use of Mason safety tread with delta metal or hard brass base has very largely increased during the past few years, as its beautiful appearance, durability, and effectiveness have become apparent. Thousands of square feet have been furnished to the U. S. Navy Department for use on stairs and decks on account of its being non-corrosive under all conditions. It is specially desirable for use on marble stairs. Many installations of this material have been made in bank buildings and restaurants, where its brightness gives a very pleasing effect. All evidences of wear on marble are perfectly concealed by the use of the deep nosing section (Fig. 14) backed by a sufficient width of any flat section.

Stanwood Tread

Very strong, and suitable for hard service where cleanliness and safety are important on stairways to engine rooms, areaways and similar conditions. These were originally designed for cars.



STANWOOD TREAD

Made up of a number of thin strips ($\frac{1}{2}$ and $\frac{3}{8}$ in.) high carbon steel, bent so that when assembled they form a series of openings in the surface of the tread. These strips are assembled and interlocked so that movement is impossible.

Frames, of rolled steel, are provided with a ledge to carry the strips, and rods pass through the frame and steel strips, firmly tying them together. Additional straight strips of steel run lengthwise with the tread for extra support, and sagging is impossible.

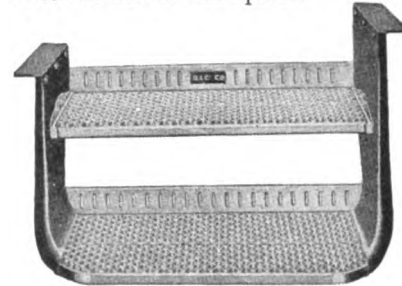
SWEET'S CATALOGUE

Stanwood Step and Tread.

Toe guards are secured to tie rods and riveted to hangers. Hangers are of pressed steel and made in four styles of top suitable for various attachments.

Surface of tread is $\frac{3}{8}$ in. above upper edge of frame and beveled slightly, producing a non-slipping edge.

Made single, double, triple, quadruple or any other style, to order in any size and shape desired. Blank dimension sheets furnished on request.



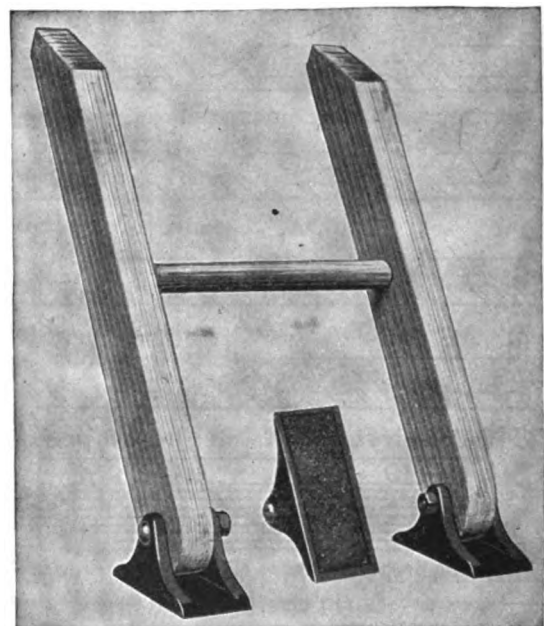
STANWOOD TREAD
Double step type

Mason Non-slip Ladder Shoes.

Accidents frequently occur in factories due to the slipping of ladders. In many instances the person mounted on the ladder is thrown violently to the floor, and such falls often result in serious personal injuries.

The non-slip ladder shoes illustrated below are designed to prevent such accidents. They are indorsed by accident liability companies and recognized by the courts as an efficient safety device.

The base of the shoe consists of a carborundum grit surface possessing exceptional gripping qualities. Note the swivel method of attachment.



MASON NON-SLIP LADDER SHOES
Method of application. Center shows abrasive material in bottom of shoe

Karbolith Flooring.

A composition with a base largely of magnesium that produces a hard, durable surface, proof against rats, fires and germs. It is impervious to heat, cold and dampness and will not chip, crack, tear loose or disintegrate. It can be laid over cement, iron or wood, and binds firmly to the base. We manufacture this material and furnish instructions for installing.

UNIVERSAL SAFETY TREAD COMPANY

NEW YORK OFFICE
120 Liberty Street

40 Court Street
BOSTON, MASS.

FACTORY
WALTHAM, MASS.

REPRESENTATIVES

PHILADELPHIA, PA., R. R. HAMMOND & Co., 417 Widener Building
DETROIT, MICH., HETTS COMPANY, 913 Dime Bank Building
CINCINNATI, OHIO, DARBROW & OTTE, 613 Elm Street
SEATTLE, WASH., S. W. R. DALLY, 332 Pioneer Building
CHICAGO, ILL., RAY P. LEE, 711 First National Bank Building
SAN FRANCISCO, CAL., G. H. TRASK, 76 Sacramento Street

Products.

UNIVERSAL SAFETY TREAD; UNIVERSAL SAFETY LADDER STEP; UNIVERSAL ANTI-SLIP METAL TREAD.

Universal Safety Tread.

Uses—It may be used on wood, iron, concrete or stone; on stairs and inclines in all kinds of buildings; on car-steps and ladders.

Construction—The baseplate is of steel or brass, punched to receive the lead inserts, which are firmly interlocked. By this construction a continuous non-slip wearing surface of lead is presented, reinforced by the steel teeth to insure durability. The baseplate can be extended to form a nosing of any depth required, and the tread made in any widths up to 12 in. in one section.

Rubber Aluminum Treads—This Universal Tread is also manufactured with hard aluminum baseplate and rubber inserts, especially suitable for hotel stairs, car steps and vestibules, elevator platforms, and automobile step plates.

Naval Work—The baseplate can be furnished of special alloy-coated or galvanized iron to resist the action of salt water; or of brass if desired, thereby rendering the tread rustproof.

Anchors—In concrete work special anchors for attaching the treads are furnished.

Universal Safety Ladder Step.

Uses—This step is designed for all types of vessels wherever an all-metal, self-supporting safety tread step is required; as well as for industrial purposes, engine room and powerhouse stairs, etc.

Construction—It is made of Universal Safety Tread plate, galvanized if desired, and stamped from one piece. The front and back edges are flanged down for the purpose of developing great rigidity, and are braced on the inside by iron straps riveted thereto. The ends are folded over, forming a double thickness of metal, through which holes are punched for the bolts that attach the steps to the supporting framework.

This step combines four essential features: non-slip efficiency, strength, light weight and rustproof advantages.

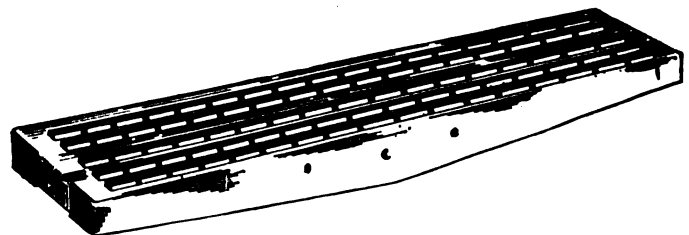
Universal Anti-slip Metal Tread.

Uses—This tread is designed for exceptionally severe wear, as on stairs in subways, sidewalks, etc.

Construction—It is made of Alundum grains, held to the metal base by a binder of lead composition. These abrasive grains give it the highest efficiency as a non-slip surface; and on account of the extraordinary hardness of the mineral, permanence and durability are assured. It can be made with flat or corrugated surface.



UNIVERSAL SAFETY TREAD BEFORE AND AFTER LEAD IS ROLLED IN



UNIVERSAL SAFETY LADDER STEP
Tested to 1000 lbs. center load without deflection



UNIVERSAL ANTI-SLIP METAL TREAD
The most effective and durable safety tread on the market

Advantages—The surface presents no steel whatever to become slippery, as the steel base plate is merely used as a stiffener for the abrasive material. In process of manufacture the tread is lead-coated on all sides, which renders it absolutely rustproof, equal in all respects to a galvanized product.

IRVING IRON WORKS COMPANY

Manufacturers of Grating Flooring and Safety Steps

TELEPHONE:
HUNTERS POINT, 3342

Dutchkill Creek and Third Street
LONG ISLAND CITY, N. Y.

Products.

Sole manufacturers of "IRVING SUBWAY" GRATING FLOORING; "IRVING SAFSTEP" STAIR and LADDER STEPS.

Also manufacturers of "Sunway," "Reticuline," "Eggrate," "Honeycomb," and other forms of Grating. Grating-Flooring, and Grating-Flooring Accessories; Irving Walkways; Metal Accessories for power and industrial plants.

Trade-marks.

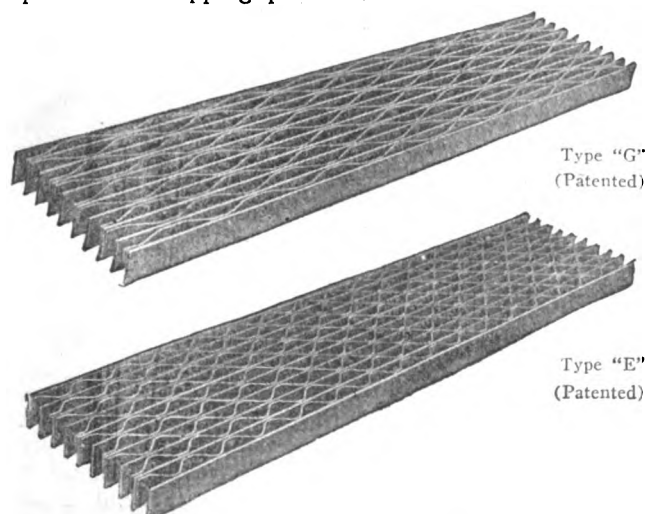
The trade-marks "Subway," "Sunway," "Reticuline," and "Safstep" are registered in the United States Patent Office, are the exclusive property of this company, and can not legally be used in connection with any other grating or grating-flooring product made by any other company.

"Irving Subway" Grating.

Construction—"Irving Subway" consists of a series of light steel bars placed on edge, between each pair of which a reticuline bar is firmly riveted in position. The finished section is a light, inflexible panel embodying the well-known truss principle by which a load applied at any point is distributed over a wide area. Maximum strength is thus secured with the minimum weight. Each section of "Irving Subway" is, in all essentials, a solid unit, in which there is, and can be, no looseness, no play, no rattling.

Types—There are two standard types of "Irving Subway" as illustrated below, differing in appearance and in price, but not in strength or general merit. The rated load capacity is the same for both. Choice between them is to be determined by the factor of size of mesh.

Exclusive Advantages—Maximum strength per unit of weight; minimum weight per unit of load and span; uniform distribution of load by truss construction; maximum lighting and ventilation area (80% of panel area); absolutely non-slipping surface; can not become loose and rattly; oil or grease, age or wear does not impair its non-slipping qualities; small size of individual



TWO STANDARD TYPES OF "IRVING SUBWAY" GRATING

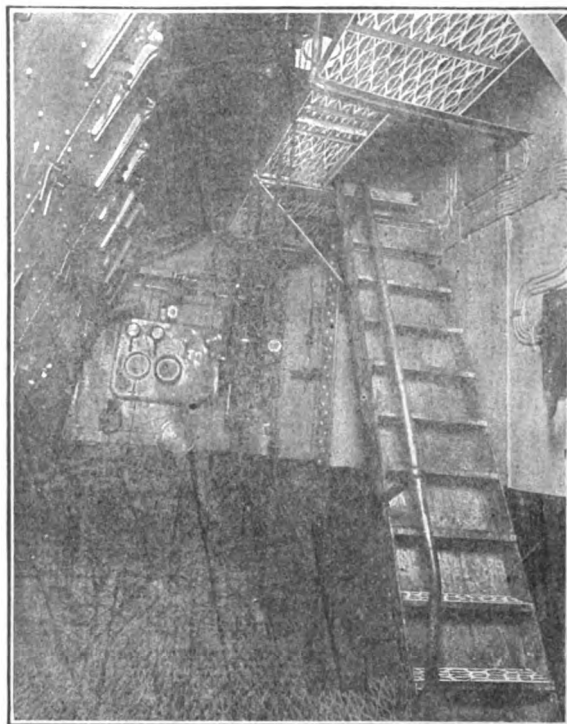
SWEET'S CATALOGUE

TRADE MARK
IRVING SUBWAY
PATENTED
THE FIREPROOF VENTILATING FLOORING

TRADE MARK
IRVING SAFSTEP
PATENTED
ABSOLUTELY NON-SLIPPING ALWAYS

openings (mesh) prevents passage of tools, etc.; wheels or rib-hooped barrels can be rolled over it in any direction without going through; its light weight permits minimum weight and cost of the supporting structure; safe to work under because nothing large or heavy can fall through it; openings for pipes, columns, etc., can be cut out without seriously impairing the strength; easily fitted into corners or formed in irregular shapes; easily mounted or attached to any type of construction without drilling, tapping, bolts or screws.

Applications—Floors, walkways, and galleries in power plants; boiler room floors in oil-fired plants; pump platforms; coverings for turbine pits, pipe trenches, and drainage sumps; floors for mine cages, freight elevators, elevator pent houses, shaft houses; floors and platforms around tanks or vats; charging floors; floors of gas plants and retort houses; a substitute for water cooled plates, affording maximum area; armoring of concrete surfaces; stair and ladder steps, etc.



AN INSTALLATION OF IRVING "SUBWAY" FOR FLOORING, IRVING WALKWAY FOR GALLERIES, AND IRVING "SAFSTEP" FOR STAIRS

"Safstep" Stair and Ladder Steps.

Made entirely of steel, in reticuline construction, these safety steps are light and strong, fireproof, and permanently non-slipping under all conditions—no safety treads to wear out or work loose. Made in fifteen standard sizes. Each unit is self-contained and complete, with carrier plates attached ready for mounting.

Catalogue.

Catalogue No. 3A17, sent on request, gives complete description, load rating, sizes, spans, weights, etc.

MITCHELL-TAPPEN COMPANY

Interlocked Steel Grating and Standardized Metal Caging

15 John Street
NEW YORK, N. Y.

REPRESENTATIVES

BOSTON, MASS., ROBT B. CAMPBELL CO.
PITTSBURGH, PA., FIREPROOF MATERIALS CO.
DETROIT, MICH., A. H. SLOAN COMPANY, INC.

AKRON, OHIO, THE SHAFFER & SON COMPANY
RICHMOND, VA., GENERAL SUPPLY COMPANY
LOS ANGELES, CAL., N. O. FLEMING

Products.

"MITCO" INTERLOCKED STEEL GRATING.
STANDARDIZED METAL CAGING ("S.M.C.").

"Mitco" Interlocked Steel Grating (Pat. Oct. 26, 1915).

Remarkable Strength and Rigidity—"Mitco" Interlocked Grating was developed to meet the demand for a more substantial grating than the ordinary, insecurely bolted or riveted, rattling thimble-and-rod grating.

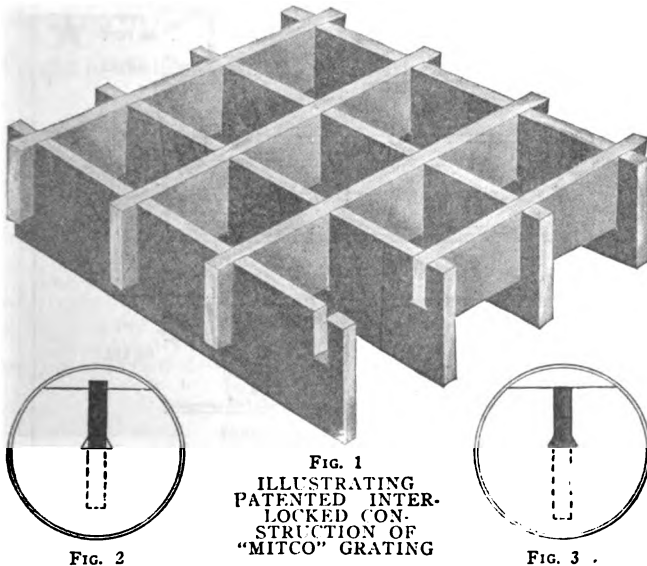


FIG. 1
ILLUSTRATING
PATENTED INTER-
LOCKED CON-
STRUCTION OF
"MITCO" GRATING

Bearing bars are punched with dovetail slots and lateral bars notched and set in place so that they stand about $\frac{1}{8}$ in. above bearing bars as shown in Fig. 2. Grating is then put under a heavy press and lateral bars forced down flush as in Fig. 3. This pressure automatically spreads the metal into laterals, completely filling the dovetail and making a perfect and permanent joint. Grating panels supplied with flush sides when desired.

"Mitco" Grating has exceptional strength and rigidity, due to the patented interlocked construction shown in Figs. 1, 2, and 3. In this construction, the punching of the bars does not affect their carrying capacity, for the dovetail slots are completely filled by the lateral bars being spread out under pressure, and as these slots are above the neutral axis they are always in compression. The original strength of the bearing bars is therefore developed, regardless of the slots. The lateral bars, besides serving as struts, give transverse strength and firmly interlock the whole construction into an integral unit, thus *distributing any concentrated load over the entire section of grating.*

Material used is the best quality open hearth steel. Safe load tables sent on request.

Salient Features—No acute angles to catch and hold dirt and interfere with proper painting.

Built for permanence; no bent bars; no bolts, screws or rivets to become loose and rust; no inaccessible surfaces; no small tie-rods; no long unsupported rods.

Stronger than the unassembled bars and can be made for any shape, form or purpose.

Can be walked upon without discomfort. Trucks, wheelbarrows, etc., can be rolled upon it in any direc-

tion without causing the wheels to enter the spaces or distort the bars.

Window Guards—Made of "Mitco" Grating are ideal. The square or rectangular openings can be laid out to afford maximum security, ventilation and light. "Mitco" Window Guards guard until the entire panel is removed. Their efficiency is not destroyed when one side is cut.

Wide Field of Application—Although originally designed for sidewalk openings over subways, "Mitco" Grating is being extensively used for general ventilating and other purposes in numerous places, a few of which follow:

Powerhouse platforms and floors	Pump platforms
Marine boiler and engine rooms	Turbine pit covers
Elevator floors and pent houses	Register openings
Screens for pump intake wells	Retort houses
Trash racks for dams	Concrete armoring
Floors and platforms in wet places	Vault guards
Ladder steps and stair treads	Charging and gashouse floors
Pipe trenches and sump covers	

"Mitco" Interlocked Grating has been approved by the New York Public Service Commission for use in the New York subway systems. Also used by the largest industrial plants and specified by the most prominent engineers in the country.

Standardized Metal Caging ("S.M.C.") Pat. Dec. 15, 1914.

For fireproofing structural steel. A steel wire basket or cage (Fig. 4) which firmly grips bottom flange of steel member, locking concrete protection to steel, and providing a continuous strengthening skeleton *at a predetermined or fixed offset from the flange.*

"S.M.C." can not "bunch"; it pulls out like a camera bellows, maintaining equal spacing of about 6 in. under middle of beam. It clasps flange tightly at edge, leaving a clear space for flow of concrete along face of flange. When used on girders, columns or deep beams, additional wires of special shape may be used to reinforce the side protection.

Exclusive features shown in Fig. 4. "S.M.C." is ready to use, and can be readily applied by inexperienced labor. Full printed directions furnished.

Caging packed close together, in collapsed sections about 4 ft. long. Easy to handle. All sizes in stock.

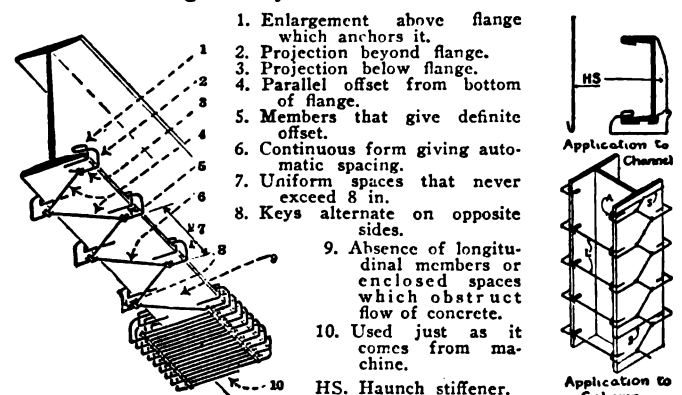


FIG. 4. APPLICATION OF STANDARDIZED METAL CAGING
End wire of section is caught over end of beam, and workman easily holds and pulls out section, which automatically locks it to the structural member. Caution: Stretch out *after* applying.

THE NATIONAL PRESSED STEEL CO.

Producers of Steel Lumber Sections

MASSILLON, OHIO

Products.

STEEL LUMBER SECTIONS, consisting of JOISTS in seven standard sizes for fire-proof floor construction.

Services and Distribution.

The product of this company is distributed through structural steel fabricators and building material yards. Fabricators are located in all important cities and are equipped with stocks of joists and facilities for co-operation with architects, contractors and owners in planning and designing fireproof structures of all types.

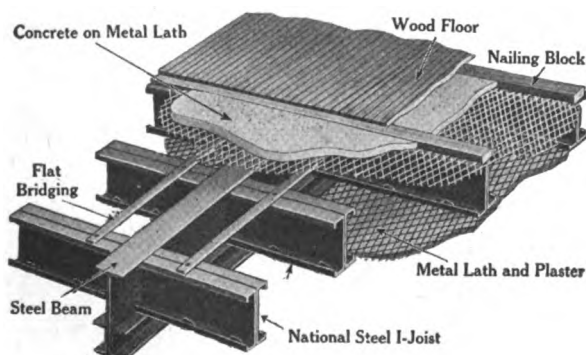
National Steel Lumber Sections.

National steel lumber sections are the result of intimate first-hand knowledge of the steel lumber industry. The salient points of every phase of the industry have been given full consideration. The result is a co-ordination of the various features applying from every angle in a section design that is basic in its economy and efficiency.

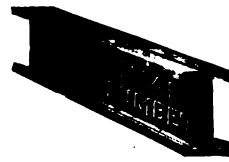
The process of manufacturing the steel and forming the product as embodied in this company's mill is the best that engineering ability and mechanical facilities can produce. The analysis and working of the steel are such that the greatest advantages are secured in quality and strength.

Uses—Steel lumber was designed primarily to take the place of wood joists and studs in floor and partition construction. It results in a light weight, fireproof and indestructible building.

Material—National steel lumber is made from a high quality basic open hearth steel, rolled from a slab to the finished product in the company's own mills

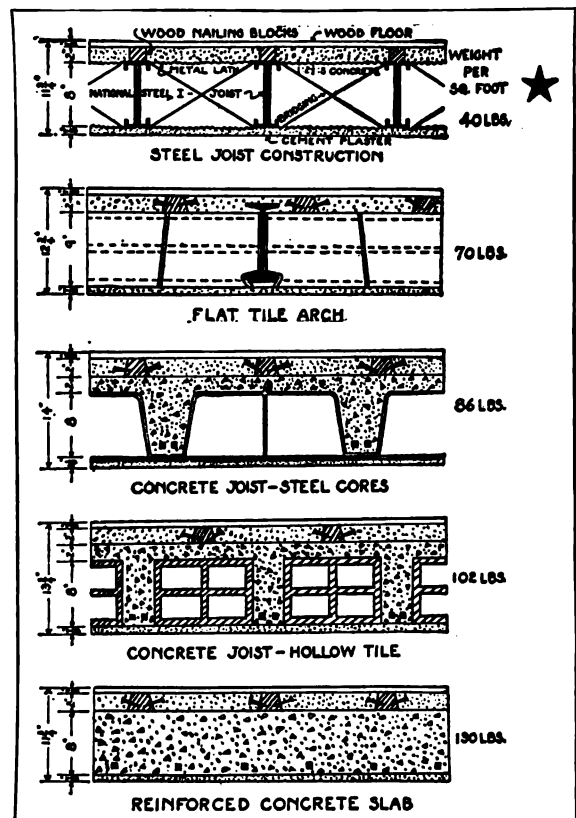


STEEL JOIST FLOOR CONSTRUCTION
Supported by rolled steel beam and resting on shelf angle

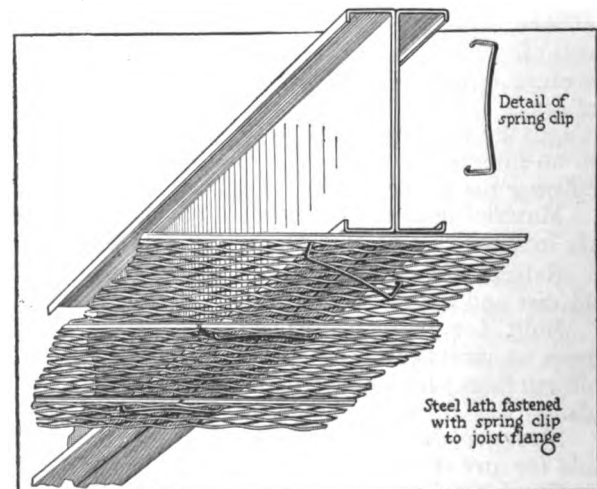


TRADE-MARK

under expert supervision and inspection. After the strip is thoroughly cooled, it is then formed into the section, which insures uniformity, eliminating the possibility of distortion due to internal stress if subjected to high temperature.



COMPARISON OF WEIGHT PER SQUARE FOOT
Various fireproof floor constructions worked out for same loading and span



SPRING CLIP AND DETAIL SHOWING CLIP'S APPLICATION

Strength—The strength of National steel lumber is ample for the purpose intended—all tables being computed on the basis of a safety factor of 4 with a fiber stress of 16,000 lbs. per sq. in. On account of the uniformity of the thickness of the section and the uniformity of the steel contained therein, a maximum strength is obtained at comparatively high temperatures.

Designing Data.

All safe loading tables shown assume a simple beam condition using Bending Moment $\frac{wl^2}{8}$. Tables showing square foot floor area loading are corrected for deflection and none of the given loadings will cause a deflection exceeding $1/360$ of the span. Where joists are supported on masonry walls a minimum bearing of at least 4 in. should always be provided. When supported on rolled steel sections a minimum bearing of $2\frac{1}{2}$ in. should be provided. Steel joists to be placed in a true perpendicular position and the floor and ceiling lath securely fastened by nails or clips.

Weight of National Steel Lumber Floors.

	Weight per sq. ft.
Wood flooring.....	3 lbs.
$1\frac{3}{4}$ in. concrete.....	21 lbs.
National steel joists (average).....	3 lbs.
Plaster ceiling.....	7 lbs.
Total.....	34 lbs.

The above total weight per square foot of steel joist floor construction is based on a wood floor finish. For other types of finish make proper correction.

The total dead weight will not exceed 40 lbs. per sq. ft. for any standard design of steel joist construction.

PROPERTIES OF NATIONAL STEEL I-JOISTS



Depth, in.	Weight per ft., lbs.	Area of section, sq. in.	Thick-ness of metal, in.	Width of flange F-in.	A-A			B-B		
					I	S	r	I	S	r
4	3.50	1.04	.072	3.00	2.50	1.25	1.55	.48	.32	.68
5	4.00	1.19	.072	3.00	4.25	1.70	1.89	.48	.32	.63
6	4.50	1.33	.072	3.00	6.59	2.20	2.22	.48	.32	.60
7	5.25	1.55	.072	3.50	10.48	3.00	2.60	.72	.41	.68
8	6.00	1.76	.072	4.00	15.60	3.90	2.97	1.04	.54	.77
9	7.00	2.04	.077	4.00	22.13	4.92	3.30	1.10	.56	.74
10	8.00	2.36	.083	4.00	29.84	5.97	3.58	1.19	.59	.71

I—Moment of inertia.
S—Section modulus.
r—Radius of gyration.

NATIONAL STEEL I-JOISTS

Total safe load in lbs., uniformly distributed for National Steel Floor Joists. Safe loads below are figured for fiber stress of 16,000 lbs per sq. in., and include weight of joists.

For loads below horizontal lines, deflection will be greater than the allowable limit for plastered ceilings. ($\frac{1}{16}$ of the span.)											No deflections greater than $\frac{1}{16}$ of the span produced by the given safe loads.										
Size	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.
Weight	3.50	4.00	4.50	5.25	6.00	7.00	8.00	3.50	4.00	4.50	5.25	6.00	7.00	8.00	3.50	4.00	4.50	5.25	6.00	7.00	8.00
6	2222	3022	3912					2222	3022	3912					2222	3022	3912				
7	1905	2590	3353					1905	2590	3353					1905	2590	3353				
8	1667	2266	2933	4000				1667	2266	2933	4000				1667	2266	2933	4000			
9	1470	2015	2608	3555	4620	5820		1470	2015	2608	3555	4620	5820		1470	2015	2608	3555	4620	5820	
10	1333	1813	2347	3200	4150	5240	6350	1075	1813	2347	3200	4150	5240	6350	1075	1813	2347	3200	4150	5240	6350
11	1215	1650	2134	2909	3770	4760	5780	887	1505	2134	2909	3770	4760	5780	887	1505	2134	2909	3770	4760	5780
12	1110	1510	1956	2667	3455	4370	5300	743	1266	1956	2667	3455	4370	5300	743	1266	1956	2667	3455	4370	5300
13	1020	1395	1805	2461	3190	4030	4880		1080	1689	2461	3190	4030	4880		1080	1689	2461	3190	4030	4880
14	950	1295	1675	2285	2962	3745	4530		931	1445	2285	2962	3745	4530		931	1445	2285	2962	3745	4530
15		1210	1562	2130	2767	3492	4230			1261	2000	2767	3492	4230			1261	2000	2767	3492	4230
16		1133	1465	2000	2595	3275	3970			1110	1762	2595	3275	3970			1110	1762	2595	3275	3970
17		1068	1380	1880	2447	3081	3740				1564	2325	3081	3740				1564	2325	3081	3740
18		1008	1302	1775	2312	2911	3530				1389	2062	2911	3530				1389	2062	2911	3530
19			1232	1682	2188	2759	3340					1860	2641	3340					1860	2641	3340
20			1172	1600	2078	2620	3170					1665	2380	3170					1665	2380	3170
21				1520	1980	2495	3070						2158	2880						2158	2880
22				1450	1888	2380	2885						1970	2640						1970	2640

NATIONAL STEEL I-JOISTS

Safe loads in lbs. per sq. ft. of floor area. Weight of floor construction included. Fiber stress not exceeding 16,000 lbs. per sq. in. No deflections greater than $\frac{1}{16}$ of the span produced by the given loads.

Clear span in ft.	Joists spaced 12 in. on centers								Joists spaced 15¾ in. on centers								Joists spaced 19 in. on centers								Joists spaced 23½ in. on centers								Clear span in ft.			
	Size	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	Size						
	Weight	3.50	4.00	4.50	5.25	6.00	7.00	8.00	3.50	4.00	4.50	5.25	6.00	7.00	8.00	3.50	4.00	4.50	5.25	6.00	7.00	8.00	3.50	4.00	4.50	5.25	6.00	7.00	8.00	Weight						
6	370	505	653						282	382	496					234	318	412					189	257	332					6						
7	272	370	478						207	282	365					172	234	302					139	189	244					7						
8	208	284	367	500					158	216	279	381				131	179	236	316				106	145	187	255				8						
9	148	224	290	396	513	650	785		113	170	221	300				94	141	183	250				76	114	148	201	262	332		9						
10	108	181	235	320	415	524	635		82	138	179	244	316	399	483	68	114	148	202	262	351	400	55	93	120	163	212	268	324	10						
11	81	137	194	264	343	433	525		62	104	148	201	261	330	400	51	87	123	167	216	273	332	41	70	99	135	175	221	268	11						
12	62	105	163	222	288	364	442		47	80	124	169	219	277	336	47	77	113	157	206	265	324	34	61	87	123	163	212	268	12						
13		83	130	190	246	310	376		36	63	99	144	187	236	286	36	63	99	144	187	236	286	28	50	71	101	137	186	232	13						
14			103	163	218	268	324		27	47	78	124	166	204	247	27	47	78	124	166	204	247	22	38	54	76	104	141	188	14						
15			84	133	184	233	282		20	34	56	84	116	147	178	20	34	56	84	116	147	178	17	26	38	54	76	104	141	188	15					
16			69	110	164	204	248		15	25	41	68	105	137	168	15	25	41	68	105	137	168	14	21	31	45	64	90	122	16						
17				92	137	181	220		11	18	29	47	70	105	137	168	11	18	29	47	70	105	11	17	25	36	51	70	93	117	17					
18				77	115	162	196		8	13	21	35	58	88	123	149	8	13	21	35	58	88	8	12	18	26	37	51	70	93	18					
19					98	139	176		6	10	17	28	45	75	106	134	6	10	17	28	45	75	6	9	13	19	27	38	50	71	90	19				
20					83	119	159		4	7	12	20	33	55	81	105	4	7	12	20	33	55	4	6	9	13	19	27	38	50	71	90	20			
21						102	137		3	5	9	15	24	39	54	76	3	5	9	15	24	39	3	4	6	9	13	19	27	38	50	71	90	21		
22						90	120		2	4	7	12	19	30	43	58	2	4	7	12	19	30	43	2	3	5	8	11	15	21	27	38	50	71	90	22



PRACTICAL APPLICATION OF NATIONAL STEEL LUMBER SHOWING RIGID CONSTRUCTION



STEEL LUMBER SECTIONS READY FOR ERECTION

ACORN WIRE AND IRON WORKS

Unit Sectional Wire Partitions, Wire Cages and Wire Window Guards

TELEPHONE:
NORMAL 1895

5908 Lowe Avenue
CHICAGO, ILL.

Products.

Manufacturers of ACORN UNIT SECTIONAL WIRE PARTITIONS for industrial uses; WIRE CAGES for cashiers, bookkeepers, etc.; WIRE WINDOW GUARDS.

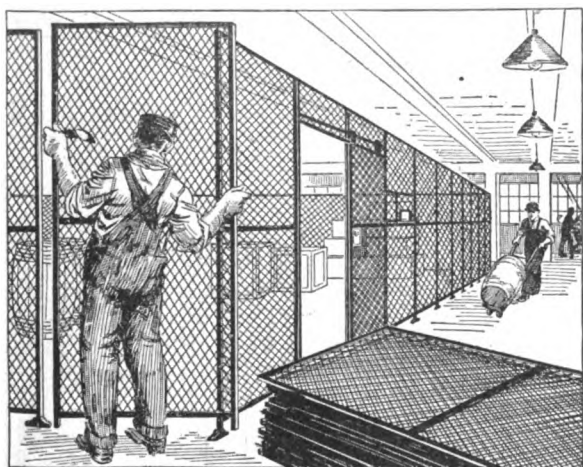
Also manufacturers of Skylight Guards, Machinery Guards; Elevator Enclosures, Wickets and Grilles; Railings for Stairs, Porches, Balconies and Windows; Area Gratings and Sidewalk Doors; Wire Signs and Collapsible Folding Gates.

Acorn Unit Sectional Wire Partitions.

They provide the security of a wall, yet obstruct neither light nor air; eliminate loss of tools and supplies, and do away with petty thievery. Where partitions divide departments into working units there is less friction between workers. They give systematic effectiveness—the aim of every factory executive.

Every section is a complete standard unit. They are easily installed by the least skilled laborer, easily changed to meet new conditions.

The diamond mesh construction guarantees strength and endurance.



ACORN UNIT SECTIONAL WIRE PARTITIONS

Specifications—MATERIAL—Panels and doors made of No. 10 ($\frac{1}{8}$ -in.) steel wire, $1\frac{1}{4}$ -in. diamond mesh with 1 by $\frac{1}{2}$ -in. channel stiffening framing. Top stiffening bars consist of $1\frac{1}{2}$ -in. channel capping, extending from center of one panel to center of next, in this way breaking joints.

SIZE OF PANELS—Standard panels are 5 ft. wide, 7 ft. and 8 ft. high. Special panels made any width or height necessary. When necessary, cut-outs or irregular shapes furnished to fit around pipes or other obstructions.

Doors—Made to slide or swing. Standard doors are 3 or 4 ft. wide, 6 ft. 6 in. high with transom panel overhead. Special sizes supplied when necessary.

Locks—Unless otherwise specified, doors are equipped with cylinder locks, but when required are equipped with hasp and staple for padlock at reduced price. Can also be master keyed.

SELF-CLOSING FEATURE—Sliding doors up to 4 ft. wide can be made self-closing without extra cost, but will be furnished only when specified.

SERVICE WINDOWS—Service windows may be had with or without small doors or shelves. When doors are wanted they are usually equipped with secret lock or padlock attachments. In ordering specify which is preferred.

CORNER POSTS—1 by 1 by $\frac{1}{8}$ -in. angle steel posts are used at corners; no posts are required at ends or gates because framing channels are used as such.

ERECTION—Panels are bolted together, the two framing channels forming a post 1 in. square; this is fastened to floor by means of cast iron shoe. After they are bolted together the capping bar is applied—always lapping joints. Door sections carry same outer framing as panels and are installed by same method. No experience necessary.

Special Partitions and Enclosures—Wire partitions of any height or specification to meet every requirement furnished to order.

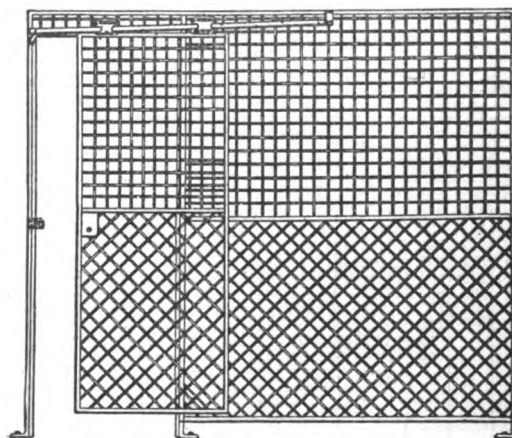
How to Order—When ordering or asking quotations furnish sketch or state quantity and size of panels and door sections wanted; also whether sliding or swinging doors are wanted and whether equipped with cylinder locks or hasps for padlocks.

Wire Cages for Cashiers, Bookkeepers, etc.

Upper part of No. 43 wire enclosure is made of flat or square wire, square mesh; lower part of round wire, diamond mesh. Doors equipped with cylinder locks that open with key from outside and latch from inside.

When ordering or writing for prices, state whether doors are to be sliding or swinging, also whether hand openings, etc., are wanted.

Usually made 7 ft. high, but can be made any height desired; can also be made with roof. This design can be



NO. 43 WIRE ENCLOSURE

furnished in round wire throughout at slight reduction in cost.

Send sketch showing size, location of doors, etc.

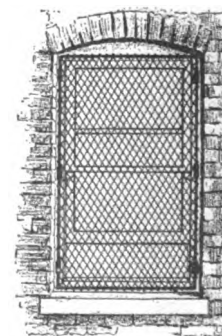
Wire Window Guards.

They permit the opening of windows for ventilation with little danger of burglary or damage to material or tools, and safeguard windows against accidental or intentional breaking.

Made of $1\frac{1}{2}$ -in. diamond mesh, with frames of $\frac{5}{16}$ -in. round or $\frac{3}{4}$ -in. channel steel. Finished in black japan. Also furnished in other wires and meshes. Channel frames fit in opening; round steel frames allow $\frac{3}{4}$ in. on all sides for fastening.

Catalogues.

Furnished on request.



WINDOW GUARD

AMERICAN FENCE CONSTRUCTION CO.

Woven Wire Fences and Iron Railings

GENERAL OFFICES

96-102 Church Street
NEW YORK, N. Y.

TELEPHONE:

BARCLAY, 6753-4

Products.

Manufacturers of and contractors for AFco WIRE LINK STEEL FENCING and AFco SOLID WROUGHT IRON PICKET and ANGLE IRON PICKET RAILINGS for mills and factories, institutions, public grounds, railway terminals, etc.; IRON GATES and GATE POSTS.

Also manufacturers of Woven Wire Fencing of Regular or Non-climbable types, Window Guards, Machinery Guards, Tool Room Enclosures, Wire or Iron Lawn Fences and Gateways, Tennis Court Enclosures, etc.

Co-operative Service and Information.

Fencing for any factory or institution presents its own peculiar problems. The designing and estimating departments of this company have been meeting such problems for years, and to supplement their work the services of district representatives are available in many points throughout the Eastern, Central and Southern States without charge.

For information about any items mentioned in the products paragraph but not shown on these pages, send for the complete Afco factory fence catalogue.

Erection.

This company does all the erection work for a large percentage of its fence output. A well equipped construction force is maintained, but when erection is not desired, shipments of materials are accompanied with instruction drawings and setting plans showing proper method of erecting, insuring mechanical workmanship in every detail.

Standardized Afco Factory Fences.

Types 1103 with top rail, and 1003 without top rail, as illustrated, are standard and carried in stock in heights of 7 and 8 ft. over all, the wire fabric being a 2-in. mesh of either No. 9 (medium weight) or No. 6 (heavy weight).



TRADE-MARK

Special heights up to 12 ft. can be furnished with various sizes of wire or mesh, either larger or smaller than standard.

The execution of all special orders is subject to delay, and will take advanced costs, depending on the particular order.

End, Corner and Gate Posts—In Afco fences these posts are made of unusually heavy tubular sections (see Specification data).

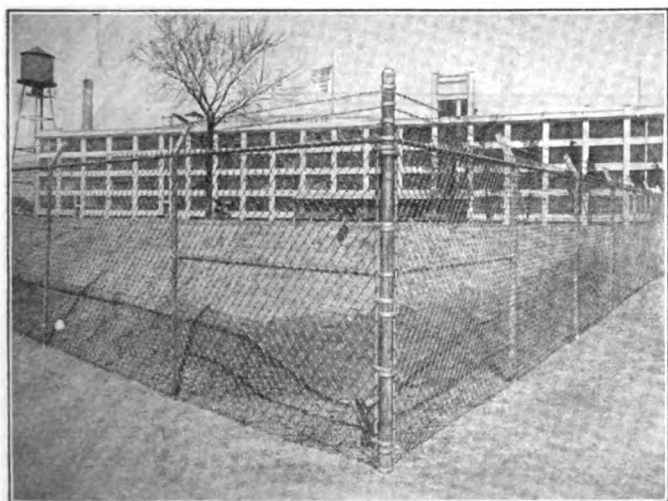
Line Posts—The backbone of any fence is its line posts. For that reason the standard spacing for line posts in Afco fences is 8 ft.

These line posts are 2 by 2-in. high carbon steel angles, having a wall thickness of $\frac{1}{4}$ in., with integral arm for carrying the barbed wire overhang. For fences with top rail such as type 1103, one leg of the angle is punched for the rail to pass through. Thus all bolted parts or slipover fittings are eliminated, and the framework can not be broken down or dismantled after having been assembled.

Wire Link Fabric—Afco wire link is made of galvanized wire, carrying 70 lbs. of spelter per ton, nearly double the quantity used on ordinary galvanized wire. After weaving, this fabric receives a special oil treatment which further increases its rust resisting qualities.

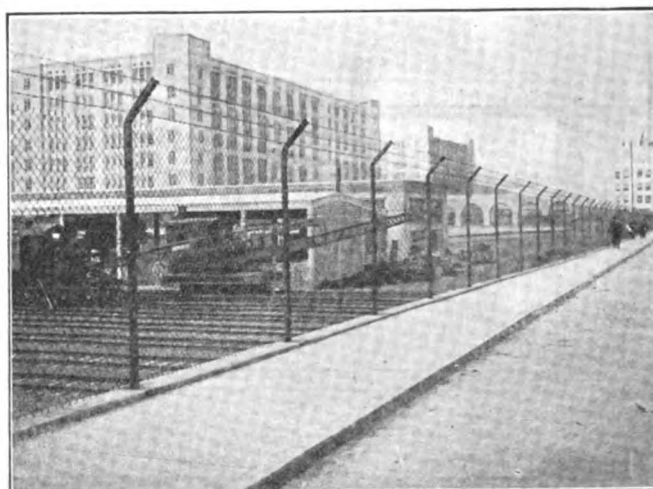
Galvanizing—In Afco fences with galvanized framework the galvanizing is done by the hot dip process *after fabrication*, covering all cut ends, punched holes, etc. No raw metal is left exposed. All bolts used are hot dip galvanized, the threads not being recut, a radical departure from the method in common practice.

Post Footings—Afco fences are erected with posts set in concrete. Contrary to common opinion this costs no more than other methods of anchoring posts, insures permanent alignment of the fence, and preserves the steel underground.



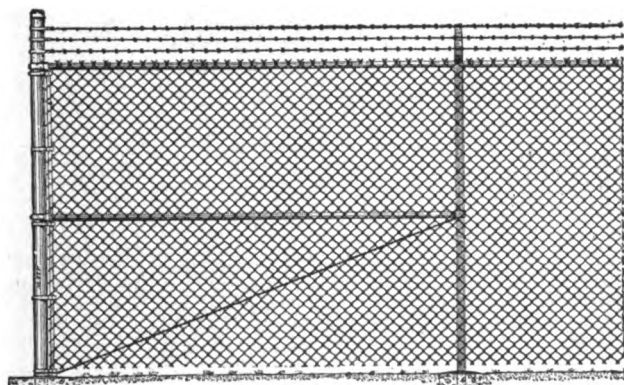
TYPE NO. 1103 AFco WIRE LINK FENCE WITH TOP RAIL

Fence 7 ft. high over all, enclosing plant of E. R. Durkee & Co. Entire framework galvanized, and all posts set in concrete footings. Fabric is 2-in. mesh of No. 6 wire

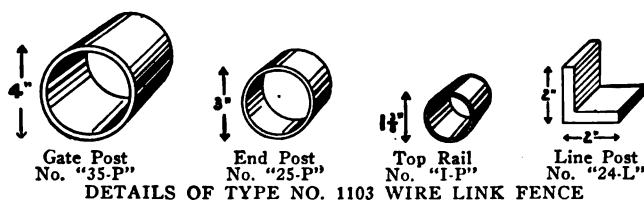


TYPE NO. 1003 AFco WIRE LINK FENCE WITHOUT TOP RAIL

Fence 8 ft. high over all enclosing Army Supply Base buildings. Posts are galvanized and grouted 12 in. into concrete wall. Fabric is 2-in. mesh of No. 9 wire. For this particular piece of government work the barbed wire overhang was flared out instead of in, the inward flare being the usual procedure



DETAILS OF TYPE NO. 1103 AFCO WIRE LINK FENCE
Showing method of bracing at ends. Standard stock heights 7 and 8 ft. Other heights up to 12 ft. can be furnished



DETAILS OF TYPE NO. 1103 WIRE LINK FENCE

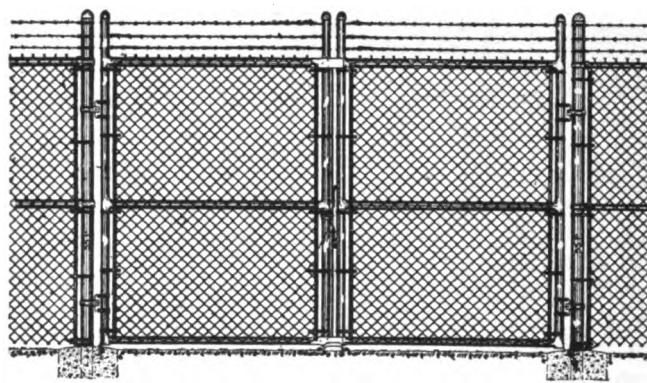
Gates—Afco swing gates are made with tubular frames, acetylene-welded at all intersecting joints. Heavy offset hinges are furnished, which allow the gate to open flat against the fence. Non-freezing gate stops insure positive locking under all conditions. Locking device is operated by eccentric lever which provides for both top and bottom fastening. Padlock attachment is so arranged that padlock is accessible from either side of fence; no chains required.

When conditions do not permit the use of swinging gates, a counterbalanced sliding gate can be furnished in any width up to 14 ft. single, or 28 ft. double. These gates do away with the cumbersome overhead track and are much easier to operate than that type.

Specification Data Afco Factory Fence.

Posts—End and corner posts 3-in. outside diameter. Gate posts 4-in. outside diameter wrought pipe with horizontal pipe braces and 2-ply No. 7 galvanized wire truss cables.

Line posts Afco 1-piece angle, with integral arm, to be spaced 8 ft. apart, set 3 ft. below grade. Galvanized or painted.



DETAILS OF AFCO SWINGING GATE

Frames are 1 9/10-in. tubular, all joints acetylene-welded. Adjustable hinges to allow for full swing. Locking device and center stop. Standard sizes: single, 4, 6, 8 and 10 ft.; double, 12, 14, 16, 18 and 20 ft.

Top Rail—Tubular 1 3/8-in. outside diameter wrought pipe. When desired a 1 9/16-in. rail can be substituted, and line posts spaced 10 ft. instead of 8 ft. apart—8-ft. spacing recommended. Fences without top rail to have two courses of No. 7 coiled steel supporting wires stretched top and bottom.

Gates—Single swing, 4, 6, 8 and 10-ft.; double swing, 12, 14, 16, 18 and 20-ft. (greater widths are special); overhead track and counterbalanced sliding types, sizes special. Frames are 1 9/10-in. tubular, all joints welded.

Fabric—Galvanized wire link, triangular mesh, or honeycomb mesh (Afco wire link 2-in. mesh No. 6 wire recommended for severer services). [Give height and size of mesh.]

Barbed wire overhang 4-point, thick-set galvanized, three or more courses.

Galvanizing—All posts and their fittings to be hot dip galvanized after fabrication.

Galvanized bolts to be used in assembling. (Threads not recut.)

Painting—When galvanizing is not specified for framework, paint 1 shop coat, also 1 field coat before galvanized wire fabric is attached.

Erecting—Set all posts in concrete footings (ordinarily 3 ft. deep); area for end, corner and gate posts not less than 15 in. in diameter, and for line posts not less than 10 in.

Notable Afco Factory Fence Installations.

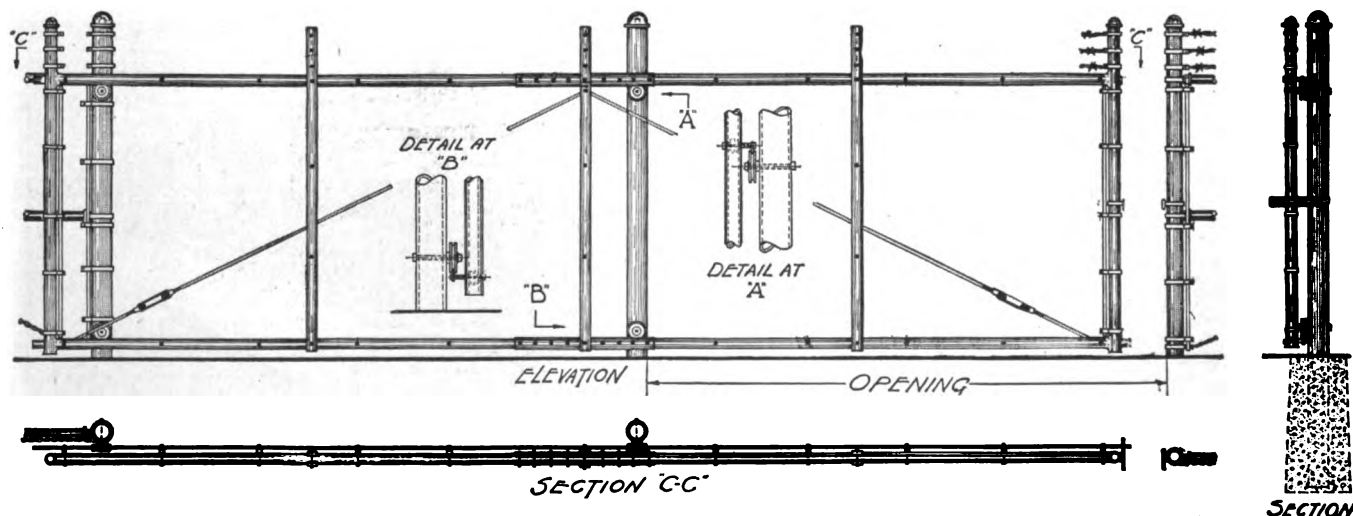
The Afco organization is national in its scope, having furnished and erected industrial fences for such concerns as:

Standard Oil Co.

Armour & Co.

The Barrett Co.

A list of the leading users of Afco fence will be sent anyone on request.



DETAILS OF COUNTER-BALANCED SLIDING GATE

Frame is 1 9/10-in. tubular with welded corners. Gate is operated on four rollers attached to adjacent posts as shown. Opens half its length. Made in single widths up to 14-ft. opening, double widths up to 28-ft. opening. Designed to overcome the use of overhead track and supporting structure. Operates with great ease—can not get out of order

Afco Wrought Iron Fences and Gates.

Illustrations show the 3 leading types of wrought iron fences and gates designed by this company for factory enclosures.

Afco factory fence catalogue showing various other designs, also methods of installation, and containing much valuable information, will be mailed on request.

No. 325 Special Iron Picket Fence.

In connection with simplicity and great strength, this design incorporates low erection cost by virtue of the panels being made in 10-ft., instead of the ordinary 8-ft. lengths. This reduces, by 20%, the number of holes to dig, posts to set and panels to hang.

Specifications—Pickets $\frac{3}{4}$ -, $\frac{7}{8}$ -, or 1-in. square wrought iron. Rails 2 by 2 by $\frac{1}{4}$ -in. angles, or 2 by 1 by $\frac{1}{8}$ -in. channels. Line posts 3-in. I-beam, $5\frac{1}{2}$ -lb. section for heights up to 6 ft.; $7\frac{1}{2}$ -lb. section for greater heights. No back bracing required with these posts. Posts set 18 in. into concrete footings which extend not less than 36 in. below grade. Panels 10 ft. long equipped with heavy center supports.

No. 152 Iron Picket Fence.

Similar in general to design shown on top of page, except that in this fence there are 3 horizontal rails of 2 by $\frac{5}{8}$ -in. solid iron, and the entire work stands on a concrete coping. Line posts enter concrete 12 in.

Angle Picket Railing.

The vertical members in this design are high carbon steel angles instead of solid bars, making a difference of about 25% in weight with a consequent reduction in cost. This reduction in weight makes it practical to rust-proof this type of fence by hot dip galvanizing in panels after fabrication. No painting is then required.

Specifications—Pickets 1 by 1 by $\frac{1}{8}$ -in. angles on 5-in. centers, or $1\frac{1}{4}$ by $1\frac{1}{4}$ by $\frac{1}{8}$ -in. on 6-in. centers. Rails 2 by 2 by $\frac{1}{8}$ -in. angles. Line posts, regular adjustable picket post with back supporting brace and cast iron ground base, or 3-in. standard I-beam section to set in concrete. Panels 8 ft. long equipped with center supports.

Special Gates.

Massive iron gates at the main factory entrance are decidedly attractive. They can be used in connection with wire as well as iron fence without greatly increasing the cost. The view shown herewith is a good example of what can be accomplished.

In this instance massive brick piers were used, ornamented at the top with specially designed lamps. Width of gates 20 ft. Height at center 7 ft. 6 in.

Note ornamental panel effect at center and on each side.

The extreme width of these gates was made necessary owing to the driveway entering at an acute angle.

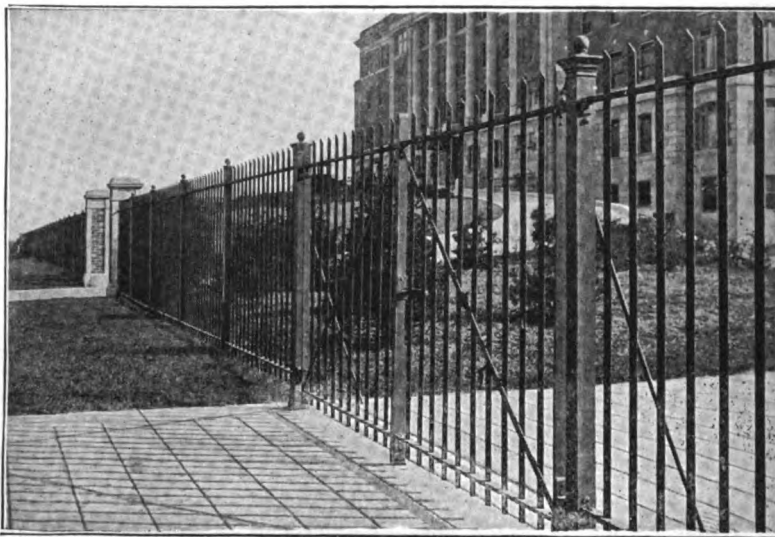
Many other designs showing factory gate installations can be submitted.



NO. 325 WROUGHT IRON RAILING, 7 FT. HIGH
Posts are $7\frac{1}{2}$ -lb. I-beam section set in concrete. Pickets $\frac{3}{4}$ -in. square, set diagonally. This fence can be furnished in all heights from 4 ft. up to 8 ft.



NO. 152 IRON PICKET FENCE, 6 FT. HIGH, ENCLOSING PLANT OF THE CROWN MFG. CO., PAWTUCKET, R. I.
Pickets $\frac{3}{4}$ -in. square, set square. Horizontal rails 2 by $\frac{5}{8}$ -in. solid. Posts are $5\frac{1}{2}$ -lb. I-beam section, ornamented with pineapple heads



ANGLE PICKET FENCE AND GATES, 6 FT. HIGH, ENCLOSING PECK MEMORIAL HOSPITAL GROUNDS, BROOKLYN, N. Y.
At a distance of only a few feet this fence has the appearance of an unusually massive solid picket fence



SPECIALLY DESIGNED WROUGHT IRON FACTORY ENTRANCE GATES, MAIN DRIVEWAY ENTRANCE TO BAER BROTHERS PLANT, STAMFORD, CONN.

ANCHOR POST IRON WORKS

Manufacturers of Wire Fences, Iron Railings and Entrance Gates

OFFICES AND SALESROOMS

TELEPHONE:

CORTLANDT 4886-7-8-9

167 Broadway
NEW YORK, N. Y.

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MINEOLA, L. I., N. Y., Jericho Turnpike

CHICAGO, ILL., Hartford Bldg.

CLEVELAND, OHIO, Guardian Bldg. GREENVILLE, S. C.

PITTSBURGH, PA., Jenkins Arcade

FACTORIES: GARWOOD, N. J., and CLEVELAND, OHIO

Products.

ANCHOR POST CHAIN LINK WOVEN STEEL and MESH FENCES and GATES; WOVEN WIRE FENCES; ANCHOR POSTS; PICKET RAILINGS; ELECTRIC WELD IRON RAILINGS and GATES for factories, water companies and railroads; WIRE FENCES and ELECTRIC WELD SLIDING and SWINGING GATES for country and suburban homes; WROUGHT IRON and WIRE WINDOW GUARDS; INTERTRACK FENCES.

Also Area and Sidewalk Gratings.

Engineering and Erecting Service.

ANCHOR POST IRON WORKS has been called upon, by many industrial corporations and railroads, to design fences to meet a wide variety of conditions. The



TRADE-MARK

experience thus acquired is offered for the solution of problems.

At New York, and also at the several branches, is maintained a force of men skilled in putting up our fences and in solving construction problems. When a customer prefers to erect a fence, instructions and necessary tools are furnished.

Information Required for Estimates.

In writing for prices or ordering, draw a simple diagram showing length of fence lines; location of gates, corners and ends; width of gate openings, single and double. State whether ground is level or graded.

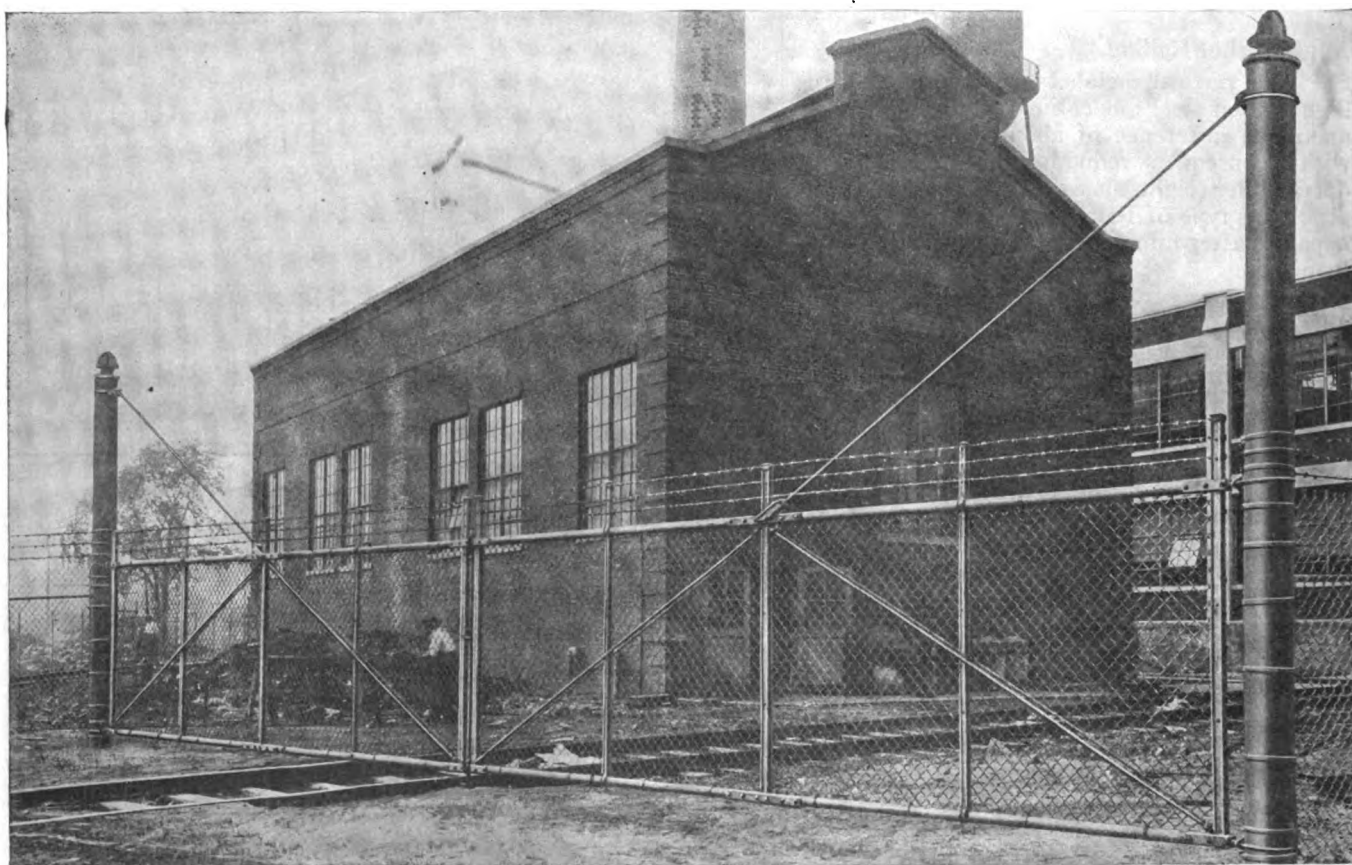


PLATE NO. E3737. 2350 FEET OF STANDARD ANCHOR POST CHAIN LINK FENCE, INCLUDING 40-FOOT OPENING TYPE "E" DOUBLE GATE, ERECTED FOR LEHN AND FINK, BLOOMFIELD, N. J.

Height	7 ft.
Posts	Galvanized Anchor posts
Fabric	2-in. mesh chain link woven steel—Wire No. 6 gage

SWEET'S CATALOGUE

Continued on next page

Anchor Posts.

Anchor posts are U-bars of high carbon steel and, together with all other parts, are heavily galvanized above and below ground, preventing rust and insuring long service. Posts are driven into the ground and held rigidly erect by two anchor stakes driven through slots clamped to opposite sides of the posts.

Chain Link Woven Steel Fences.

Chain link woven steel is of the best quality galvanized steel wire of No. 9 or No. 6 gage, No. 6 being the size most used. Made in any width up to 10 ft. The mesh is so small it affords no foothold for fence climbers; and as an additional protection 3 or more strands of barbed wire are fastened to inwardly inclined arms attached to the tops of posts.

Fence is furnished with or without top rail of galvanized pipe. Posts and all fence parts are galvanized by hot dip spelter process. Under conditions where protection is of utmost importance, these fences are made 10 ft. in height, and diagonal arms and barbed wire are attached to both front and back of posts; the spread across the top is about 2 ft. The gates are as unclimbable as the fence.

Triangular Mesh Fences.

To meet conditions which do not demand the heavier chain link fence, this company builds an unclimbable fence of moderate cost but of great strength and durability.

The posts are regular Anchor posts, size No. 2, set 8 to 10 ft. apart. Fence is made in heights from 4 ft. up to 8 ft. Triangular mesh fabric is of 2-ply cables, 4 in. apart; the upright wires are 2 in. on centers; No. 12½ wires are used for both. Inclined inward from the post tops are steel arms, on which are stretched two or more strands of barbed wire. Posts, fittings and fabric are thickly galvanized.

Chain Link Gates with Electric Weld Frames.

Rigidity and strength are the most important characteristics of these gates. Their great strength is secured by joining the top and bottom rails of 2½-in. galvanized pipe, to double uprights of 2-in. channel by means of channel corner plates *electrically welded* to the uprights. The corners so formed are fused together into a single absolutely unbreakable and unbendable piece.

The center lift rod holds the gates at both the top and bottom. The padlock can be reached equally well from either the inside or outside of the gate. The hinges are of extra strong malleable iron and so made that the gate can be swung open 180°, or back parallel to the fence line, a feature which is sometimes of the utmost importance, especially on railroad sidings.

Another exclusive feature of this gate is the method by which the chain link panel is fastened between the channel uprights and stretched up taut by means of hook bolts.

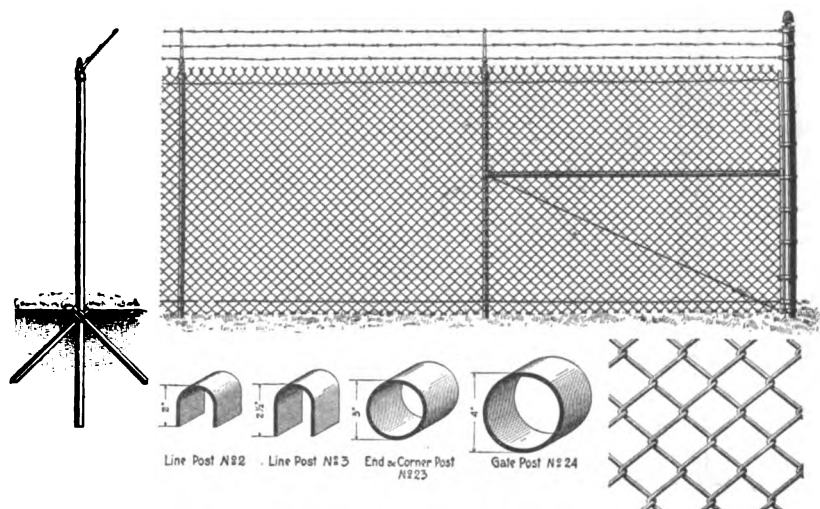


PLATE NO. E3536. CHAIN LINK WOVEN STEEL FENCE

Fabric.....Chain link woven steel—Wire No. 6 gage
Line posts.....Galvanized Anchor posts, size No. 3, 2½-in. steel U-bar, set 8 ft. on centers
End and corner posts.....3-in. steel pipe
Gate posts.....4-in. steel pipe

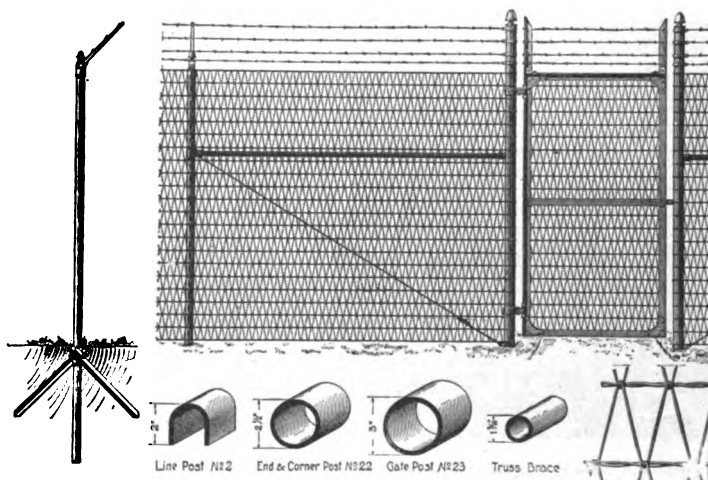


PLATE NO. E3537. TRIANGULAR MESH FENCE

Fabric.....Triangular mesh, No. 12½ wire
Line post.....Galvanized Anchor posts, size No. 2, 2-in. steel U-bar, set 10 ft. on centers
End and corner posts.....2½-in. steel pipe
Gate posts.....3-in. steel pipe

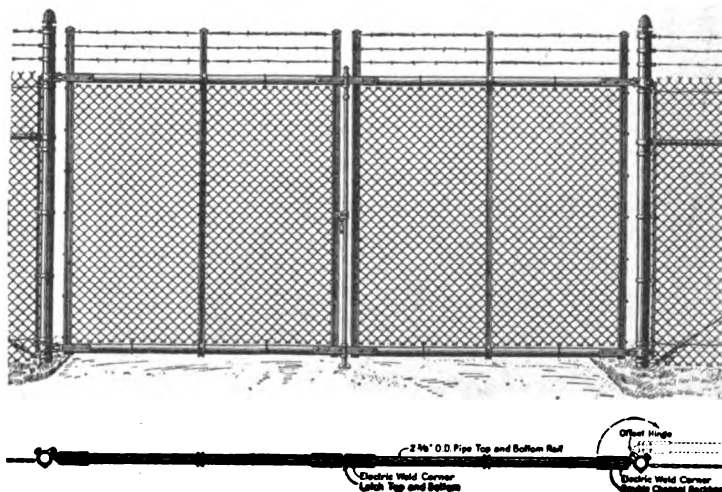


PLATE NO. E3648. ELECTRIC WELD SWINGING GATE

Frames made with electric weld uprights in corner pieces. Standard gates made in height to match fence. Single gates, 4 to 10 ft. between gate posts; double gates, 8 to 24 ft. and larger

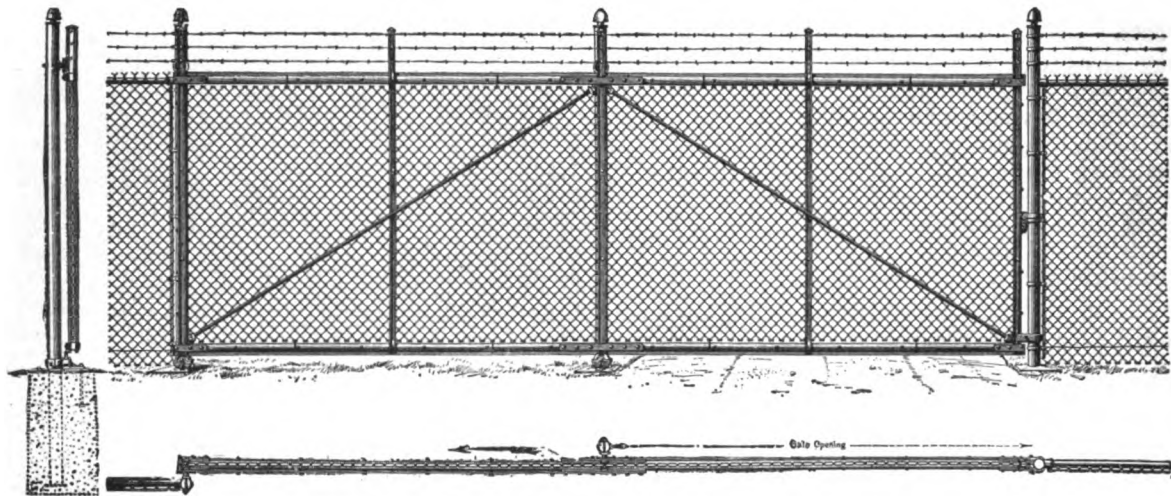


PLATE NO. E3692. ELECTRIC WELD SLIDING GATE

Operates on rollers attached to two supporting posts. Gate opens one-half its length. No overhead structure and track required. Single gates made in widths from 4 to 14 ft., opening from right to left as ordered. Double gates, sliding in both directions, furnished for greater widths than 14 ft.

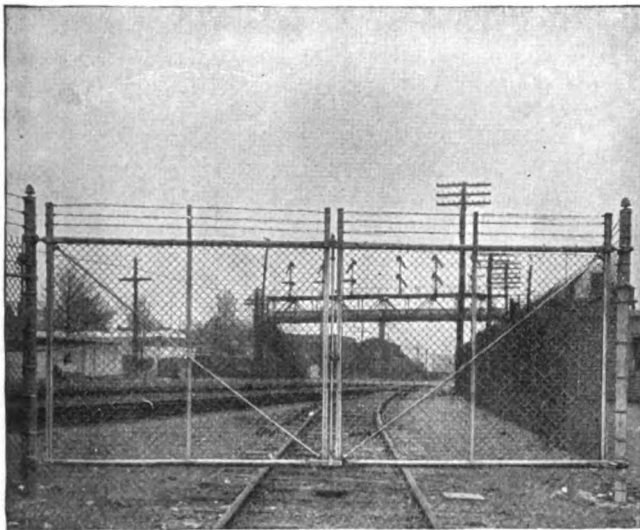


PLATE NO. E3738. ALUMINUM CASTINGS CO., GARWOOD, N. J.
(ONE OF FIVE PLANTS)

Length 2500 ft.
Height 8 ft.
Fabric.....Chain link woven steel. Wire No. 6 gage, 2-in. mesh



PLATE NO. E3739. PITTSFIELD ELECTRIC CO., DALTON, MASS.

Length 250 ft.
Height 7 ft.
Fabric.....Chain link woven steel. Wire No. 6 gage, 2-in. mesh

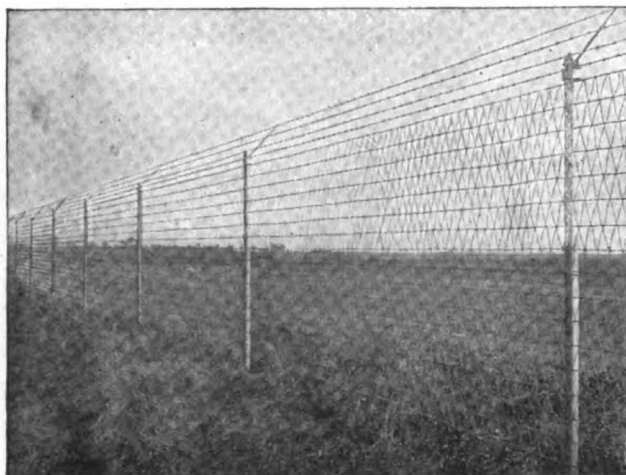


PLATE NO. E3533. TRIANGULAR MESH FENCE, ERECTED FOR
THE AMERICAN AIRCRAFT COMPANY AT COPIAGUE, N. Y.

Height..... 8 ft.
Posts..... Galvanized Anchor posts
Fabric..... Triangular mesh 2 x 4 in.
Equipped with arms and 4 strands barbed wire
(Specifications and details on preceding page)



PLATE NO. E3695. SQUARE MESH FENCE, ERECTED FOR
MERCK & CO., RAHWAY, N. J.

Height..... 8 ft.
Posts..... Galvanized Anchor posts
Fabric..... No. 9 galvanized wire, woven into rectangular mesh
Equipped with arms and 7 strands of barbed wire



PLATE NO. E4632. ELECTRIC WELD IRON RAILING, ERECTED FOR THE HARTFORD HIGH SCHOOL, HARTFORD, CONN.

Height.....6 ft.
Pickets..... $\frac{1}{4}$ -in. grooved square
Rails..... $\frac{1}{4}$ -in. grooved square double rails
Posts.....3-in. I-beam, set with drive anchors
Panels.....Standard length, 10 ft.: height, 6, 7 or 8 ft.

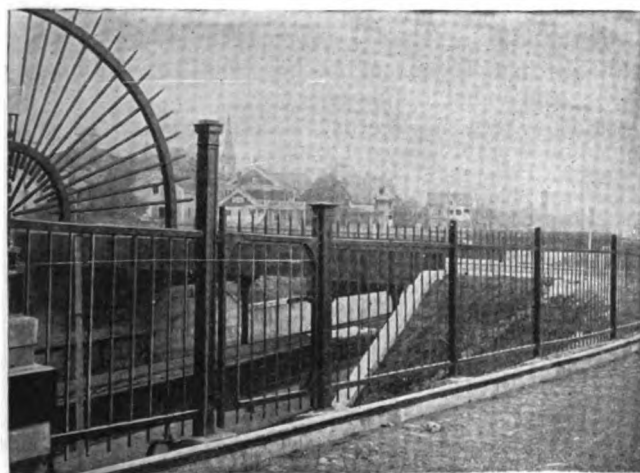


PLATE NO. E4596. RAILING ERECTED FOR NEW YORK, NEW HAVEN & HARTFORD RAILROAD CO., PAWTUCKET, R. I.

Height.....5 ft.
Pickets..... $\frac{1}{4}$ -in. square
Rails.....2x2-in. channels
Posts.....3-in. I-beams, set in concrete
Panels.....Standard length, 10 ft.
Length.....12,000 ft.



PLATE NO. E4606. ELECTRIC WELD DOUBLE GATES AT THE FACTORY OF THE DURATEX COMPANY, NEWARK, N. J.

Electric Weld Railings and Gates.

ANCHOR POST IRON WORKS has secured the rights of manufacture, and has installed the necessary electrical machinery for the manufacture of railings and gates of every size and weight, from those made of light iron bars of $\frac{1}{2}$ -in. square, up to the very heaviest forms required for any service.

By this process, the rails, pickets or other members are welded together at all points of intersection under a heavy electrical current, combined with a mechanical pressure of from 1 to 5 tons exerted at the moment the weld is made. This insures an absolute and unbreakable union of the metal of both the pickets and the rails.

Railings and gates made in this way are remarkably strong and rigid. Each unit, that is, each panel of railing, or each gate, being welded into practically one piece of metal, is free from weak joints or rivets.

Bulletin No. 24 describes this type of railing. A copy will be sent on request.

Iron Gates.

These gates are made to match the railing; the rails and pickets being the same as in the railings.

The gates are hung on strong, malleable iron

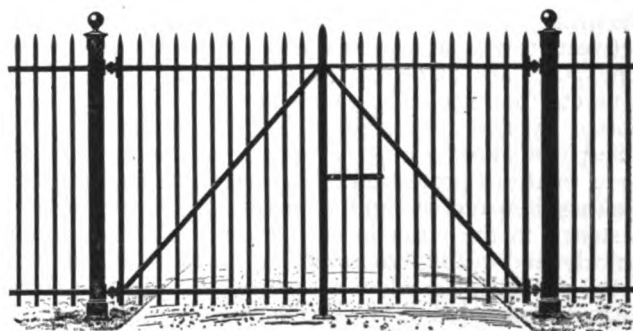


PLATE NO. E4531. IRON DOUBLE GATE

hinges; and are equipped with drop bolt in the center, hasp and padlock.

The gate posts are our standard posts No. 100 or No. 200; 3 in. or 4 in. square, respectively.

These posts are usually set in concrete.



PLATE NO. E4460. WROUGHT IRON WINDOW GUARD

In writing for price, give width and height of window openings and state method of fastening preferred

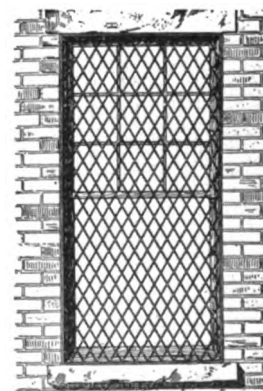


PLATE NO. E3453. WIRE WINDOW GUARD

In ordering, state size of mesh, number of wire, and whether channel or round frame is preferred

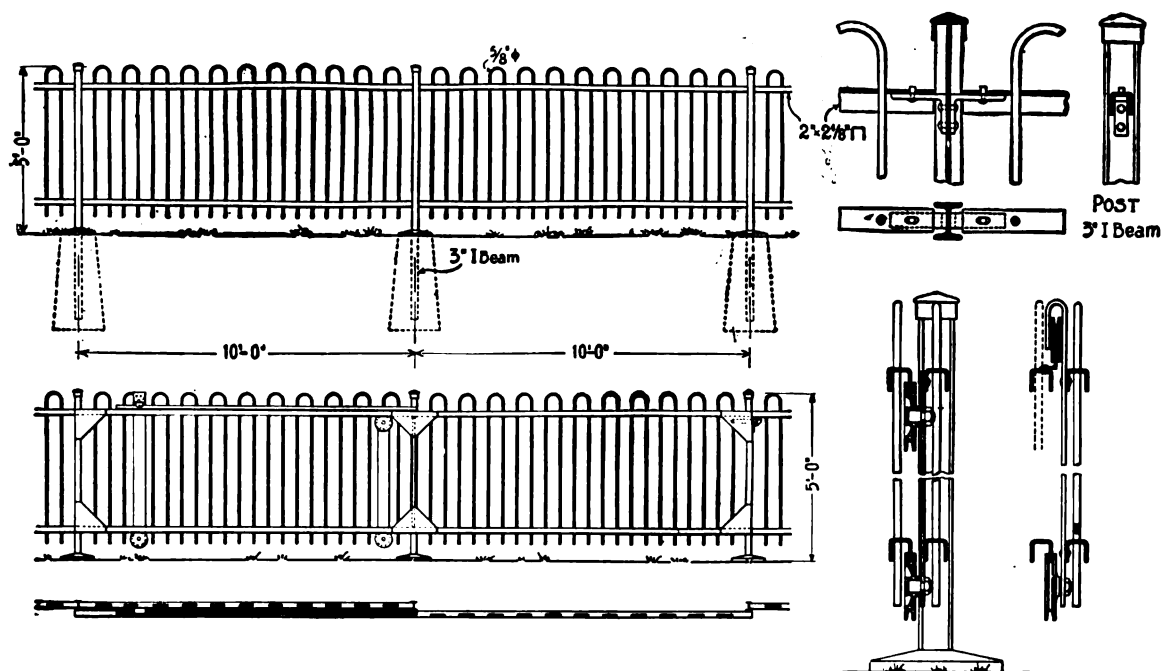


PLATE NO. E4487. INTERTRACK RAILROAD FENCE

Intertrack Railroad Fence.

This type of railing has been adopted by some of the principal railroad systems of the country, for fencing between tracks at stations and other exposed points. The posts are made of 3-in. standard I-beam, set in concrete footings. The panels are 10 ft. in length, supported by two very rigid rails of 2 by 2-in. channel. The pickets are $\frac{3}{8}$ or $\frac{3}{4}$ in. round, spaced 8 in. apart, so as to afford protection and strength, at the same time making the panel as light as possible. These panels are fastened to the posts in such a way that they can be quickly and readily removed, so as to facilitate work between the tracks when necessary. The railing shown in the illustration is 4 ft. 6 in. in height but can be made higher if desired.

The gates are very substantially constructed; give a maximum opening of 10 ft.; and are so arranged that they slide on the railing, and do not require a track across the gate opening at grade. They are easy to operate, and will not get out of order. The framing of the gate is made of the same panels as the railing, reinforced with gusset plates as shown in illustration.

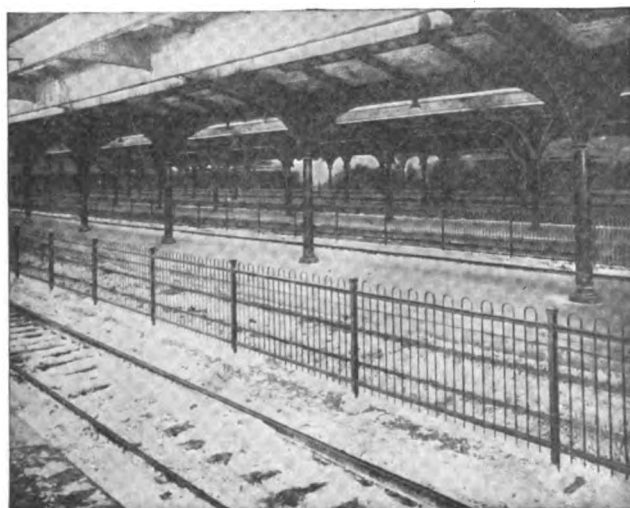


PLATE NO. E4551. INTERTRACK FENCE
Erected for Central Railroad of New Jersey, Jersey City, N. J.

Notable Installations of Anchor Post Iron Railings and Unclimbable Fences.

Alabama & Vicksburg Railway, Vicksburg, Miss.
American Brass Company, 4 plants
American Encaustic Tiling Company, Maurer, N. J.
American Glue Company, Peabody, Mass.
American Locomotive Works, 3 plants
American Radiator Company, 2 plants
American Thread Company, Willimantic, Conn.
Canadian Car & Foundry Company, Fort William, Ont., Can.
Central Railroad of New Jersey, Jersey City, N. J.
Cluett-Peabody Company, Troy, N. Y.
Colt's Patent Fire Arms Company, Hartford, Conn.
Crouse-Hinds Co., Syracuse, N. Y.
Delaware, Lackawanna and Western R. R., New Jersey
Diamond Match Co., 2 plants
E. I. Du Pont de Nemours & Co., and Allied Interests, 32 plants
Edison Electric Illuminating Company, Boston, Mass.
Erie Railroad Company, New York, N. Y.
Federal Glass Company, Columbus, Ohio
Firestone Tire & Rubber Company, Akron, Ohio
Fisk Rubber Company, Chicopee Falls, Mass.
Ford Motor Car Company, Detroit, Mich.
J. H. Frederick Silk Mills, Emaus, Pa.
General Electric Company, 3 plants
B. F. Goodrich Company, Akron, Ohio
Imperial Tobacco Company, Ltd., Durham, N. C.
Linde Air Products Company, 10 plants
McKinnon Dash & Chain Company, St. Catharines, Ont., Can.
Michelin Tire Company, Milltown, N. J.
Minneapolis Threshing Machine Company, Hopkins, Minn.
National Lead Company, Port Richmond, S. I., N. Y.
New England Westinghouse Company, Chicopee Falls, Mass.
New York Central & Hudson River R. R., New York, N. Y.
New York Edison Company, Shadyside, N. J.
New York, New Haven & Hartford R. R., New York, N. Y.
New York, Westchester & Boston R. R., New York, N. Y.
Ohio Match Company, Wadsworth, Ohio
Postum Cereal Company, Battle Creek, Mich.
Procter & Gamble Company, 3 plants
Hans Rees' Sons, Asheville, N. C.
Remington Arms & Ammunition Company, Ilion, N. Y.
Rome Brass & Copper Company, Rome, N. Y.
Sayles Bleacheries, Saylesville, R. I.
Southern Cotton Oil Company, Savannah, Ga.
Swift & Company, Boston, Mass.
Taylor & Crate, Buffalo, N. Y.
Thomaston Cotton Mills, Thomaston, Ga.
Union Bleaching & Finishing Co., Greenville, S. C.
Washington Steel & Ordnance Co., Washington, D. C.
Whitman Barnes Mfg. Company, St. Catharines, Ont., Can.
Winchester Repeating Arms Company, New Haven, Conn.
The United States Government

CINCINNATI IRON FENCE COMPANY

3300 Spring Grove Avenue

CINCINNATI, OHIO

Product.

IRON FENCING.

For Folding Gates and Door and Window Guards, see page 265.

Service.

When requesting prices, time and delay will be saved if a diagram of the grounds is supplied, specifying the number of feet and gates required. If this company is advised for what purpose the iron fence is wanted, they can suggest suitable designs to suit requirements.

Any ordinary mechanic can erect Cincinnati fence, as full instructions are furnished with each order.

Experience and Facilities.

This company has been established in business for 25 years and has built up an enviable reputation for quality of products and workmanship.

The company has one of the most complete fencing factories in the United States and its unsurpassed facilities, together with its extensive experience, assure purchasers of strictly high grade work for quick delivery at reasonable prices.

Cincinnati Iron Fencing.

The CINCINNATI IRON FENCE COMPANY offers to the industrial field the most durable fencing made.

Cincinnati iron fencing will last indefinitely and from the standpoint of economy, it is much cheaper than wooden fencing. It is built in panels and is very easy to set, complete instructions for erecting being furnished with each order. Expansion and contraction of panels has been provided for and construction throughout is mechanically correct.

In addition to the standard iron fencing illustrated below, this company will build fencing in accordance with purchasers' designs or specifications.

Fencing is furnished complete with one coat of black paint, line posts, braces, center supports under each panel and bolts. Gates and gate posts, end and corner posts are charged for extra and measured in line of fence. Blue prints sent on request.

Specifications.

Channel Rails— $1\frac{1}{2}$ by $\frac{1}{2}$ by $\frac{3}{8}$ -in. rails used with $\frac{5}{8}$ -in. round or square pickets. Rails 2 by $\frac{5}{8}$ by $\frac{3}{8}$ in. used with $\frac{3}{4}$ -in. round or square pickets.

Pickets—Fence made with $\frac{5}{8}$ -in. or $\frac{3}{4}$ -in. round or square pickets makes a very strong and substantial fence. All pickets are securely calked in the rails.

Line Posts—Line posts are made of 1-in. square solid steel with 4 by 4 by $\frac{1}{4}$ -in. plate on the bottom, set 2 ft. 6 in. in the ground.

Braces—Braces are made of $\frac{5}{8}$ -in. round with 3 by $\frac{3}{8}$ -in. plate on bottom, set 2 ft. 6 in. in ground.

Center Supports—Center supports are made of $\frac{5}{8}$ -in. round with $2\frac{1}{2}$ by 3-in. plate on bottom placed in the center of every 8-ft. panel.

Connections—All connections and picket tops are made of the best malleable iron.

Gates and Gate Posts—All gates are made to match the design of fence selected.

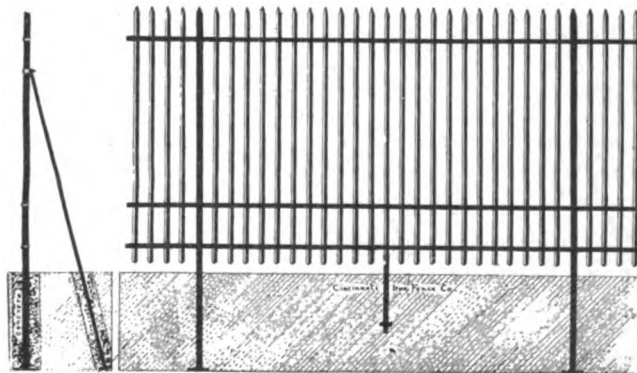
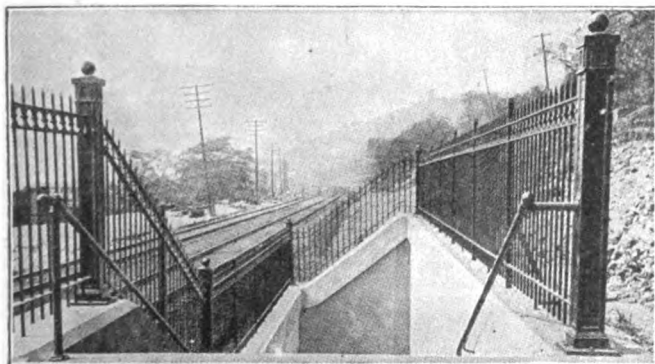
Standard size walk gates are 3 ft. 2 in. wide between posts.

Standard size drive gates are 8 ft. 6 in. wide between posts.

Cast iron gate posts make a very attractive entrance. Wrought iron or tubing posts can also be furnished.

Directions for Taking Measurements of Fence.

Always face the lot when taking measurements. Begin at one corner of the lot and measure from center to center of gates. Also specify the grade in the ground if it is not level.



STANDARD CINCINNATI IRON FENCING

These designs can be made in any height or with any size pickets desired. Blue prints furnished on application. Orders given prompt attention

CYCLONE FENCE COMPANY

Manufacturers of Fencing and Gates in Wire and Iron

WAUKEGAN, ILL.

BRANCH FACTORIES: CLEVELAND, OHIO and FORT WORTH, TEX.

BRANCH OFFICES

CHICAGO, ILL., New York Life Building
INDIANAPOLIS, IND., 431 Merchants Bank Building
DETROIT, MICH., 45 Washington Boulevard
ROCHESTER, N. Y., Cutler Building
PHILADELPHIA, PA., 403 Stock Exchange Building
NEW YORK, N. Y., 2787-89 Woolworth Building

BALTIMORE, MD., 15 East Fayette Street
ST. LOUIS, MO., 1888 Arcade Building
OAKLAND, CAL., 310 Twelfth Street
PORTLAND, ORE., 52-54 Union Avenue
SAN FRANCISCO, CAL., 245 Market Street
LOS ANGELES, CAL., 320 North Los Angeles Street

Products.

CYCLONE PROPERTY PROTECTION STEEL FENCING and GATES for industrial plants of all kinds, shipyards, and waterfront properties, textile mills, tank farms and oil refineries, chemical plants, industrial housing communities, city power and pumping stations, filtration plants, reservoirs, etc.

FENCING for city, county, state and national institutions, parks, cemeteries, public and private grounds, fair grounds, country estates, country clubs, tennis courts, public and industrial playgrounds, kennels, animal cages, bird cages, etc.

SPECIAL FENCING and ENTRANCE GATES, Wire or Iron, built for any purpose.

SWINGING, SLIDING and FOLDING GATES, IRON RAILINGS, etc.

WIRE WORK of all kinds: Wire Partitions (built-in-sections) for factory departments, offices, stock-rooms, etc., Window and Skylight Guards, Woven Wire Display Signs, Flexible Steel Mats, Wire Conveyor Belting.

Cyclone Service.

The expert engineers of this company will solve all fencing problems such as rolling land, steep grades, ravines, switch tracks, etc.



TRADE-MARK

Blue prints showing details of Cyclone fence construction, sent free on request.

Special construction salesman will call, measure property, show samples of fence and photographs of completed jobs.

When desired, expert construction superintendent is furnished at nominal charge to superintend erection of fencing anywhere.

Cyclone Standard Construction.

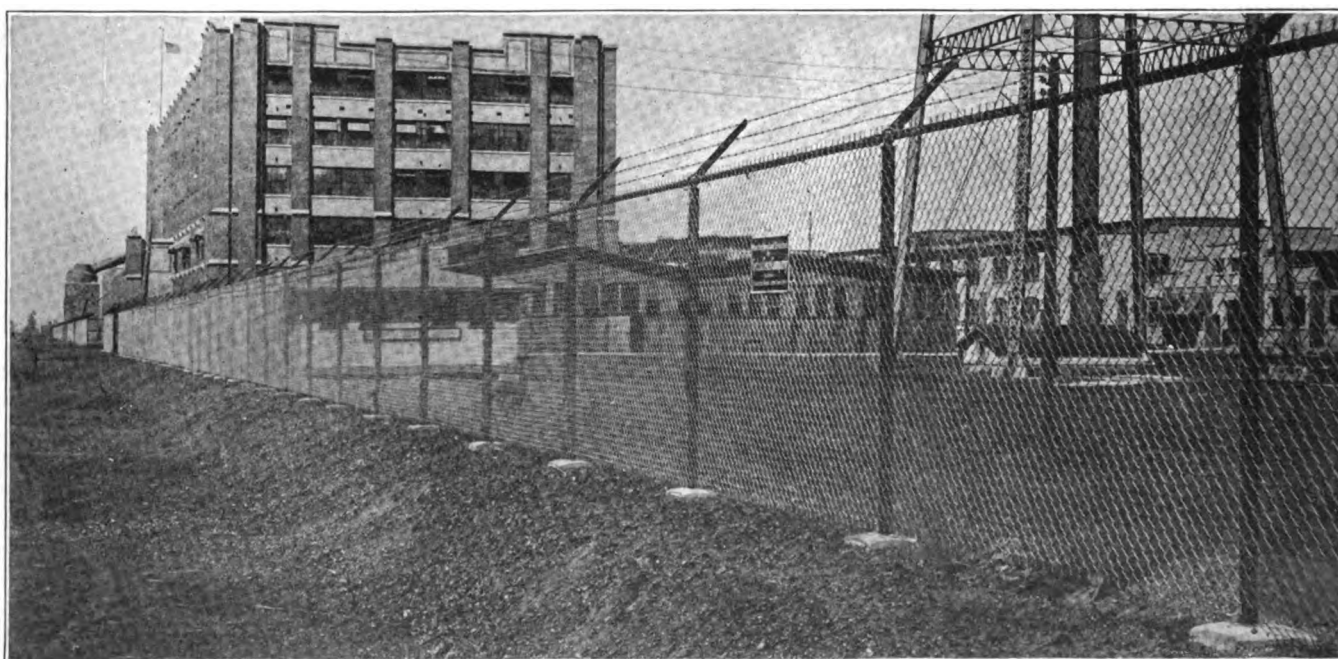
Specifies full standard weight tubular steel for posts and rail. The outside diameter size, also weight per lineal foot of posts and top rail are specified. Figures are taken from full standard weight schedule adopted by manufacturers. It is recommended that all posts be set in concrete and that Cyclone standard specifications be used to insure maximum satisfactory service.

When Cyclone standard fence construction represents a greater investment than conditions would warrant, a lighter weight post construction is provided to suit any requirement.

Chain Link Invincible Fence Specifications.

Fabric—Made in all sizes of wire from No. 4- to No. 12-gauge. Woven in various sizes of mesh, in any height desired.

Top and bottom selvages have *twisted* and *barbed* finish.



CYCLONE CHAIN LINK INVINCIBLE FENCING

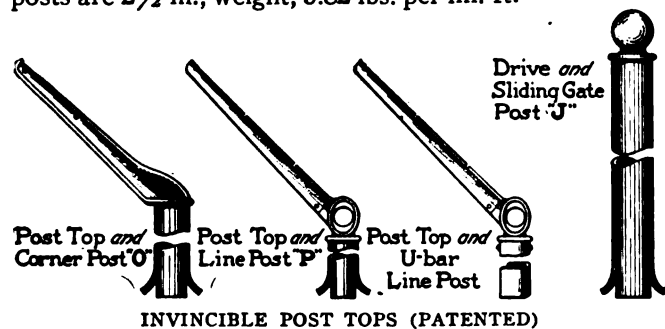
Posts—Full standard weight tubular steel. Line posts set 30 in. in ground; end, gate and corner posts, 36 in. in ground. Line posts spaced not over 10 ft. apart.

End and corner posts "O," also walk gate posts "J," 3 in. outside diameter, weight, 5.79 lbs. per lin. ft. Single swing drive gate posts "J," for gates up to but not including 10-ft. opening, also double swing drive gates up to but not including 20-ft. opening, 3½ in. outside diameter, weight, 7.58 lbs. per lin. ft.

Posts for single swing drive gates 10 ft. and over, also double swing drive gates 20 ft. and over, and slide gates of all opening sizes, 4 in. outside diameter, weight, 9.1 lbs. per lin. ft. Line posts "P," 2½ in. outside diameter, weight, 3.65 lbs. per lin. ft.

Note—All weights and dimensions are nominal, and are taken from the full standard weight schedule adopted by manufacturers. The permissible variation in specifications is 5% either way.

When desired, U-bar high carbon steel line posts are furnished instead of tubular steel line posts. Up to and including 7-ft. fence, U-bar posts are 2⅝ in., weight, 2.73 lbs. per lin. ft. For 8-ft. fence and over, U-bar posts are 2½ in., weight, 3.82 lbs. per lin. ft.



INVINCIBLE POST TOPS (PATENTED)

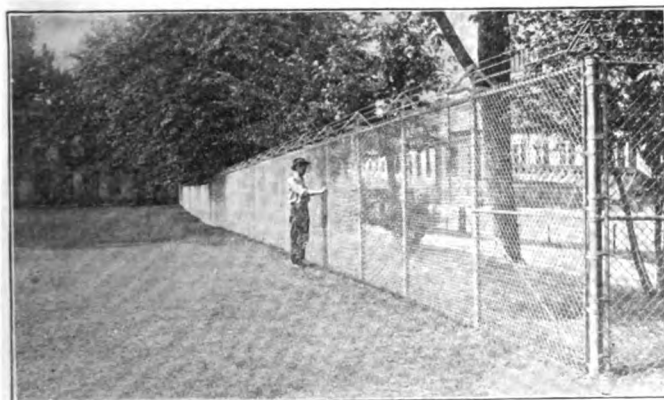
Post Tops—Patented; made of pressed steel arms securely riveted to heavy malleable iron base, and carry three 4-point barbed wires, 12 in. in or out from fence line.

Top Rail and Braces—Tubular steel, 1⅝ in. outside diameter, weight 2.27 lbs. per lin. ft. Top rail provided with sliding expansion joint (patent applied for) that allows for expansion and contraction of top rail due to atmospheric changes.

Galvanized or Painted—Furnished all heavily galvanized, or with galvanized fabric and painted framework.

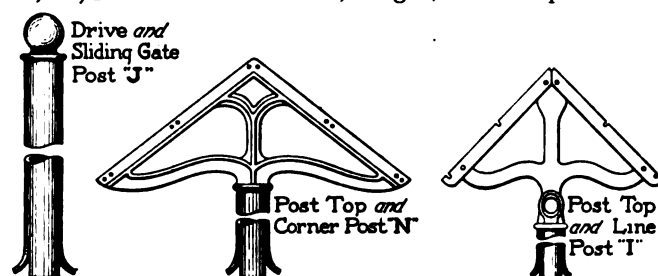
Chain Link Non-climbable Fence Specifications.

Posts—Full standard weight tubular steel. Line posts provided to set 30 in. in ground; end, gate and corner posts, 36 in. in ground. Posts to be spaced in line of fence not over 10 ft. apart.



CHAIN LINK NON-CLIMBABLE FENCE

End and corner posts "N," also walk gate posts "J," 3 in. outside diameter, weight, 5.79 lbs. per lin. ft. Single swing drive gate posts "J," for gates up to but not including 10-ft. opening, also double swing drive gates up to but not including 20-ft. opening, 3½ in. outside diameter, weight, 7.58 lbs. per lin. ft. Posts for single swing drive gates 10 ft. and over, also double swing drive gates 20 ft. and over, and slide gates of all opening sizes, 4 in. outside diameter, weight, 9.1 lbs. per lin. ft. Line posts "I," 2½ in. outside diameter, weight, 3.65 lbs. per lin. ft.



NON-CLIMBABLE POST TOPS (PATENTED)

Post Tops—Patented; made of pressed steel arms securely riveted to heavy malleable iron base, and carry five 4-point barbed wires 9½ in. in and out from fence line.

Chain Link Safeguard Fence Specifications.

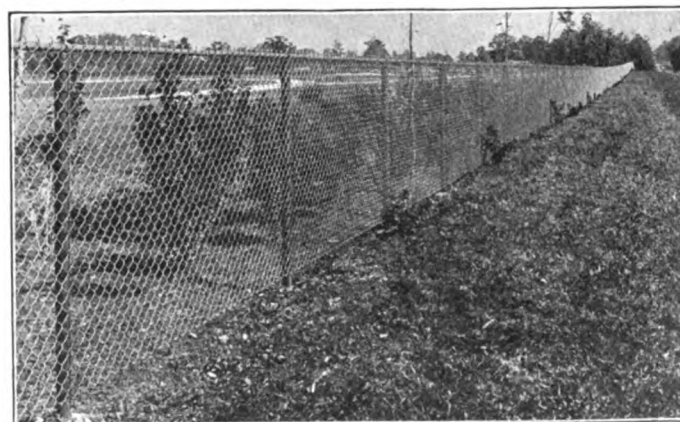
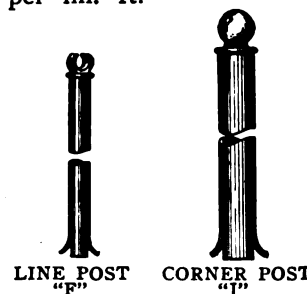
Especially recommended for schools, playgrounds, athletic grounds, country estates, parks, etc.; also industrial plants of all kinds. A row of protecting barbs projects above top rail, or fence is furnished with smooth knuckled selvage in place of barbs.

Posts—Full standard weight tubular steel. Line posts set 30 in. in ground; end, gate and corner posts, 36 in. in ground. Posts spaced in line of fence not over 10 ft. apart.

End, corner and walk gate posts "J," 3 in. outside diameter, weight, 5.79 lbs. per lin. ft. Single swing drive gate posts "J," for gates up to but not including 10-ft. opening, also double swing drive gates up to but not including 20-ft. opening 3½ in. outside diameter, weight, 7.58 lbs. per lin. ft.

Posts for single swing drive gates 10 ft. and over, also double swing drive gates 20 ft. and over, and slide gates of all opening sizes, 4 in. outside diameter, weight, 9.1 lbs. per lin. ft.

Line posts "F," 2½ in. outside diameter, weight, 3.65 lbs. per lin. ft.



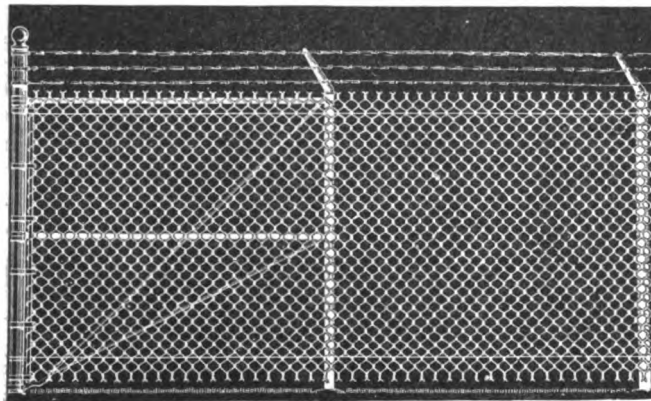
CHAIN LINK SAFEGUARD FENCE

Chain Link Reliance No. 1 Fence Specifications.

Fabric—Made 6 ft. high of No. 9-gauge heavily galvanized wire woven into a 2-in. mesh. Top and bottom selvages of fabric have a *twisted* and *barbed* finish.

Posts—End, corner and walk gate posts full standard weight tubular steel 3 in. outside diameter, weight, 5.79 lbs. per lin. ft. Swinging drive gate posts 3½ in. outside diameter, weight, 7.58 lbs. per lin. ft. Posts for sliding gates 4 in. outside diameter, weight, 9.1 lbs. per lin. ft.

Line posts of high carbon steel rolled U-shape 2½ in. wide, weight, 2.73 lbs. per lin. ft. and spaced 12 ft. apart. Brace posts of tubular steel, 2 in. outside diameter, weight, 2.72 lbs. per lin. ft. Braces 1½ in. outside diameter. Post tops, same as used on Invincible fence.



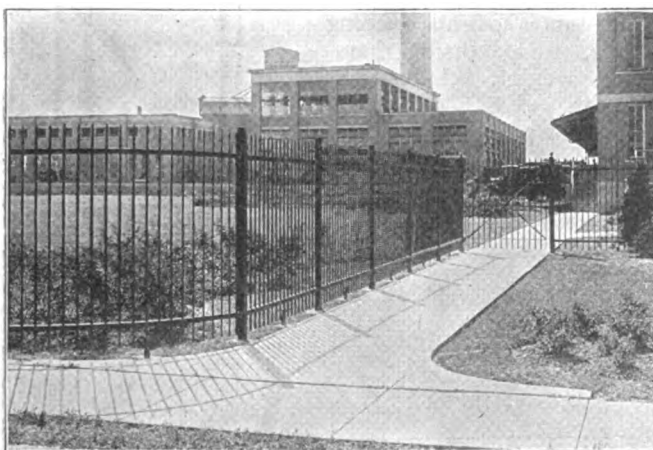
CHAIN LINK RELIANCE NO. 1 FENCE

Gates.

Made in any height for any opening size, single or double drive, to match fence; also made in special designs. Swinging gates arranged to swing either way, to lock from either side. When desired, roller bearing sliding gates furnished to run on overhead enclosed steel track.

Iron Fences.

Iron fencing and iron front entrance gates built and erected for any purpose. Purchasers' tastes can be incorporated in attractive designs that will harmonize with any architecture or landscape.



SOLID PICKET IRON FENCE

Prices, Information Required, etc.

Prices on fence job erected complete, or services of construction superintendent, quoted on application.

When writing, send a diagram or blue print of proposed fence lines, giving measurements of each stretch

and total measurements. Make an "O" where corner, end or gate posts are to be placed. State whether single or double drive gates are wanted, and give opening size.

Quotation on complete job will follow by return mail.

Wire Work of All Kinds.

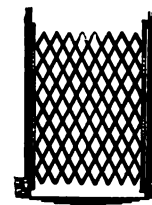
(Built-in-Sections) Partitions—Built in standard size sections 4 ft. wide by 8 ft. high. Frames are 1-in. channel iron. Fabric is No. 10-gauge wire woven in 1½-in. diamond mesh. Furnished with either swinging or sliding gates. Handholes or wickets provided where needed. Floor flanges furnished for either wood or concrete floors. Sections are interchangeable, movable; can be taken out and used elsewhere—no refitting—no loss. Quick changes in departments can be made any time.

Send blue print or layout of partition work wanted.

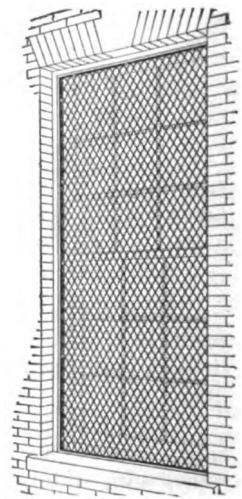
Window and Skylight Guards—Frames are 1-in., ¾-in. channel, or ¾-in. round iron. Fabric is No. 10-gauge wire woven in 1½-in. diamond mesh.

Channel iron frames fit into openings. Round iron frames usually allow ¾ in. on all sides for lap. Special guards built with either channel or round iron frames, using size of wire and mesh desired.

Folding Gates—Built for any width or height. Take up minimum space. Fold out of the way.

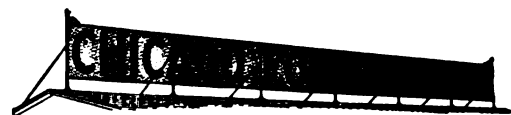


FOLDING GATE



DIAMOND MESH WINDOW GUARD

Woven Wire Signs—Built in any size with heavy channel iron frames. Letters of heavy galvanized sheet steel. All signs are constructed to withstand weather conditions and give permanent service. State length and height of sign wanted, also name to be displayed.



WOVEN WIRE SIGN

Woven Wire Conveyor Belts.

Flat wire and chain link belts furnished in 1- and ½-in. mesh, any length, in standard widths of 18, 24 and 30 in. Special widths and mesh to suit requirements.



WIRE CONVEYOR BELT

ESTABLISHED 1858

J. W. FISKE IRON WORKS

Ornamental Iron, Brass, Bronze, Wire and Zinc Work

65-67 Park Place
NEW YORK, N. Y.**Products.**

FISKE CLIMBPROOF CHAIN LINK FENCING and ENTRANCE GATES; MANHOLE FRAMES AND COVERS; CATCHBASINS.

Also manufacturers of Window Guards, Tool and Stock Room Enclosures, Folding Gates.

Ornamental Lamp Standards, Wrought Iron Railing, Stable Equipment for horses and cattle, Weather-vanes, etc.

Quality.

The quality of Fiske products is best evidenced by installations for government, states, cities and leading commercial organizations.

Fiske Climbproof Fencing.

Affords protection to all points at all times. The fence is made of heavily galvanized chain link fabric with galvanized set-in-concrete posts assuring a perfect alignment and a further protection from the weather at the ground line.

Fiske gates are strongly constructed of "T" iron galvanized after making; filling of the gate is also chain link fabric.

The height and size mesh can be made to suit all conditions.

Fiske Erecting Service.

For the protection and convenience of customers, a corps of widely experienced erecting men is maintained to set any kind of fencing, railing, gates, and stock room enclosures at reasonable cost. Entire responsibility is assumed when this work is done under their direction.

Catalogue.

A handsomely illustrated catalogue of Fiske products will be mailed on request.

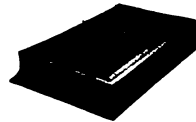


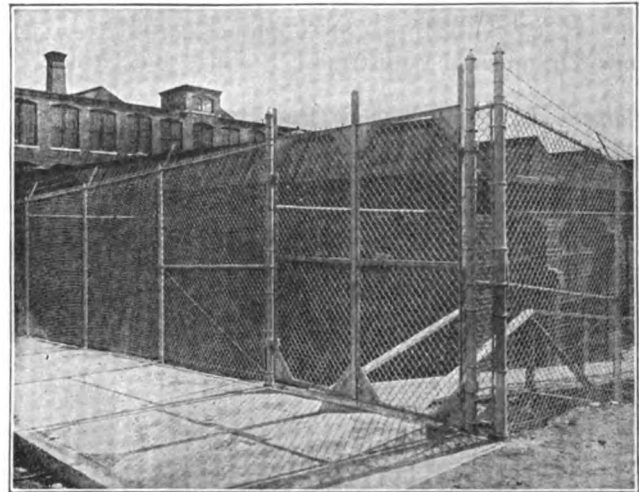
FIG. 161AK. GRATING AND FRAME
Heavy, $3\frac{1}{4}$ in. long, 19 in. wide on top, 6 in. deep



FIG. 163K. MANHOLE FRAME AND COVER
Top, 25 in. diam. Bottom, 36 in. diam., 9 in. deep



FIG. 162AK. CATCH-BASIN INLET
Top 23 in. by 32 in. Bottom flange, 42 in. diam. Grating concave at rear



CHAIN LINK FENCING FURNISHED AND ERECTED FOR THE MILLS WOVEN CARTRIDGE BELT CO., WORCESTER, MASS.



PLATE NO. 3100F. WROUGHT IRON RAILING FURNISHED AND ERECTED FOR TH. CLARKE ESTATE, COOPERSTOWN, N. Y.

ESTABLISHED 1883

POTTS MANUFACTURING CO.

Ornamental Iron and Wire Work

MECHANICSBURG, PA.

Products.

POTTS BARRIER CHAIN LINK FENCING for all purposes.

POTTS ALL WROUGHT IRON SOLID RAIL PICKET FENCES, Bow or Spear Top with special patented Ground Base, for complete industrial protection.

POTTS ENTRANCE GATES of every description and for every purpose, public and private.

POTTS EASY OPENING (patented) DIAMOND SAFETY TREAD FLUSH SIDEWALK DOOR for coalholes, cellar entrances, pits, vaults, etc.

POTTS DIAMOND TREAD INDUSTRIAL STAIRWAYS and FIRE ESCAPES.

Also manufacturers of Window Guards, Area Gratings, Ornamental Balustrades, Railings and Grilles.

Potts Easy Opening Door (Patented).

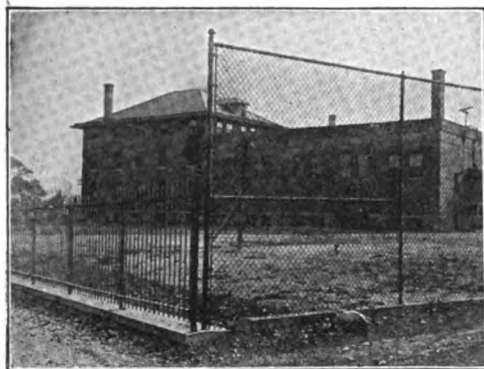
The outcome of 20 years' continuous development

in steel sidewalk doors. The truss which carries the weight of both doors at the center positively prevents all sag, and the whole weight of the door being counter-balanced by a specially coiled tension spring obviates the possibility of slamming.

Other exclusive features are $\frac{1}{4}$ -in. "Diamond" safety tread plates (non-slipping); loose head piece when specified; positive acting locking device; concealed hinges; reinforced angle corner guards; complete door flush with sidewalk.

Co-operative Service.

The company will gladly co-operate in the solution of fencing and related iron work problems. On the receipt of necessary data and a rough sketch of the proposed work, the Engineering Staff will furnish detailed plans and estimates together with valuable engineering suggestions.



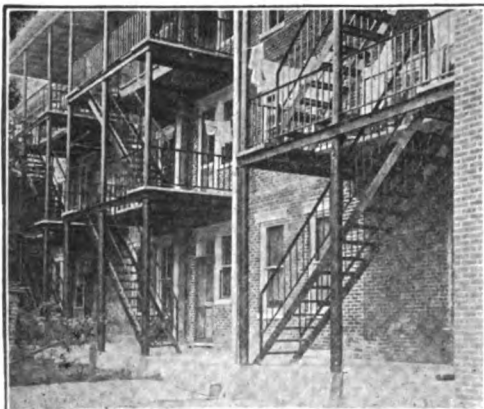
POTTS FENCES PROTECTING PLAY GROUNDS



POTTS ALL-STEEL DIAMOND TREAD INDUSTRIAL STAIRWAY



POTTS ALL WROUGHT IRON SOLID RAIL PICKET FENCE AND HINGED ENTRANCE GATE



POTTS STAIRWAYS AND PLATFORMS ON A LARGE APARTMENT HOUSE



POTTS EASY OPENING, DIAMOND SAFETY TREAD FLUSH SIDEWALK STEEL DOOR



ORNAMENTAL ENTRANCE GATES FOR ESTATES, INSTITUTIONS, CEMETERIES, ETC.

CINCINNATI IRON FENCE COMPANY

Manufacturers of Iron and Wire Work

3300 Spring Grove Avenue
CINCINNATI, OHIO

Products.

FOLDING GATES.
WINDOW and DOOR GUARDS.
IRON and WIRE WORK.
For Iron Fencing, see page 259.

Quality of Products.

Many years of experience, unsurpassed facilities, reasonable prices and strictly high grade work backed by a liberal guarantee has resulted in the widespread popularity of the CINCINNATI IRON FENCE COMPANY'S line of iron and wire work.

Only the best materials are used; the workmanship is the very best obtainable, and all products are smoothly and accurately finished.

This company invites rigid comparison of its products with those of other manufacturers and requests prospective purchasers to decide on merit alone.

Folding Gates.

This company manufactures Bostwick and lattice type folding gates for all purposes.

The construction of these gates insures great strength and

lasting satisfaction. They are easily and noiselessly operated and fold compactly, thus permitting use of the entire opening.

Several standard types are shown herein which can be made in any height or width, thus it is necessary when ordering to specify the height desired and the size of the opening.

Window and Door Guards.

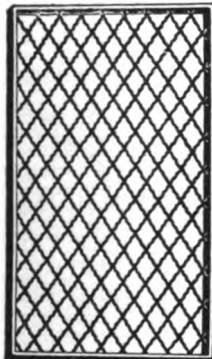
Window and door guards can be furnished in any size with either channel iron or round iron frames, with heavily galvanized steel wire, painted black. These guards can be furnished with hinges and hasps at additional cost.

Iron window guards with $\frac{1}{2}$ - or $\frac{5}{8}$ -in. pickets can also be furnished.

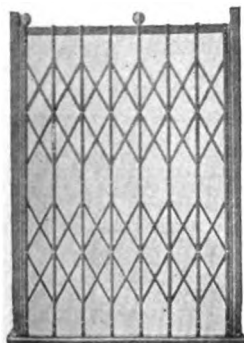
When ordering or writing for estimates, send diagram giving correct dimensions, and specify gauge of wire, size of mesh and style of frame.

Iron and Wire Work in General.

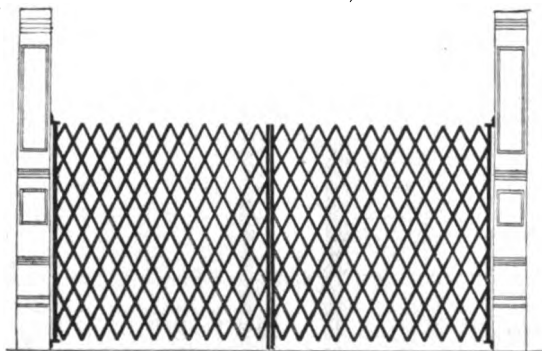
This company manufactures plain and ornamental iron and wire work of all kinds in accordance with any specifications.



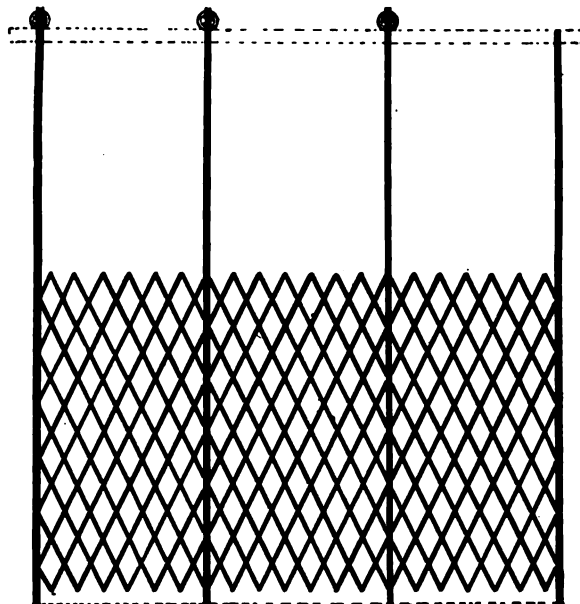
NO. 1 STEEL WIRE
GUARD
With channel frame



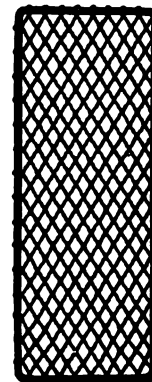
NO. 602 BOSTWICK
TYPE PASSENGER
ELEVATOR GATE
Channel uprights, $\frac{3}{4}$ x
 $\frac{1}{4}$ x $\frac{1}{4}$ in.; lattice, $\frac{1}{2}$ x
 $\frac{1}{4}$ in.



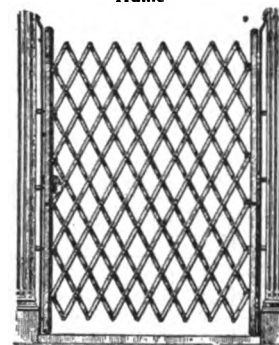
NO. 600 DOUBLE FOLDING GATE
Same construction as No. 601



NO. 599 SPECIAL TYPE FOLDING GATE
For freight elevators and large entrances of all kinds.
Channel uprights, $1\frac{1}{4}$ x $\frac{1}{2}$ x $\frac{1}{4}$ in.; lattice, $\frac{3}{4}$ x $\frac{1}{4}$ in.



NO. 2 STEEL
WIRE GUARD
With round iron
frame



NO. 601 SINGLE FOLDING
GATE
Side bars, $1\frac{1}{4}$ x $\frac{1}{4}$ in.; lattice,
 $\frac{3}{4}$ x $\frac{1}{4}$ in.

DAHLSTROM METALLIC DOOR COMPANY

CABLE ADDRESS:
"DAHLSTROM JAMESTOWN"

433 Buffalo Street
JAMESTOWN, N. Y.

NEW YORK OFFICE, 130 East 15th Street

CHICAGO OFFICE, 19 South La Salle Street

BRANCH OFFICES IN ALL PRINCIPAL CITIES

Products.

HOLLOW METAL INTERIOR TRIM "UNI-TRE" TYPE FRAMES; INTERIOR METAL FINISH for Railway Coaches; LARGE CEILING LIGHTS, etc.

Also manufacturers of Doors, Frames, Casings, Mouldings, Partitions, Cabinets, Radiator Covers, Fume Hoods, and Metal Trim for Boats and Automobiles.

Originators of the process of Cold Drawn Mouldings used in connection with Hollow Metal Interior Trim.

"Uni-tre" Frames.

Made of high grade cold rolled sheet steel of proper gauge for size and condition of openings. May be used with equal advantage with wood or metal doors. The frame is set as soon as floor arches are in, and walls, floors and ceilings are built up around it—saving time and expense in erection.

Cut-outs for hardware are made to template before forming. All reinforcing for hardware included in fab-



TRADE MARK

rication work. Prime coat baked on, serves as excellent ground coat for final finish. Frames can be shipped completely finished if conditions warrant.

Railway Car Work.

Interiors of the first steel sleepers, diners, private cars and day-coaches were developed and built at the Dahlstrom plant. Our equipment is unsurpassed.

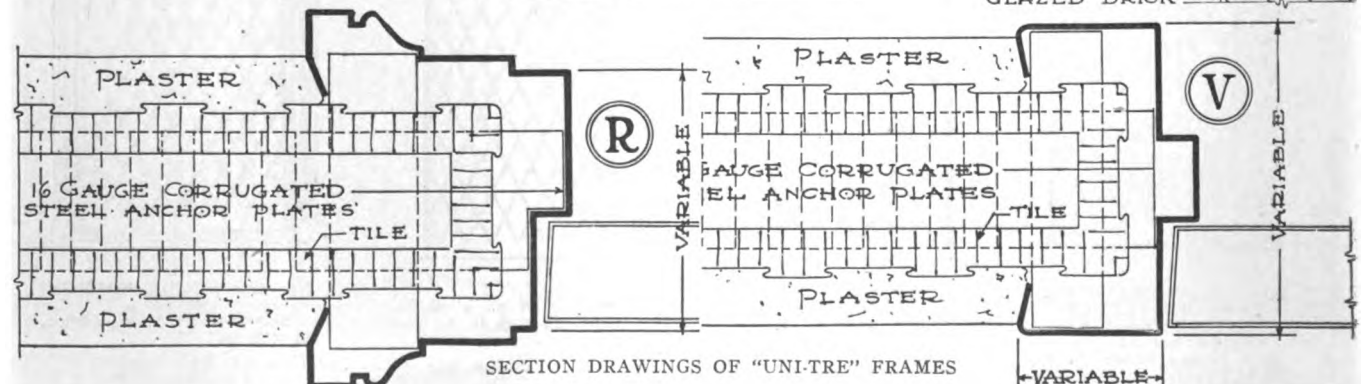
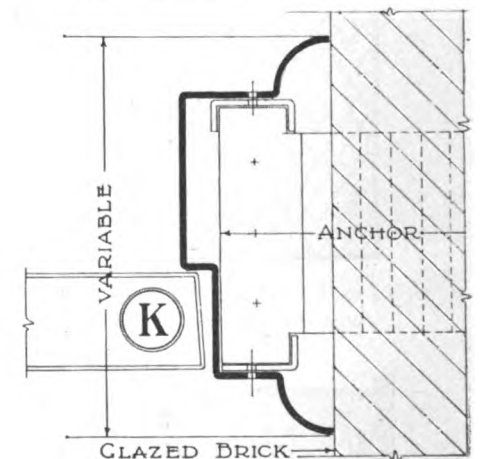
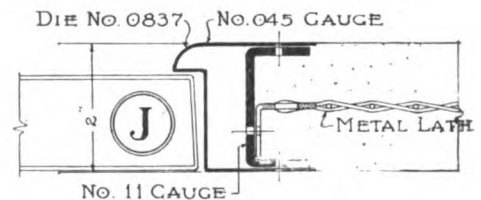
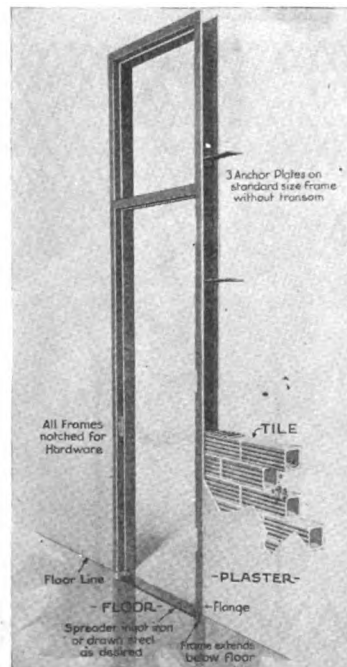
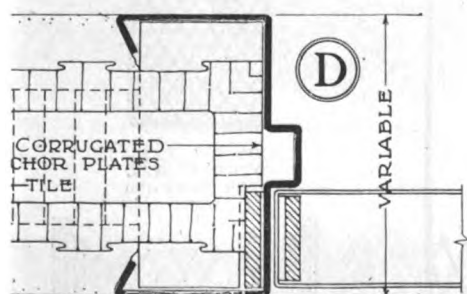
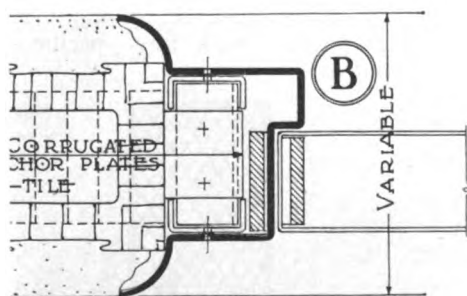
Special Ornate Ceiling Lights.

A most striking installation is the Chester Water Side Station, Chester, Pa. These lights span practically the entire roof, over 80 ft. above the floor.

Services.

We will send to architects or building engineers and contractors designs for these items of construction.

Dahlstrom service begins when you call on us. We help design units best adapted to the requirements, and this service follows all the way through.



SECTION DRAWINGS OF "UNI-TRE" FRAMES

PENN METAL COMPANY

Manufacturers of Fireproof Doors and Windows

65 Franklin Street
BOSTON, MASS.

SALES OFFICES

PHILADELPHIA, PA., 25th and Wharton Streets

PORTLAND, ME., 95 Exchange Street

EXPORT OFFICE, Corner of First and Washington Streets, JERSEY CITY, N. J.

Products.

PENCO METAL COVERED DOORS, FRAMES and TRIM; TIN CLAD FIRE DOORS and SHUTTERS; STANDARD ROLLED STEEL BUCK, FRAME and TRIM UNITS.

Also manufacturers of Metal Lath, Roofing, Ceiling, Tanks, Lockers, Shelving, etc.



Special styles and sizes furnished on short notice. Made in kalamein iron, copper and low brass.

Penco Tin Clad Fire Doors and Shutters.

Penco tin clad fire doors and shutters are made in any style and size to meet either standard or unusual and special conditions.

Doors are furnished with or without hardware, either f.o.b. cars Boston, or installed complete at the option of the purchaser.

Penco Standard Rolled Steel Buck, Frame and Trim Units.

These door frames and trim units are made of heavy sections, formed from cold rolled sheet steel. The weight of the metal used varies from No. 12- to No. 18-gauge, according to the conditions to be met.

The miters are process welded. Anchor plates, welded to the frame, are provided to extend into the masonry joints, thus providing a perfectly rigid integral combination of buck frame and trim.

Made in variable sizes to meet practically any condition.

Finished with priming coat of gray paint before leaving factory.

Penco Metal Covered Doors, Frames and Trim.

Penco metal covered doors are made by drawing sheet metal through steel dies over a wood core of clear white pine.

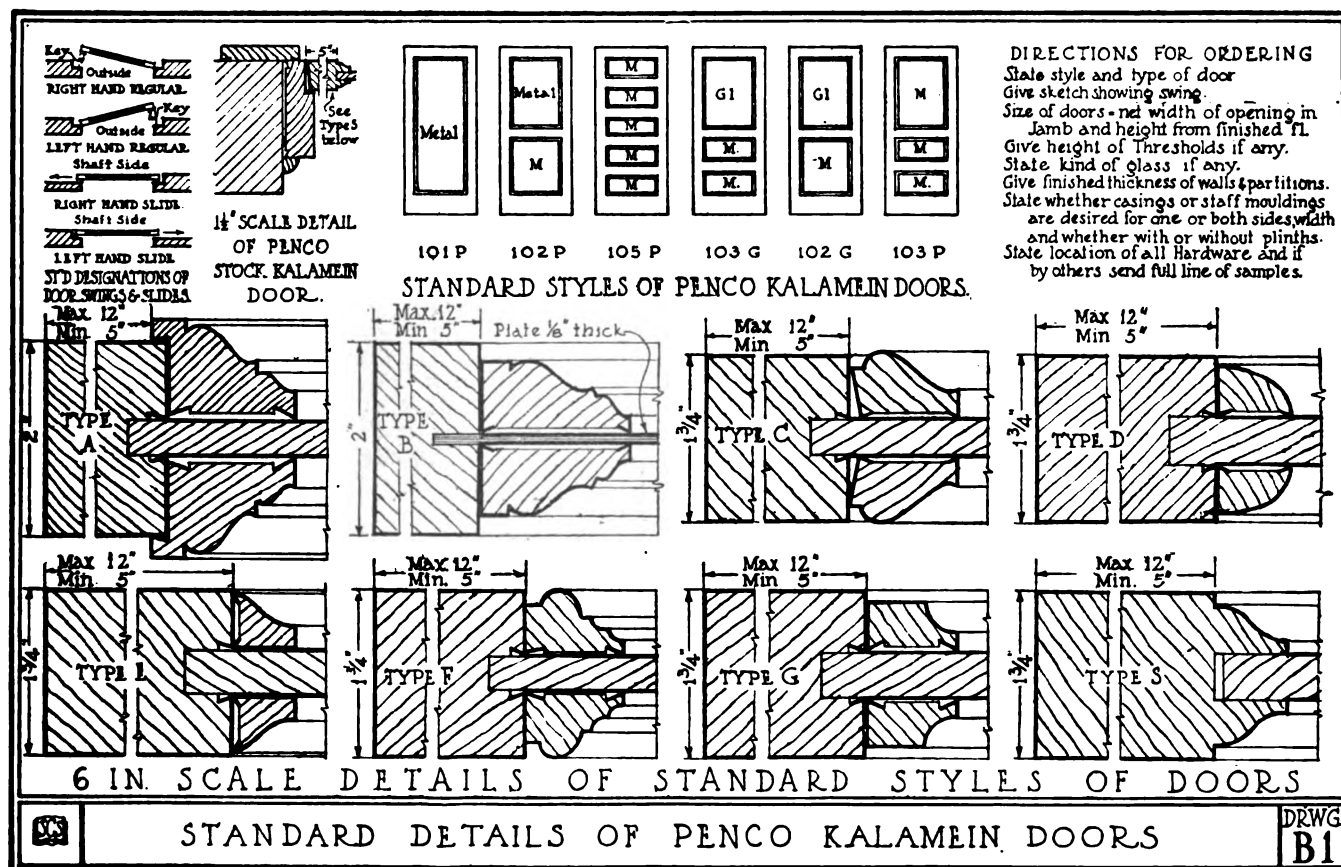
The drawing process practically welds the metal covering to its core, eliminating all buckles and bringing out all mouldings and members in clear relief.

The doors are made in sections, mortised, tenoned and bolted together.

Stock sizes (door size): 2 ft. 8 in. by 6 ft. 8 in., 2 ft. 10 in. by 7 ft., 3 ft. by 7 ft.

All kalamein doors finished with priming coat of gray paint.

Immediate Shipment—Standard sizes and styles in kalamein iron, as illustrated, are carried in stock for immediate shipment.



THE PEELE COMPANY

Manufacturers of Elevator and Warehouse Fireproof Doors

TELEPHONE:
STAGG 365, 366, 367

Stewart Avenue, Harrison Place near Flushing Avenue
BROOKLYN, N. Y.

BRANCHES

BOSTON, 18 Tremont Street—Telephone, Fort Hill 747

CHICAGO, 175 Jackson Boulevard—Telephone, Wabash 2020

CLEVELAND, Caxton Building—Telephone, Main 4053

AGENCIES IN ALL PROMINENT CITIES IN THE UNITED STATES AND CANADA

Communicate With Main Office for Nearest Agency

Product.

PEELLE COUNTERBALANCE TRUCKABLE FIREPROOF ELEVATOR DOORS.

Services.

THE PEELE COMPANY engineers are prepared to assist clients in selecting the proper and most economical equipment to suit special conditions and requirements.

Peelle Counterbalance Truckable Door (Patented).

Manufactured exclusively by this company, this door is constructed under the direct supervision of the Underwriters' Laboratories, Inc. and bears their label, and is approved and highly recommended by the Building Departments and State Labor Bureaus.

Peelle counterbalance doors open up and down from the center; and as each part has to travel only half the opening, the clear opening is given instantly. The two halves balance one another, and are operated by heavy flexible chains running over double radial

ball bearing pulleys, making their operation very easy.

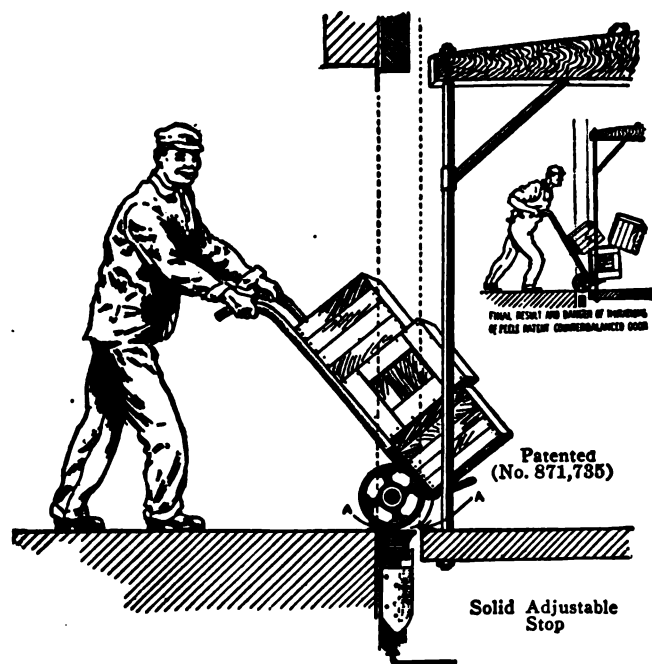
Peelle doors can have any type of panels, either wood, metal covered, or all-metal, as specified. The panels are set and bolted into rigid angle and T-iron frames. The upper edge of the lower panel is reinforced so that when the Peelle door is open, it presents a solid sill between the building floor and the elevator car (see illustration).

Construction Specifications of Peelle Counterbalance Truckable Doors.

Hanger bar at upper surface of lower panel on all Peelle counterbalance doors is reinforced and extends beyond panel frame, to rest on solid adjustable stops riveted to wall rails. This removes all weight from turnbuckles and chains when door is open and in use. Hanger bar which forms the trucking sill can be made to carry any specified load.

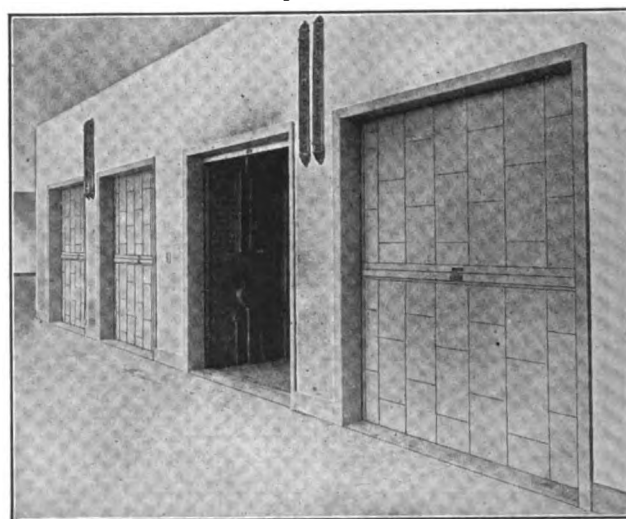
Panels are made of two thicknesses of white pine covered with best grade I. C. terne tin, set and bolted into angle iron frames with reinforced corners.

This door is always used unless floor heights are too low or when a kalamein panel is desired.



PEELLE TRUCKABLE ELEVATOR DOOR

Note special adjustable stop which firmly binds door, when open, to building sill. This is the only counterbalance door that fills gap between car and building floor firmly and perfectly flush with building sill. Peelle corrugated steel elevator door has additional similar binding and supporting devices at center or at more frequent intervals, according to size of door and amount of trucking it is to be subjected to. Running chains are not used in the support of Peelle doors, when open. The Peelle patented truckable feature has been infringed, and users should beware of imitations



STANDARD TIN COVERED PEELE COUNTERBALANCE DOORS

Made under the direct supervision of Underwriters' Laboratories, Inc.

Doors exceeding 8 ft. in width or 10 ft. in height can, in no case, bear the underwriters' label, but can be made according to label specification.

See following page for space requirements.

Any of the Peelle safety appliances or electrical equipment can be furnished with this door.

Peelle Electric Interlock.

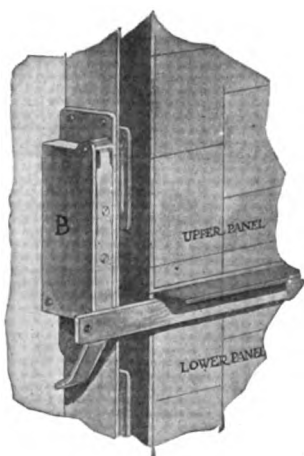
The position of the interlock on the rails of the Peelle counterbalance door is shown here. The mechanism is entirely enclosed and protected from dirt and dust.

Doors equipped with electric interlocks are manually operated. The function of the interlock is to render the car inoperative unless all doors are first closed and locked.

An emergency switch in glass covered box can be installed in the elevator car, to operate the car with doors open in case of fire or other emergency.

Elevator cars not having a full magnetic control are equipped with the Peelle mechanical interlock, making it possible to interlock any type or make of car.

Peelle interlocks are approved by all State Departments and other boards having jurisdiction.



PEELLE ELECTRIC INTERLOCK

MINIMUM FLOOR HEIGHTS FOR PEELLE DOORS

Height of opening	Finished floor to finished floor	Height of opening	Finished floor to finished floor
5' 9"	9' 5 1/4"	7' 6"	12' 1"
6' 0"	9' 10"	7' 9"	12' 5 1/4"
6' 3"	10' 2 1/4"	8' 0"	12' 10"
6' 6"	10' 7"	8' 3"	13' 2 1/4"
6' 9"	10' 11"	8' 6"	13' 7"
7' 0"	11' 4"	8' 9"	13' 11 1/4"
7' 3"	11' 8 1/4"	9' 0"	14' 8 1/4"

Above table is for labeled doors. Deduct 4 in. for unlabeled. Pass type doors can be used where floor heights are too low.

Shaft Construction Data.

Channel jambs should be provided.

Hollow tile or other light wall construction should

have channel jambs from floor to ceiling. All sills, jambs and lintels to be built flush and plumb.

Openings must be built in vertical alignment.

Jambs, sills, stationary lintels or trim not furnished by THE PEELLE COMPANY.

Pass Type Construction—Tin Clad Doors.

Where high door openings are required in a building where the story heights are relatively low, the regular type of Peelle doors can not be used.

Peelle pass type counterbalanced elevator doors are admirably suited for this purpose and are a most effective solution for fire and general safety problems in connection with warehouse and garage elevator openings.

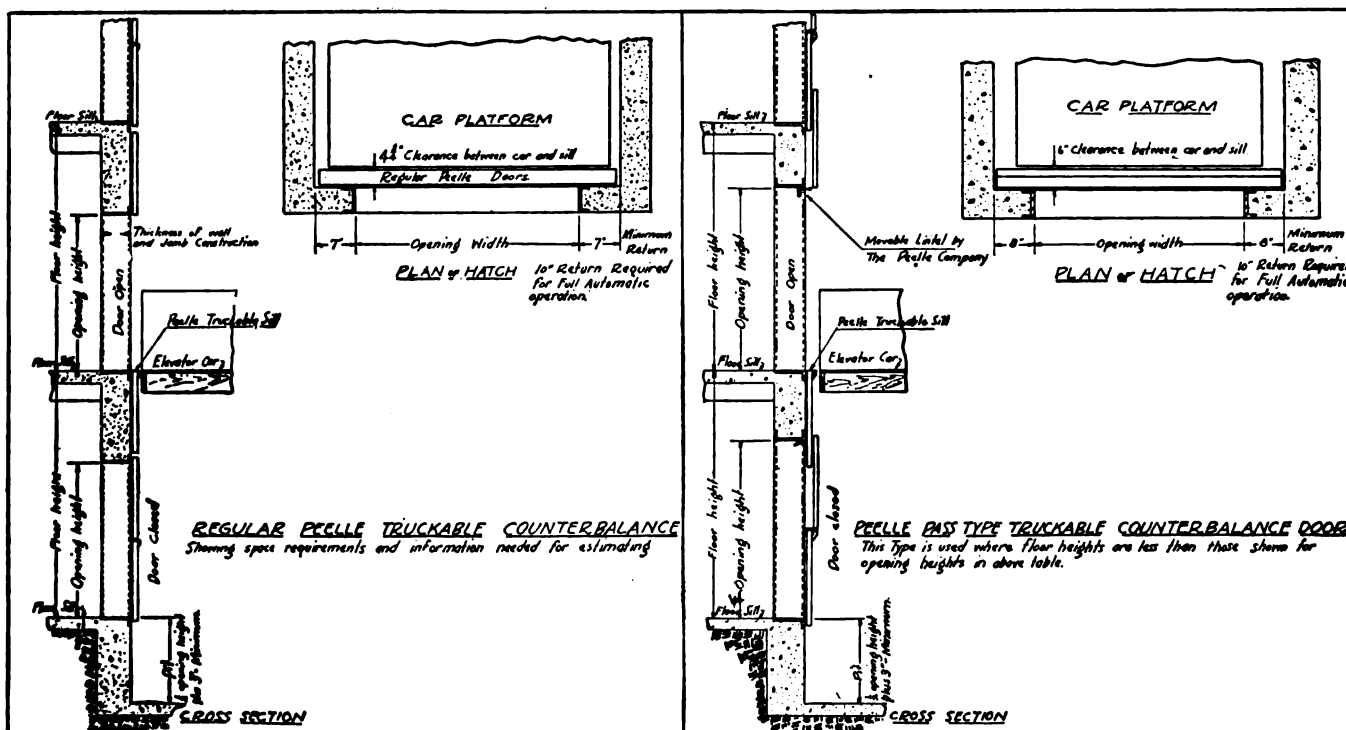
Peelle pass type counterbalance doors can be installed wherever openings are separated 12 in. or more without special construction and are labeled by the Factory Mutual Companies only.

The operation of these doors is the same as that of the regular Peelle counterbalance truckable doors and the same high grade materials and workmanship are used throughout.

The panels are not mounted one directly above the other, but are staggered and run on separate guides. The upper panel is thus enabled to pass by the lower panel of the door on the floor above, the lower panel likewise lapping the upper panel of the door on the floor below. The gap formed at the lintel is effectually closed by a movable lintel which is so constructed as to allow the lower panel of the door above to pass as required.

Lap style doors are made with exactly the same panels as the regular counterbalanced doors. Corrugated steel panels are not recommended for large sizes, the wood tin covered panels being superior.

Peelle pass type counterbalanced elevator doors have been installed in thousands of warehouses and garages in this country and Canada, are in constant use under heavy traffic and are giving utmost satisfaction.



PLANS AND CROSS SECTIONS OF TWO TYPES OF PEELLE COUNTERBALANCE TRUCKABLE DOORS

RICHMOND SAFETY GATE CO.

Manufacturers of Fire Doors and Shutters

MAIN OFFICE AND FACTORY
RICHMOND, IND.

FOR NEAREST AGENCY COMMUNICATE WITH MAIN OFFICE

Products.

HORIZONTAL FOLDING DOORS; STANDARD TIN CLAD FIRE DOORS and SHUTTERS; COUNTERBALANCED ELEVATOR DOORS.

Installation of Richmond Products.

Products are sold f. o. b. Richmond, Ind., in which case complete erection instructions are furnished and when desired, a competent foreman is supplied at a minimum rate; or a contract is entered into for the products and their installation complete. Fire doors are sold with or without fixtures.

Canopy Folding Doors.

Suitable for factories, warehouses, garages, etc. May be installed inside or outside of opening (form-

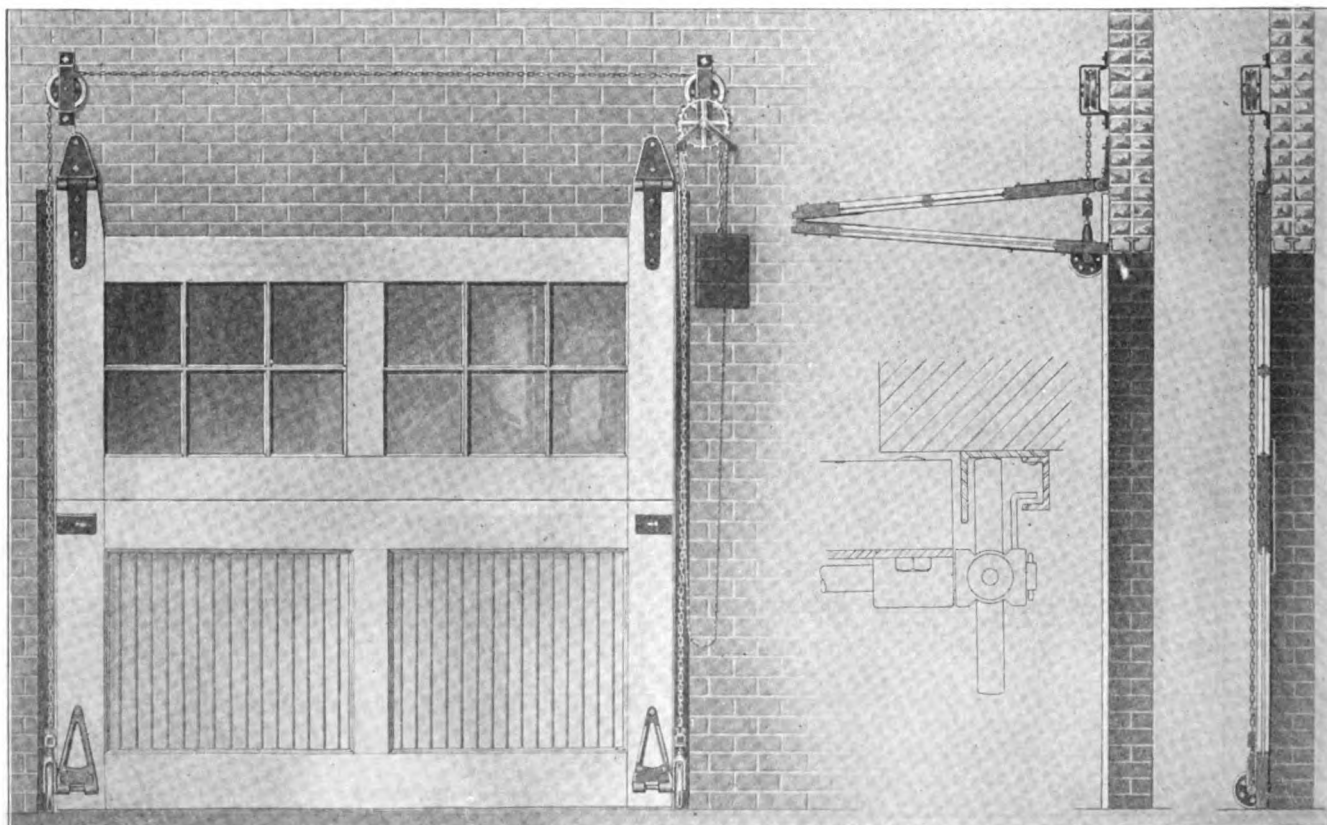
ing a canopy over opening). Operated by means of chain hoist and counterweights.

Standard Tin Clad Fire Doors and Fixtures.

Richmond fire doors and fixtures are made in strict accordance with the latest rules and requirements of insurance authorities. Several types of doors and fixtures are labeled under the supervision of the Underwriters' Laboratories, Inc., and are sold with the guarantee that they will be fully approved by local and state inspection bureaus.

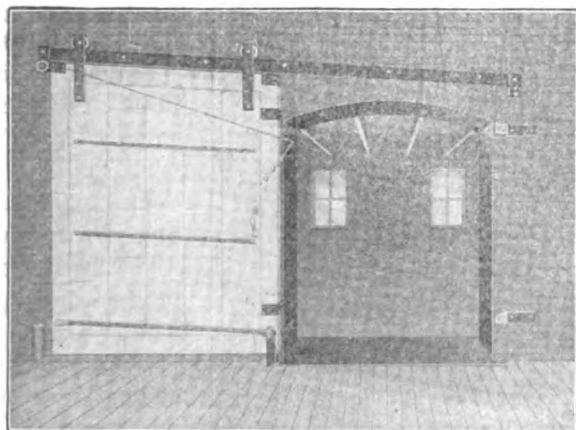
Every National standard fire door and fire shutter made by us is constructed in accordance with the rules and requirements of the National Board of Fire Underwriters and inspected and labeled under the supervision of the Underwriters' Laboratories, Inc.

A finished door measures $2\frac{5}{8}$ in., including tin, and a finished shutter $1\frac{3}{4}$ in.; 4 in. is considered standard lap each side of the opening.



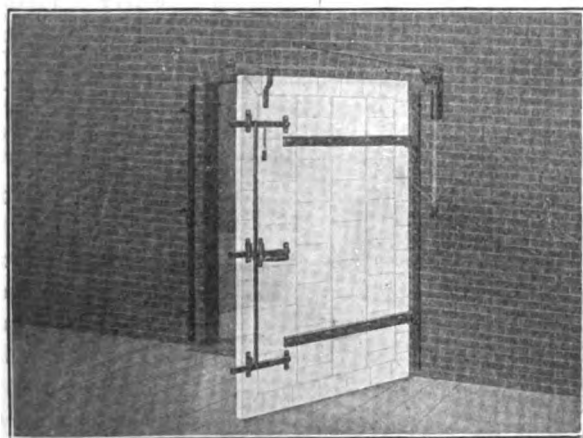
RICHMOND CANOPY FOLDING DOOR, ENDLESS CHAIN TYPE

Sliding Doors and Fixtures—The type illustrated below is in many respects the simplest, yet the most reliable on the market. The door is counterbalanced and held in any desired position. The automatic closing device may be modified to comply with local insurance requirements. Doors and hardware are regularly inspected and labeled under the direction of the Underwriters' Laboratories, Inc.



NO. 200. SLIDING DOORS AND FIXTURES

Swing Doors and Fixtures—Recommended when sliding doors can not be used. Automatic closing attachment should be used on all doors used frequently; device shown below is positive in action and thoroughly reliable. Doors and hardware are regularly inspected under direction of the Underwriters' Laboratories, Inc.



NO. 120. SINGLE SWING DOOR AND FIXTURES

Other Types—The several types of standard fire doors commonly furnished include single and double slide, single and double swing, vertical slide, etc.

Special Conditions—Doors, fixtures and operating devices can always be arranged or supplied to meet unusual conditions. The conditions shown in this company's catalogues are desirable but not necessarily invariable. The engineering department is available to those who have fire doors problems to solve.

Standard Fire Shutters.

Constructed the same as standard fire doors but are 2-ply. They are made to swing or slide and are specially constructed when necessary.

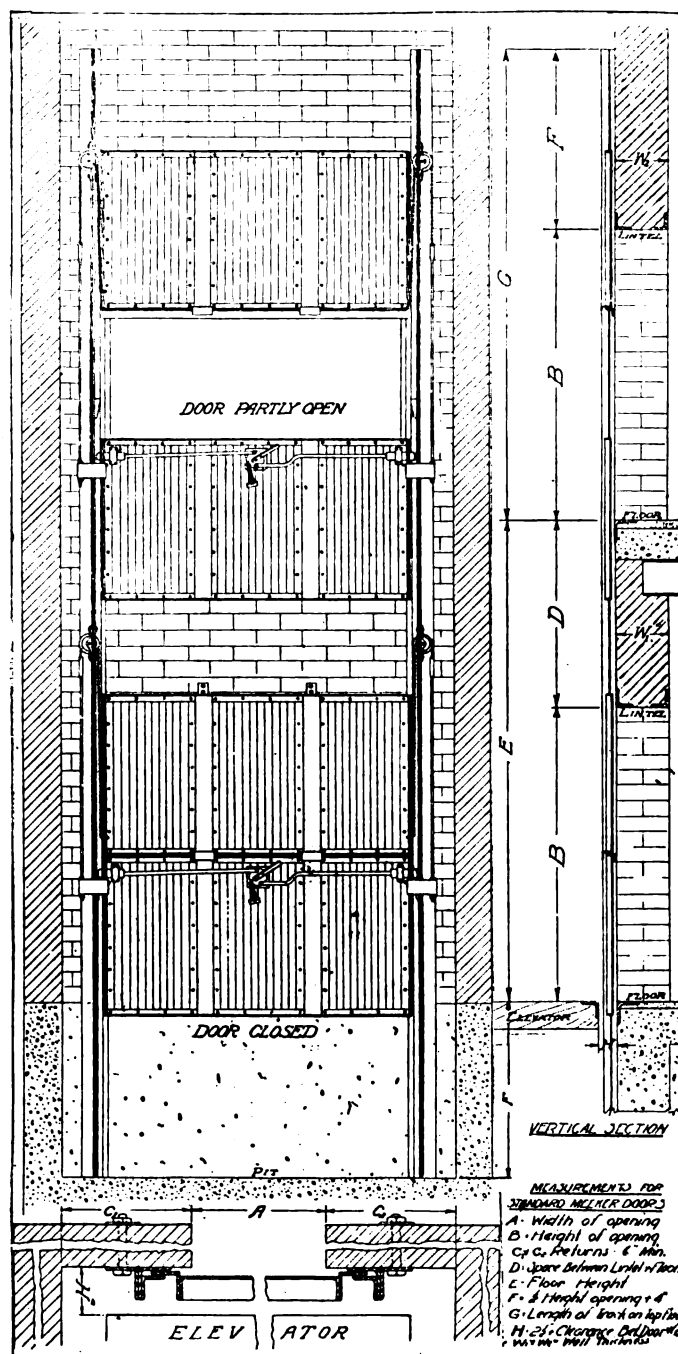
Counterbalanced Elevator Doors.

Richmond counterbalanced doors are mounted on the inside of the elevator shaft, and are made in two sections divided in the center. The guides are of angles bolted to wall. The door sections are of corrugated iron surrounded by and riveted to angle frames. The two door sections are connected by means of heavy cable chain and rods. The chain travels over roller bearing sheaves riveted to the guide angles.

Counterbalanced doors are designed for manual operation from the car, but when desired a self-closing attachment is provided.

Richmond counterbalanced doors are inspected and labeled under the direction of the Underwriters' Laboratories, Inc.

Detail blue prints on request.



DETAILS OF COUNTERBALANCED ELEVATOR DOOR

CORNELL IRON WORKS

Manufacturers of Rolling Steel Shutters and Doors

TELEPHONES:
CHELSEA 1423, 1424, 550

26th Street and 11th Avenue
NEW YORK, N. Y.

Products.

ROLLING STEEL SHUTTERS and DOORS, Hand Chain and Motor Operated, for residences, office buildings, garages, wharves and piers, warehouses, elevator shafts, store fronts and buildings of all kinds.

Experience.

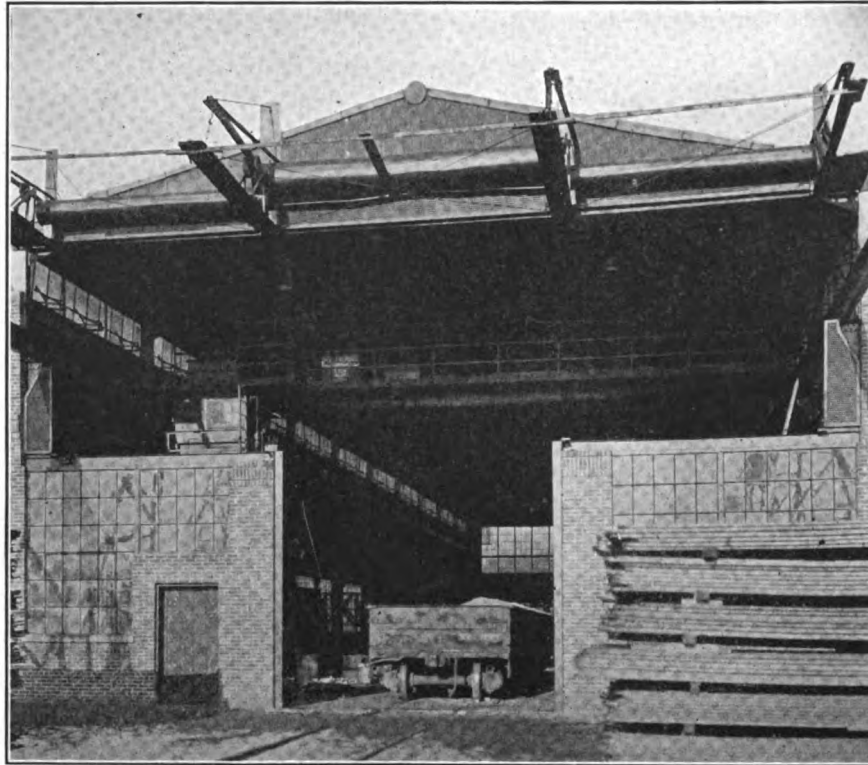
The CORNELL IRON WORKS is the oldest rolling door manufacturer in the United States. Cornell doors have been in use for 50 years.

Description.

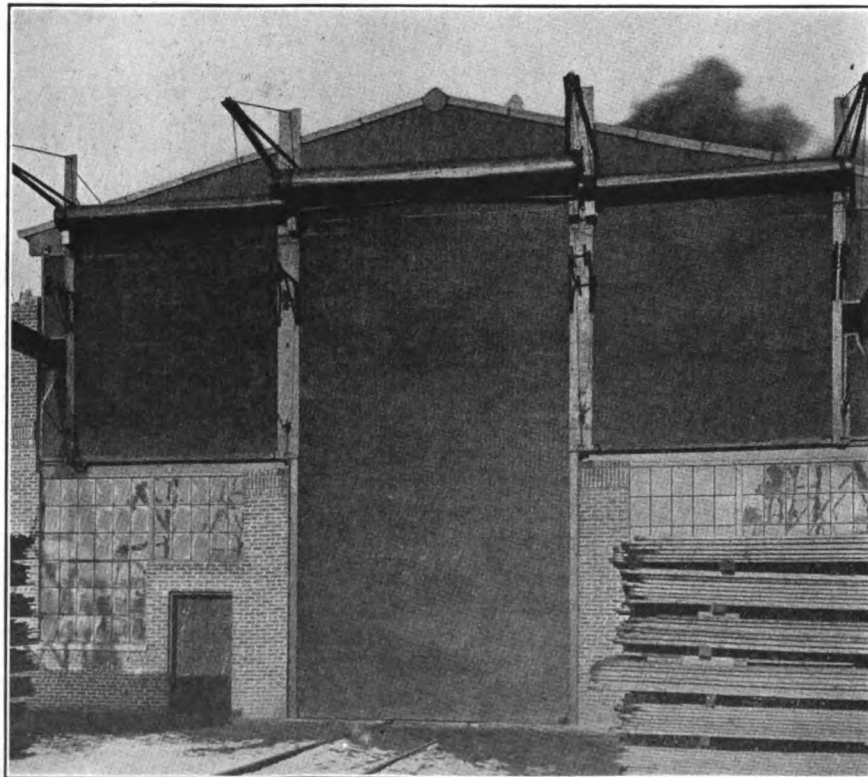
Cornell doors and shutters are constructed of a special shaped deep corrugated open hearth resilient galvanized sheet steel. Motor driven for large doors, chain-hoist geared for medium sizes and self-coiling (to push up and pull down) for doors about 8 ft. wide and under; also automatic fuse link doors.



ROLLING SHUTTER
SWEET'S CATALOGUE



Doors Open



Doors Closed

MOTOR DRIVEN CORNELL ROLLING DOORS ERECTED FOR THE ADVANCE RUMELY CO., LA PORTE, IND.

Features and Advantages.

When injured, easily repaired. Not difficult to erect. Will last a lifetime if cared for.

All parts can be reached by painter's brush. If properly installed work easily.

Cost less than other makers' doors. Last longer than others.

All spring balanced. Motor driven doors, fire-proof. Limit switches used. Heavy grooves for chain hoist. Heavy angle bottom bars.

Can be made up to 50 ft. in width, and any height desired. Can be put outside, inside or between piers. Will work up or down or any way desired. Craneway doors a specialty. Will keep cold out, or heat in.

The best core oven door made. Hot galvanized, not plated. Edges protected by malleable shields. Bronze bearings for quick moving shafts. Smooth galvanized chain hoist. Tinned rivets.

GEO. W. JOHNSON MFG. CO.

Manufacturers of Standard Underwriters' Labeled Automatic Fire Doors

1210-1212 South Eighth Street
ST. LOUIS, MO.

209-211 West 17th Street
KANSAS CITY, MO.

Products.

STEEL ROLLING DOORS and SHUTTERS; COUNTER-BALANCED TRUCKOVER ELEVATOR DOORS.

Also manufacturers of Automatic Tin Clad Sliding Fire Doors; Tin Clad Hinged Fire Doors and Shutters; Metal Covered Doors in several styles; Boiler Plate Doors and Shutters.

Steel Coil Doors.

Steel coil doors provide protection for openings of any size; occupy the minimum amount of space and have a smooth finished appearance from either side of the wall. The Johnson doors are made of flexible corrugated steel, galvanized. The corrugations are short and deep, giving the maximum resistive power against wind pressure.

No. 100, Push Up—Spring counterbalanced, roller bearing, operated by hand. For nominal openings.

No. 100A—Spring counterbalanced, roller bearing, automatic closing. For nominal openings.

No. 110, Chain Hoist—Spring counterbalanced, roller bearing, operated by means of endless chain. For large openings.

No. 100 W. C.—An automatic steel rolling door equipped with perforated shaft containing water pipe. When fuse link releases door in case of fire, water flows over surface of curtain, thereby keeping down

radiation and reducing fire hazard. Door can be operated manually without causing flow of water.

Special Features—The Johnson automatic attachments with two fuse links, one placed at the ceiling line, are superior to the old style attachments with link only at the opening.

Experience has demonstrated that the ceiling link released doors where fire occurred, and in many cases the link at the opening was still intact when fire was extinguished.

Elevator Truckover Doors.

The most practical freight elevator door on the market. Serves the purpose of a fire door and elevator safety gate combined, cutting off draft at each floor.

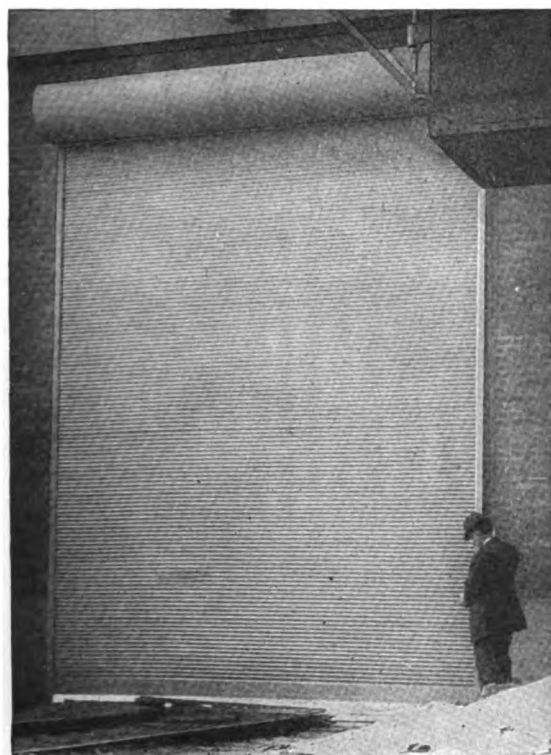
Features—The patented trucking bar is pivoted and conforms to location of elevator platform. If same is below sill level, this bar automatically adjusts itself to the proper angle, giving a smooth surface for trucks, even with small wheels, to pass over without jar or damage to contents.

Another important feature is the interlocking guides, which prevent danger of heavily loaded trucks striking door from room side when closed and forcing same out of guides. Such accidents have occurred when doors were equipped with only plain guides, resulting in contents of truck falling into shaft.

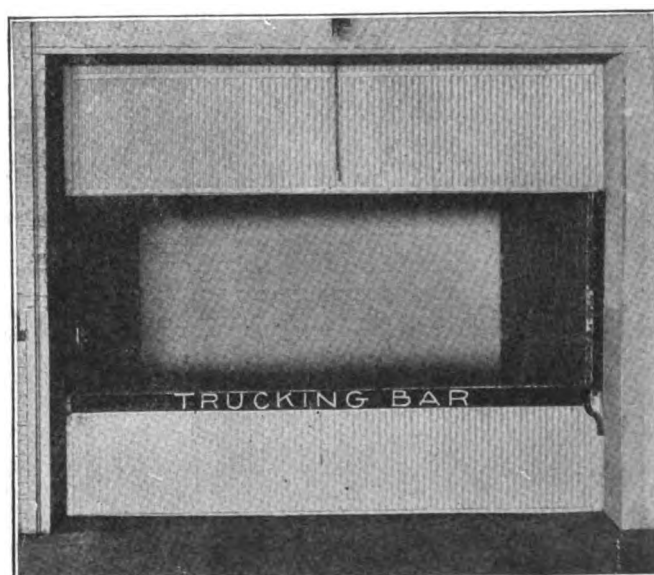
Doors are substantially made and are durable. No weights or springs are required, as one door counterbalances the other with simple and perfect mechanical operation. Doors work easily, and can be equipped with safety attachments.

Details.

Write for more particulars and details.



NO. 110 STEEL COIL DOOR INSTALLED ON TRACK OPENING



ELEVATOR TRUCKOVER DOOR

THE KINNEAR MANUFACTURING CO.

Steel and Wood Rolling Doors, Shutters and Partitions

COLUMBUS, OHIO

BRANCH OFFICES

NEW YORK, N. Y., 1182 Broadway
WASHINGTON, D. C., 929 Southern Building
BOSTON, MASS., 294 Washington Street
PHILADELPHIA, PA., 503 Wesley Building

CHICAGO, ILL., 1860 C. & C. Bank Building
DETROIT, MICH., 709 Ford Building
CLEVELAND, OHIO, 409 Union Building
KANSAS CITY, MO., 503 Railway Exchange Building

AGENTS IN ALL PRINCIPAL CITIES

Products.

STEEL ROLLING DOORS and SHUTTERS; BIFOLDING DOORS, WOOD or STEEL; WOOD ROLLING DOORS for roundhouses; VERTICAL SLIDING DOORS; WOOD ROLLING INTERIOR PARTITIONS.

Kinnear Steel Rolling Doors and Shutters.

Kinnear steel rolling doors and shutters should recommend themselves to engineers and owners for the following reasons:

- (1) They are constructed entirely of steel and therefore fireproof and burglarproof.
- (2) They are mounted above the opening entirely out of the way and afford economy of space.
- (3) Entirely counterbalanced and provided with suitable bearings they are easy to operate.
- (4) Constructed of interchangeable parts which can be quickly replaced in case of accidental damage, the expense of maintenance is negligible.
- (5) For fire purposes labeled doors are positive in closing automatically, can be re-set without difficulty, and, as fire stops, have a long record of successes unknown to any other type.

(6) Can be mounted either on face of wall or in opening.

(7) Can be operated manually, mechanically or electrically, according to size and requirement. If electrically, either by switches or push button control.

Bifold Doors—Wood and Steel.

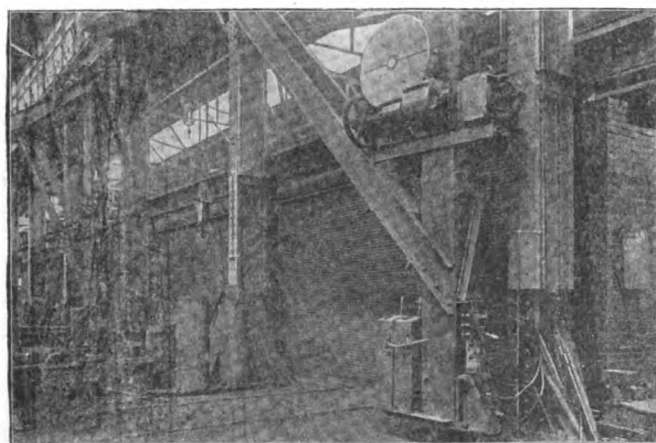
Kinnear bifold doors are made either of wood or steel, and are particularly desirable for openings in buildings, such as piers and warehouses, where the sources of light are limited, as the upper panel may be constructed to carry sash and glass to the extent of approximately one-third of the entire opening.

When in a closed position these doors are entirely out of the way and when in an open position they are suspended overhead either upon a steel track or heavy steel link. Therefore, practically the entire floor space is available with this type of door.

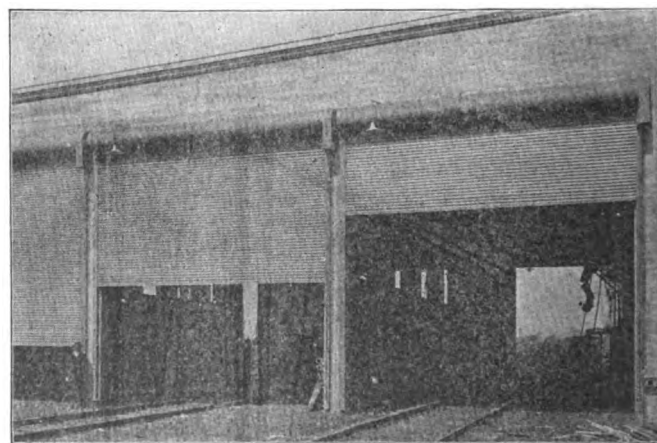
Panels are counterweighted and operated by means of reduction gearing and endless chain.

Vertical Sliding Doors.

Kinnear vertical sliding doors are built of steel in



Pennsylvania R.R. Steel Foundry, Altoona, Pa.



Pennsylvania Grain Elevator, Girard Point

INSTALLATIONS OF KINNEAR STEEL ROLLING DOORS

two or more sections, consisting of trussed frame covered with corrugated steel.

Each section is counterweighted, and door is operated by means of reduction gearing and endless chain.

Sash for carrying glass can be provided in the upper section if desired.

Wood Rolling Doors.

Kinnear wood rolling doors were designed for use in roundhouses, or other buildings where doors are subjected to such influences as would deteriorate the steel rolling doors. Slats are constructed of cypress and treated with creosote. These doors are mounted and operated in manner similar to steel rolling doors, being entirely out of the way, easy to operate, and cheap to maintain.

Interior Partitions.

Kinnear interior partitions are constructed with wooden slats. The coil is concealed in box under lintel, being entirely out of sight and out of the way when open. Slats can be supplied to suit other trim in building. This type of partition is particularly suitable for churches, schools and wardrobes in schools, being neat in appearance and easy to operate. The curtain proper is counterbalanced by means of helical springs. Slats

are held in position by phosphor bronze tape, passing through same at frequent intervals. Openings in slats are so shaped that during flexure there is no change in relative length of slats, or ribbon, nor is there any danger of pinching the bronze ribbon.

Comprehensiveness of the Kinnear Line.

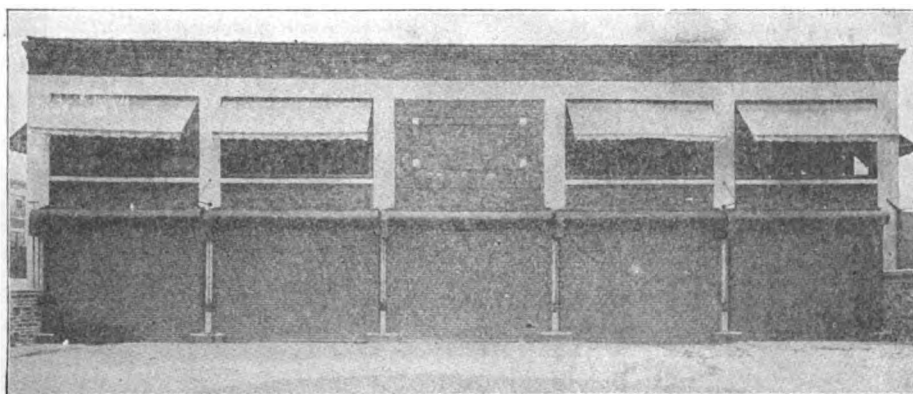
Kinnear products embrace a line of doors and shutters comprehensive enough to meet the most exacting requirements of any class of architecture. They include all the improvements known to the industry which are distinctly *Kinnear*.

Kinnear products may be classified as service doors and shutters and labeled doors and shutters.

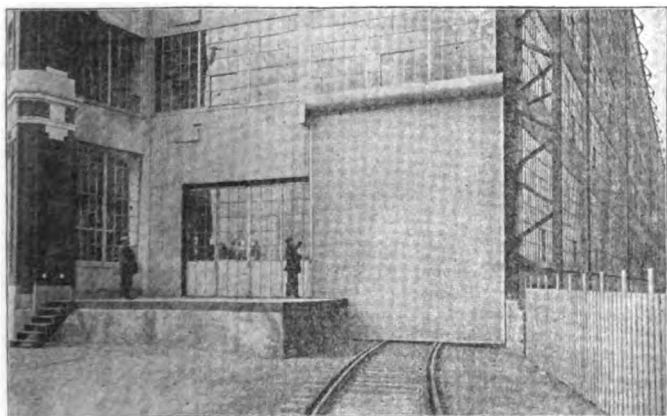
Service Doors.

Service doors are supplied for openings where Underwriters' requirements are not a consideration and can be supplied for manual, mechanical or motor operation. For openings either large or small, Kinnear doors lend themselves especially to the treatment of large railroad openings, crane openings, piers, warehouses, or even in buildings of classic design.

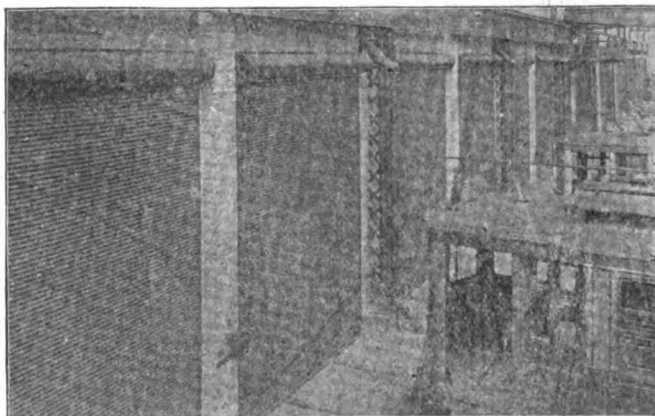
All Kinnear products are built to order to suit each peculiar requirement and assure the highest type of installation.



TYPICAL INSTALLATION OF KINNEAR STEEL ROLLING DOORS IN TRANSFORMER STATION



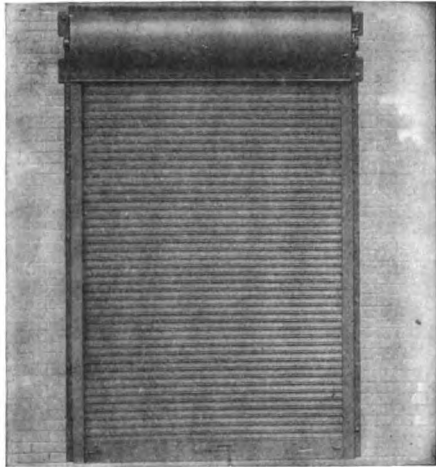
FORD ASSEMBLY PLANT, CAMBRIDGE, MASS.



MILWAUKEE ELECTRIC RAILWAY & LIGHT CO., COLD SPRINGS, WIS.

Some Types of Service Doors—The illustrations below show some of the types of service doors manufactured by this company.

We also supply doors which can be mounted on one side of wall and operated from the other side either with chain or crank.



Elevation



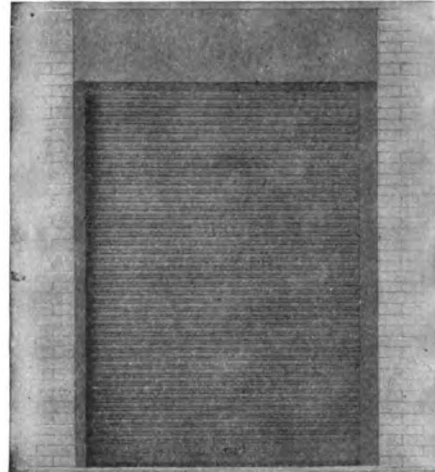
Vertical Section



Cross Section

F.M. 10. CONSTRUCTION

Mounted on face of wall.
Push-up type, entirely counterbalanced.
Can be opened or closed from either side.
Provided with suitable lock.
Available for openings not in excess of 100 sq. ft.
Can be made with automatic closing device if desired



Elevation



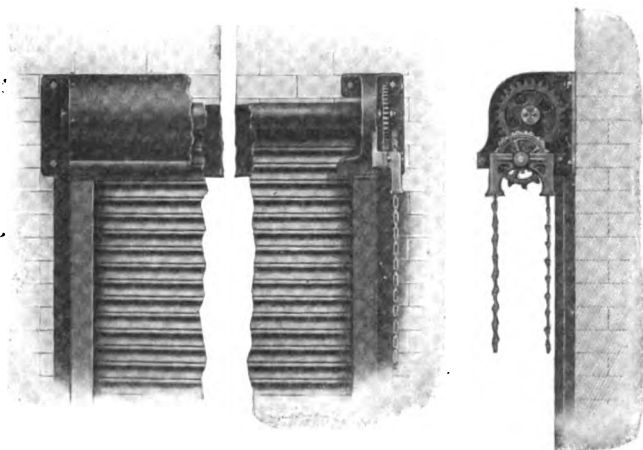
Vertical Section



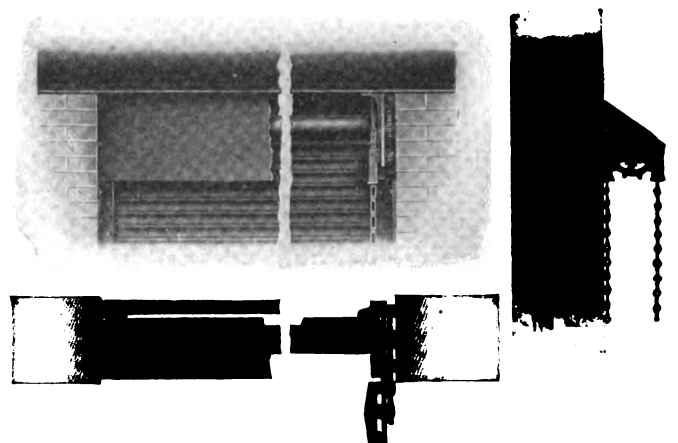
Cross Section

B.M. 10. CONSTRUCTION

Mounted in opening.
Can be opened or closed from either side.
Curtain entirely counterbalanced.
Can be made automatic.
Paneled hoods can be provided

**F.H. 20. CONSTRUCTION**

Mounted on face of wall.
Curtain counterbalanced.
Operated by means of reduction gearing and endless chain.
Suitable chain lock.
Can be made automatic

**B.H. 20. CONSTRUCTION**

Mounted in opening.
Curtain counterbalanced.
Operated by means of reduction gearing and endless chain.
Can be made automatic.
Suitable chain lock.
Paneled hoods where desired

Bifolding Doors.

This type of door can be made with panels either of wood or steel and upper panel can be provided with sash for glass.

Bifold No. 1—Door comprises 2 sections hinged together and supported at center by radial arms pivotally connected to wall brackets.

Chains which communicate with counterbalancing weights are attached at the bottom of lower panel.

Bottom of door is fitted with rollers which travel in guides attached to wall and transmit the thrust.

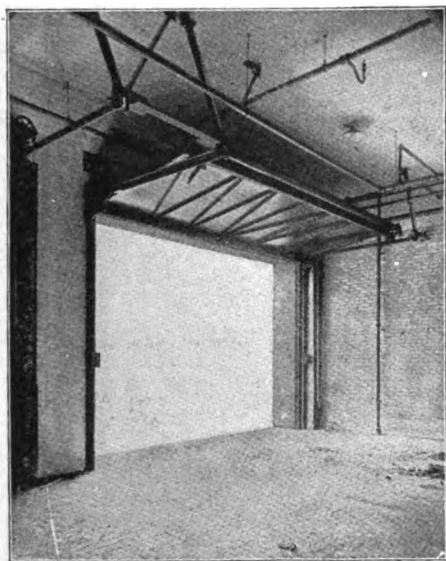
Bifold No. 2—Similar to Bifold No. 1 except that this type is designed for large openings.

It is unnecessary to break door as the operation of unlocking, breaking and raising are accomplished by means of endless chain and suitable reduction gearing.

A reversal of these functions occurs when door is closed. In opening, lower section moves upward a distance of approximately 18 in. when hooks on lower section engage reciprocal members on upper section, door then folds radially to a point above the opening.

Bifold No. 3—Designed for large openings; made in 2 sections.

In operating, the lower section raises to half the height of opening, the door then breaks and both sections move simultaneously, the lower edge vertically, the upper edge horizontally on suspended tracks, to a position above the opening.



BIFOLD NO. 3 IN OPEN POSITION

Vertical Sliding Doors.

This type of door is particularly suitable for freight

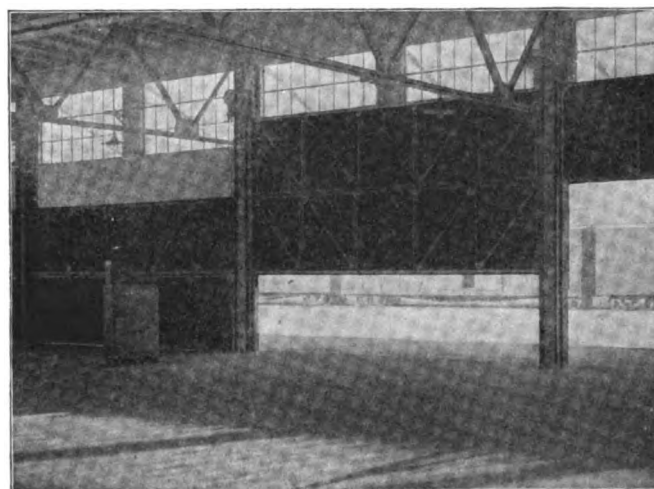
houses, piers and warehouses where light is essential through doors.

The door comprises 2 or more sections consisting of trussed frame covered with corrugated iron, hung independently with chains connected with counterbalance weights, and is operated by means of endless chain and suitable reduction gearing.

Where doors are mounted on steel columns, guides and weight boxes should be incorporated as a part of the column and be supplied by steel contractor, according to details supplied by our Engineering Department.

This type can also be supplied to be mounted on the face of wall in which case, we supply weight box and guides as a part of our equipment.

It is advisable to get definite information from factory in connection with the above type of door.



VERTICAL SLIDING DOORS
Installed in Santa Fe freight shed

Kinnear Fire Doors and Shutters.

A complete line of steel rolling fire doors and shutters are manufactured by THE KINNEAR MANUFACTURING Co. under the supervision of the Underwriters' Laboratories, Inc., and are supplied bearing labels under the following conditions:

Class "A"—For openings in fire walls where total area is not in excess of 80 sq. ft. and where neither dimension exceeds 12 ft. Double doors required.

Class "B"—For vertical shaft openings, entrances to bridges or tunnels where total area is not in excess of 80 sq. ft. and where neither dimension exceeds 12 ft. Single doors required.

Class "C"—For openings in corridor or room partitions where total area is not in excess of 80 sq. ft. and where neither dimension exceeds 12 ft.

Class "D"—For openings in exterior walls where total area does not exceed 100 sq. ft. and where neither dimension exceeds 12 ft.

Excess Sizes—Doors in excess of these sizes can be supplied and are constructed in every way similar to the labeled type for classification desired, but can not carry label. Certification of inspection may be secured by application of owners or purchasers to the Underwriters' Laboratories, Inc., requesting that such inspection be made at the factory.

Underwriters' labeled doors are furnished to operate in the following manner:

- Push-up and self-coiling.
- Gear operation with endless chain.
- Gear operation with crank and shaft.

Advantages of Kinnear Fire Doors and Shutters.

Kinnear labeled steel rolling doors and shutters are fundamentally correct as fire stops.

(1) They are compact, sturdy, always in place, out of sight and out of the way.

(2) They move in a vertical plane and do not consume valuable space.

(3) Curtain is made of interlocking slats formed of extra heavy gauges of steel, which project beyond opening into guides of sufficient depth to insure against excessive deflection either in case of wind pressure or fire.

(4) Malleable end locks riveted to ends of slats are designed to prevent the passage of fire, and to take the wear incident to constant use.

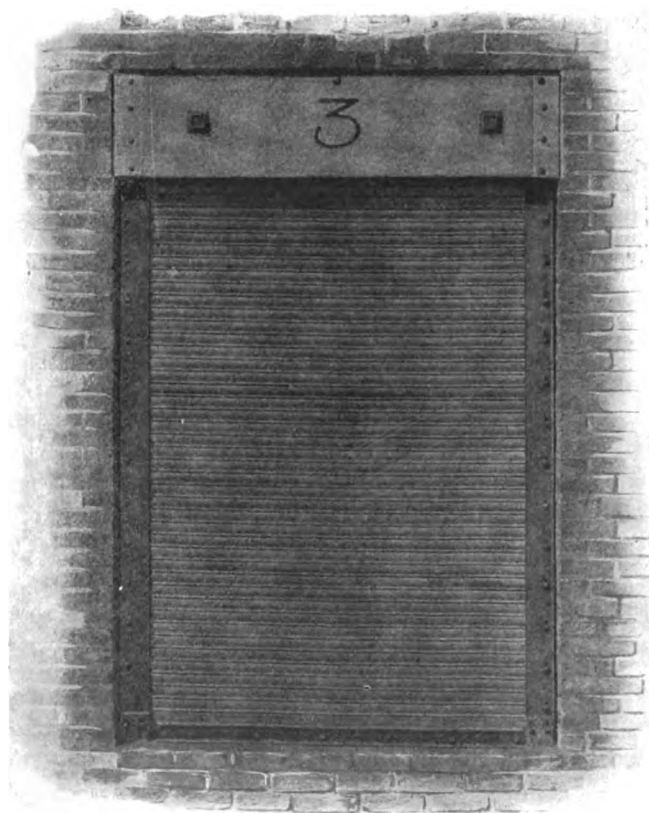
(5) An auxiliary or inner hood is provided to close automatically, and, when curtain is in closed position, prevents the passage of smoke or flames through the opening.

(6) Guides are slotted, and each bolt for attaching same is provided with a fusible washer which takes care of expansion of guide in case of extreme heat.

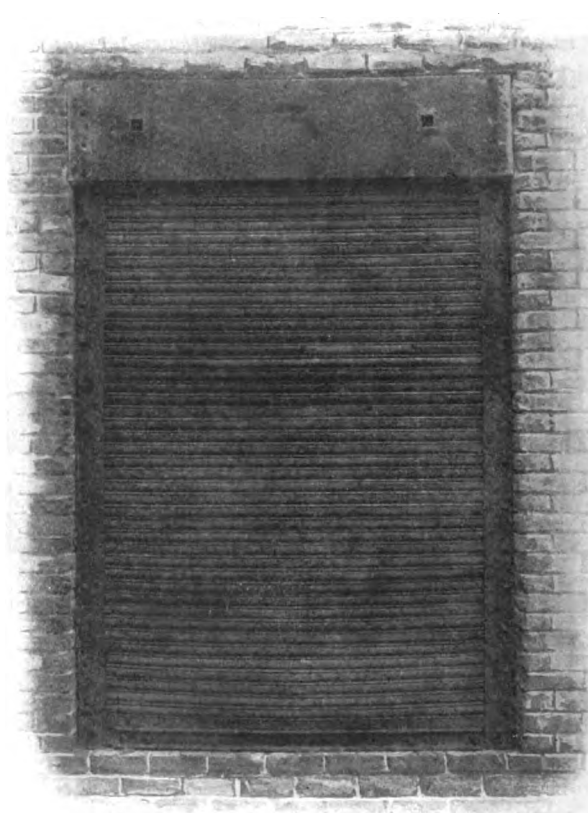
(7) Close automatically from any open position.

(8) Can be reset without difficulty after automatic closure.

(9) Can be provided with *safety device* in the shape of a governor which controls the drop of the door in automatic closure, eliminating all danger, and avoiding the violent impact where such device is not used.

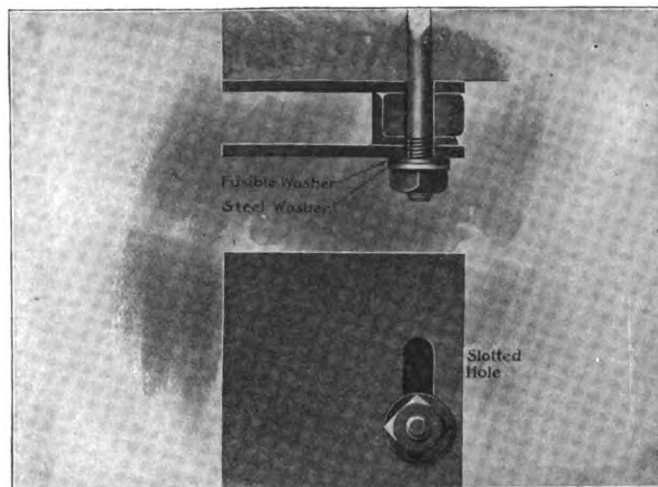
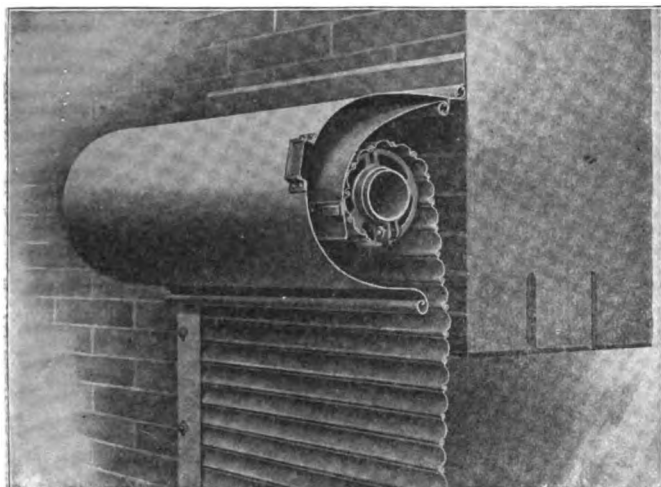


Before Test

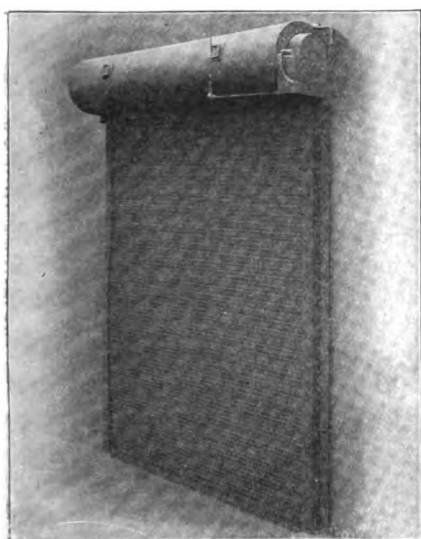


After Test

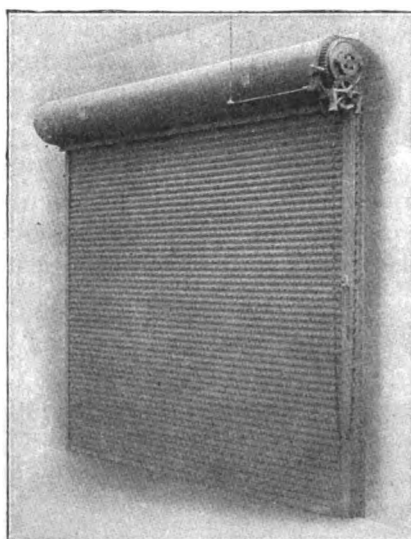
RESULT OF TEST CONDUCTED BY THE UNDERWRITERS' LABORATORIES, INC., ON A KINNENAR FIRE DOOR
The fire temperature was 1880°; illustrations show the side of the door presented to the fire



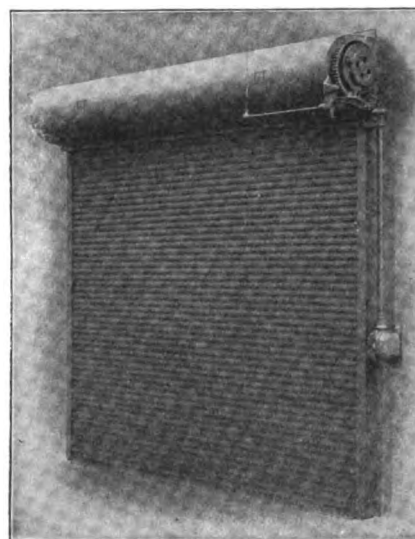
SALIENT FEATURES OF KINNEAR FIRE DOORS AND SHUTTERS



Manual Operation

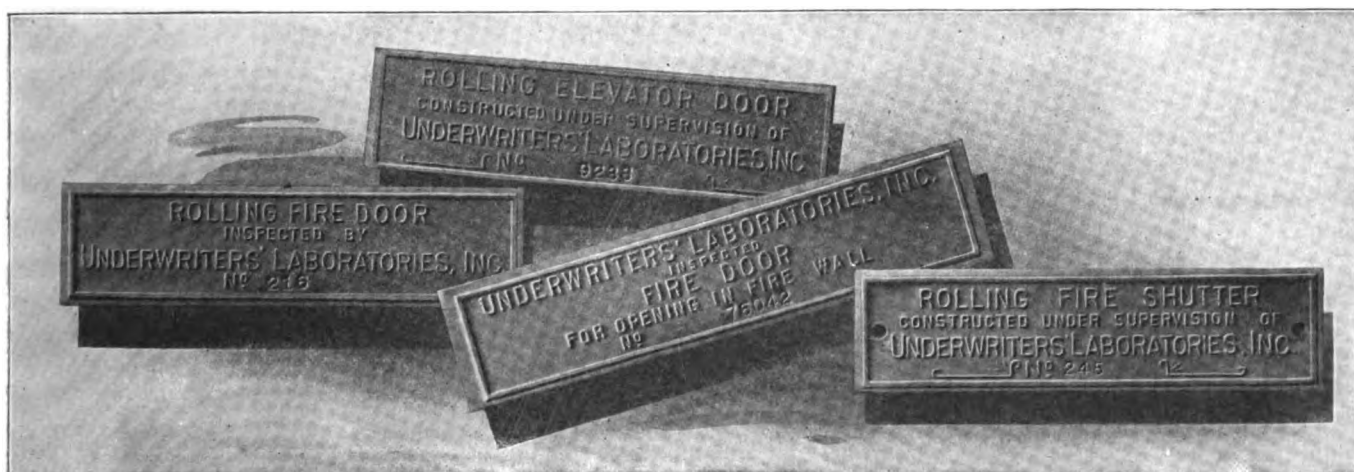


Chain Operation



Crank and Shaft Operation

A FEW TYPES OF AKBAR CONSTRUCTION



UNDERWRITERS' LABELS

Motor Operation for Steel Rolling Doors.

To meet the constantly growing demand for power operation in connection with Kinnear steel rolling doors—where applied to large railroad openings, crane openings and other types of large openings—where frequent operation is necessary, we have developed a complete power unit which can be attached to Kinnear doors and which, because of its compactness, is available for all classes of openings.

In order to supply a power unit entirely suitable to requirements we have designed three distinct types which are designated, as follows:

- Power Unit No. 1
- Power Unit No. 2
- Power Unit No. 3

Each power unit comprises motor, limit switches, magnetic brake, reduction gear, manual (or emergency) operating mechanism, automatic starter, reversing and service switches.

Limit switches, susceptible of precise adjustment, control the travel of the curtain, stopping it at the proper time; also actuate the magnetic brake and the automatic starter which breaks the circuit, stopping the motor.

The reduction gear is enclosed in heavy cast iron housing, they are cast iron and steel, cut teeth, running in oil bath, the spray lubricating all bearings.

Heavy bearings are bushed with bronze, light bearings are babbitted. Enclosed type of knife switches. Externally operated—safety type are supplied as our standard equipment for operating and service purposes.

Power Unit No. 1—Our heaviest unit, being designed for extremely heavy loads. Either power or manual operation is secured through the same gear, and either method may be employed without the shifting of clutches.

Power Unit No. 2—Designed for average sized openings and similar in all respects to Power Unit No. 1 except that it is somewhat smaller. Further, this type is essentially a power drive—manual operation intended for emergency only. The emergency chain should be placed on sprocket when needed for manual operation and removed when the motor is employed.

Power Unit No. 3—This unit is small and very compact, and is supplied either to be attached to the bracket or the wall, according to conditions, and is particularly desirable for small doors with limited head-room. It is essentially the same as Power Unit No. 1 except smaller in design.

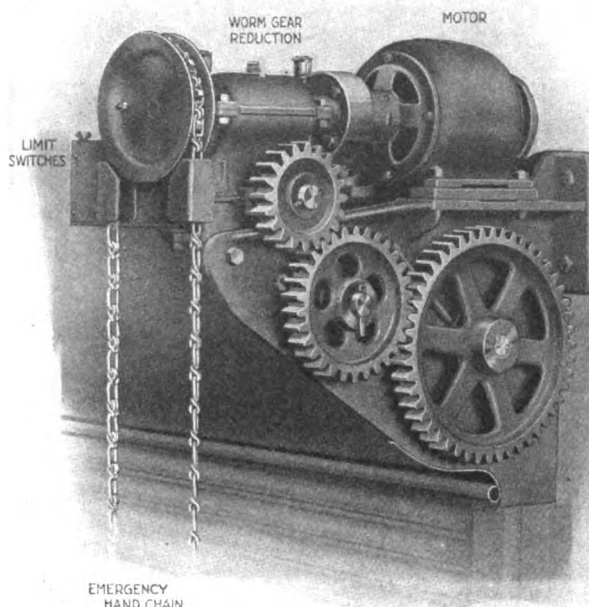
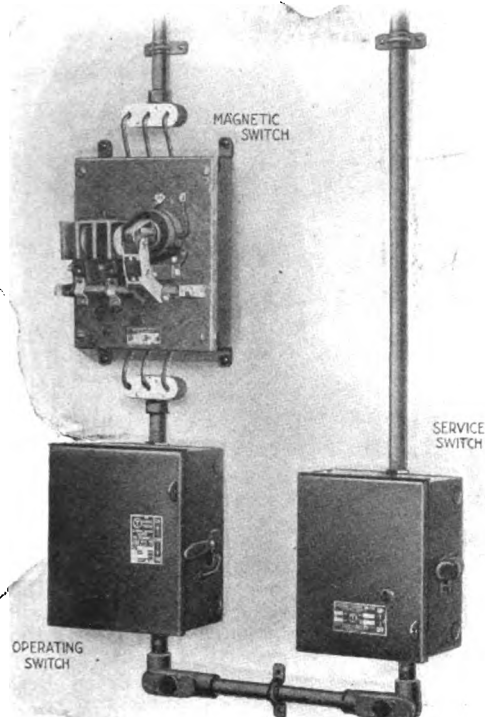
Speed—Our power units are designed to raise and lower curtains at the rate of 1 ft. per second, and are always placed above the openings where possible to do so, being entirely out of the way. The complete equipment is mounted on platform or bracket in most compact form.

Accessories—Wire, wiring and fuses are always furnished and installed by others.

For Quotations—The information necessary to quote intelligently on motor operated doors is, as follows: number and sizes of doors; complete description of current.



TYPICAL INSTALLATION OF KINNEAR MOTOR OPERATED DOOR



NO. 3 POWER UNIT COMPLETE

Consists of motor, limit switches, magnetic brake, reduction gear, manual (or emergency) operating mechanism, automatic starter and service switches

Kinnear Motor Operated Doors are Efficient.

Motor operation in connection with Kinnear steel rolling doors has rapidly grown in popularity for the very good reason that our power units have been designed by experts who are familiar with the inherent peculiarities of our doors. We offer our several types of power units with an absolute guarantee, that if properly installed, and maintained, they will render a service 100% efficient.

Operation of Kinnear Doors.

The above illustration shows No. 3 power unit mounted on bracket and equipped with enclosed knife switches, externally operated. The entire equipment, including limit switches, is in the most compact form possible and motors are of sufficient size to raise and lower doors at the rate of 1 ft. per second.

Push button control may also be employed with one or more stations as desired. Where frequent opening and closing of doors is necessary, the labor cost entailed by manual operation would in a very short time pay the extra cost of a power unit, saying nothing of the added convenience.

Doors may be operated in groups or individually, and where hinged posts are necessary for dividing large

openings, these posts may also be operated by our power units.

This equipment is as nearly foolproof as it is possible to make it and can be operated as well by unskilled labor as by a trained mechanic.

Write our Engineering Department for further information, giving size of doors and description of current.

Efficient Service.

Kinnear steel rolling doors have a long record of achievement, and there is scarcely a city or hamlet anywhere in which our doors or shutters have not been installed.

Each job is carefully engineered to meet the most exacting conditions, and Kinnear doors have kept pace with every advance made in architectural design.

Coil and brackets above openings, curtain completely counterbalanced, easy to operate, inexpensive to maintain, Kinnear steel rolling doors are easily the most efficient door on the market.

The initial cost may be more, but the final cost will be very much less.

A highly developed Engineering Department will solve door problems. Write for catalogue.

THE J. G. WILSON CORPORATION

SUCCESSORS TO THE JAS. G. WILSON MFG. CO.

ESTABLISHED 1876

Manufacturers of Rolling Doors and Shutters in Steel, Wood, Bronze

TELEPHONE:
VANDERBILT 1875-76

8 West Fortieth Street
NEW YORK, N. Y.

CABLE:
"LYDIAN, NEW YORK"

FACTORY ADDRESS—MAIL AND TELEGRAPH: NORFOLK, VA.

OFFICES AND AGENCIES

RICHMOND, VA., J. S. ARCHER, 203 Real Estate Exchange Building	BUFFALO, N. Y., THE J. G. WILSON CORPORATION, Fidelity Building
BOSTON, MASS., E. A. BAKER, 17 Pearl Street	PORTLAND, ORE., F. W. FARRINGTON & Co., 304 Henry Building
TOLEDO, OHIO, BUILDING PRODUCTS Co., Summit and Sandusky Streets	PHILADELPHIA, PA., L. H. MYRICK, Otis Building
PITTSBURGH, PA., H. H. CHARLES, Bessemer Building	PUEBLO, COLO., PATTERSON ENGINEERING AND SALES Co., 114 West 7th Street
CINCINNATI, OHIO, CINCINNATI CLAY PRODUCTS Co., 409 Johnson Building	KANSAS CITY, MO., J. P. SPRAGUE Co., 624 Bryant Building
CHICAGO, ILL., H. B. DODGE & Co., 332 South Michigan Avenue	CHARLOTTE, N. C., T. L. TALBERT, 5th and Church Streets
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MINNEAPOLIS, MINN., JOHNSON, JACKSON & CORNING, 712 Builders' Exchange	SYRACUSE, N. Y., H. L. WATERMAN, 608 Cahill Building
	LOS ANGELES, CAL., THE J. G. WILSON CORPORATION, 600 Metropolitan Building
	WASHINGTON, D. C., R. T. McKNEW, 627 Woodward Building

Products.

WILSON STEEL ROLLING DOORS and SHUTTERS, Interlocking Slat Type.

WILSON UNDERWRITERS' ROLLING FIRE DOORS.
WILSON ROLLING WOOD DOORS.

Engineering Department.

This company, through its Engineering Department, makes a specialty of a solution of various intricate conditions where rolling doors and shutters are particularly desirable and where the peculiarities of the conditions make it impractical to standardize the operating methods.

For example: where craneway openings demand unequal curtains, the operation of each of which depends upon the operation of another curtain; where pilasters carrying the curtain guides have to be removed or swung up parallel with the opening or at right angles to it, or where they are trolleyed to one side or the other to clear the opening.

In all cases where peculiar engineering requirements are involved, the Engineering Department of THE J. G. WILSON CORPORATION is placed at the disposal of the engineer or architect, and it is especially desirable that personal consultation be had before any definite arrangements are made.

Wilson Steel Rolling Doors and Shutters.

Wilson steel rolling doors and shutters are designed to meet two classes of service: first, the effective closure of openings against weather and intrusion; second, approved underwriters' fire doors.

Closure Doors—The doors and shutters made for closure of openings are substantial and are excellent fire retardants.

Underwriters' Fire Doors—These doors and shutters are made particularly for protection against fire. They are similar in construction to the closure doors, excepting that they include special fire protective devices.

They are automatic in operation, and they meet all of the requirements of, and are indorsed by, the National Board of Fire Underwriters.

Official Indorsement—Wilson rolling steel fire doors are indorsed and labeled by the National Board of Fire Underwriters, Inc., for the following services:

OPENINGS IN VERTICAL SHAFTS—Openings in vertical shafts, corridors and room partitions, the area of opening not to exceed 80 sq. ft., width or height of opening not to exceed 12 ft.

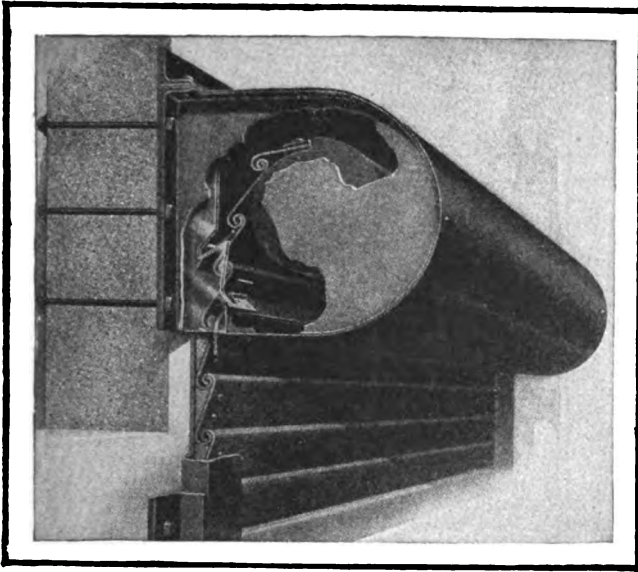
Curtains may be hung on face of wall or between jambs, operated manually or mechanically, and automatic where desired. Wilson's type Nos. 21 to 35 inclusive, interlocking slat pattern No. 2, No. 20 gage.

FIRE WALL OPENING—Area of opening not to exceed 80 sq. ft., width or height not to exceed 12 ft.

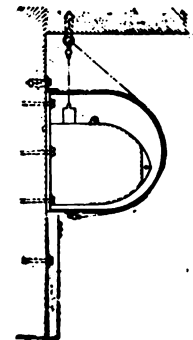
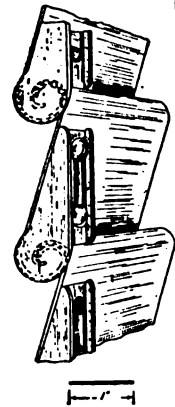
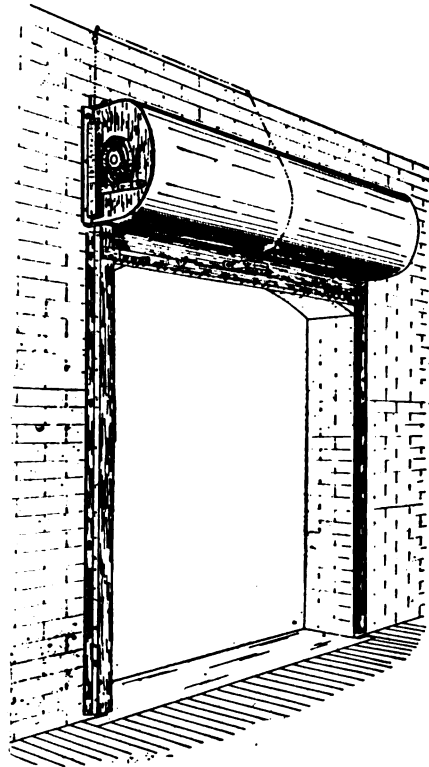
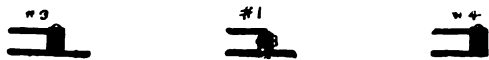
Curtain may be hung on face of wall or between jambs, operated manually or mechanically, automatic where desired. Wilson's type Nos. 31 to 35 inclusive, interlocking slat pattern No. 2, No. 16 gage.

OPENINGS IN EXTERIOR WALLS—Area of opening not to exceed 100 sq. ft., width or height not to exceed 12 ft.

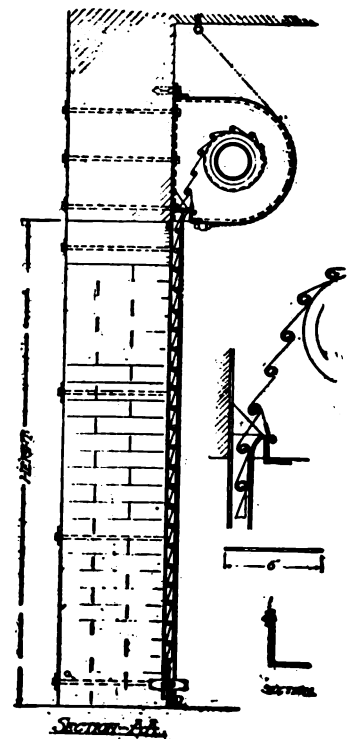
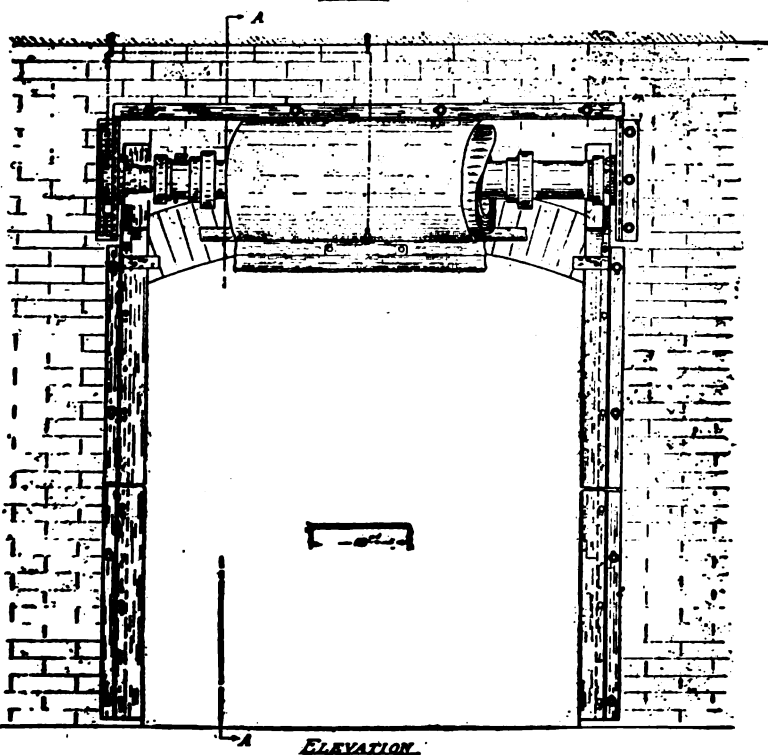
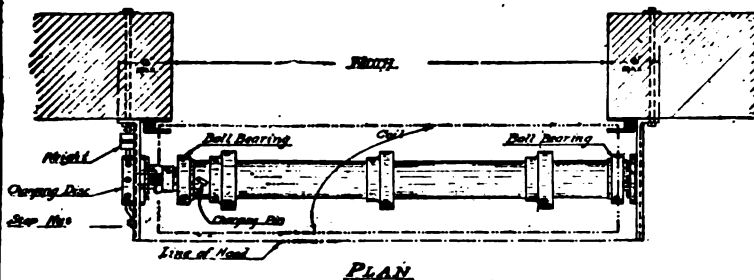
Curtain may be hung on face of wall or between jambs, operated manually or mechanically, automatic where desired. Wilson's type Nos. 41 to 49 inclusive, interlocking slat pattern No. 2, No. 22 gage.



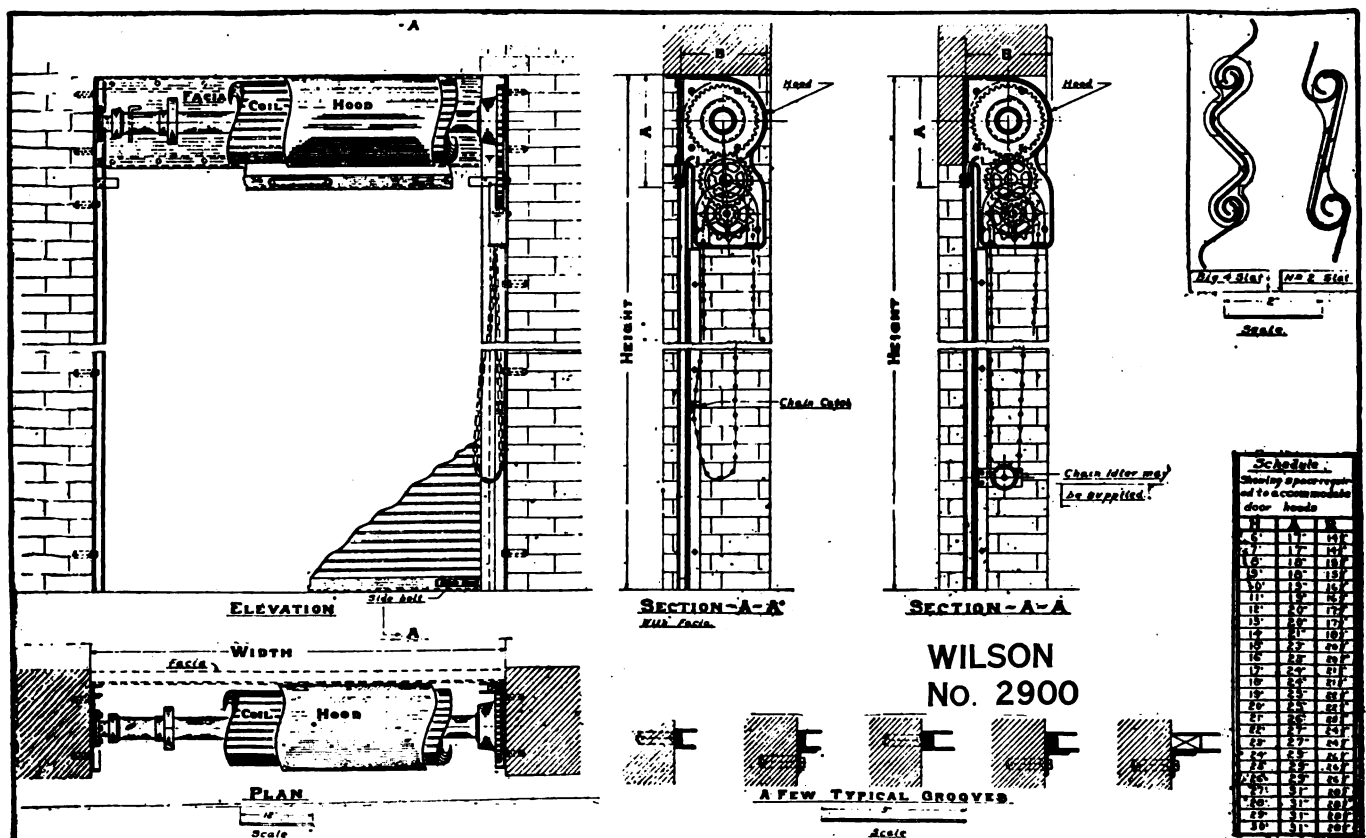
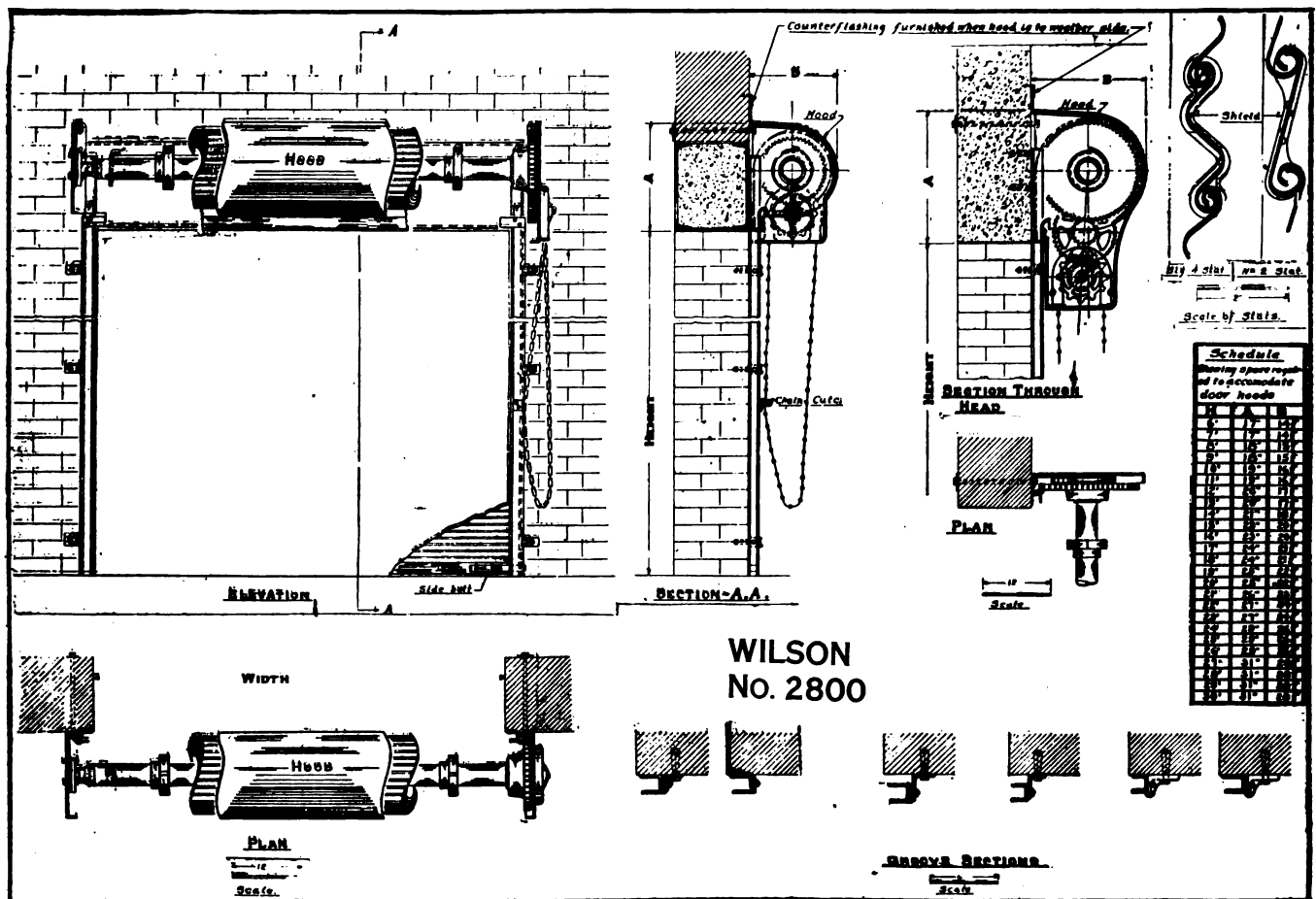
DETAIL OF UNDERWRITERS ROLLING
STEEL FIRE DOOR



WILSON
No. 2500



NO. 2500. WILSON FIRE DOORS LABELED FOR ELEVATORS, STAIRCASES, CORRIDORS AND FIRE WALLS



Wilson Steel Rolling Doors and Shutters—(Continued).

Operation—All doors are counterbalanced by helical springs arranged to properly balance door in any position. The operation is in three general types as follows:

SPRING BALANCE OR SELF-COILING—Wilson Nos. 1441 and 1794. Manually operated by means of handles attached to bottom of door; for openings 8 by 10 ft. or less.

GEAR OPERATION FOR LARGE OPENINGS—Operated by means of chain and sprocket, Wilson Nos. 2800 and 2900 (see preceding page); by bevel gear, Wilson Nos. 3368 and 3363 (see following page). Various types of simple and compound gears are used to conform with requirements. Easy access for repairs or lubrication.

Journals are of cold rolled shaft, all gears four-pitch and designs for special operation where worm and bevel gear are required will be supplied on application. Ball bearings are used where required.

POWER OPERATION FOR EXTRA LARGE OPENINGS—Electric motors of suitable type and of standard make are supplied. These are directly connected by flexible couplings to reduction gears, which are of ample strength.

Transmission of power from reduction gear to door shaft is accomplished by means of roller chain. This eliminates any possibility of trouble due to inaccurate alignment of direct gearing. Reduction gears are of the Hindley worm design.

Control—This is accomplished by means of enclosed reversing switch; or when remote control is desired, by means of push button station and reversing switch of the contractor type. Travel of the door is governed by worm limit switches in conjunction with solenoid brake.

More complicated installations will of necessity require additional electrical appliances. Where such conditions exist it is recommended that the matter be taken up with the Wilson Engineering Department. Doors electrically controlled may be operated independently or

in groups simultaneously. Emergency hand operation will be supplied with each power unit.

Wicket Doors—Hinged wicket doors, maximum size 2 by 5 ft., may be placed in any closure door, preferably at the side. The doors are so designed that the wicket with its frame must be swung back out of the way before raising the large door.

Types of Slat—**INTERLOCKING SLAT TYPE, STYLE No. 1 FOR SMALL OPENINGS**—This type is designed to give maximum strength with minimum depth of corrugation. Design eliminates all sharp bends.

INTERLOCKING SLAT TYPE, STYLE No. 2—Labeled by the National Board of Fire Underwriters for closing openings in vertical shafts, room partitions and fire walls. Attention is called to underwriters' size limitations following. The large round hooks forming the lock contribute to strength of slat.

Adapted for closures up to 25 ft. in width. Manufactured from Nos. 20, 18 and 16 gage stock.

INTERLOCKING SLAT TYPE, STYLE BIG 4—This is similar in design to Style No. 1, having the advantage of a greater depth of corrugation, which materially increases its rigidity and places it in a class by itself, particularly when fitted with safety attachment for resisting wind pressure. This type is recommended for large openings.

This construction is adapted to all classes of closures and is manufactured from Nos. 22, 20, 18 and 16 gage stock (cold rolled).

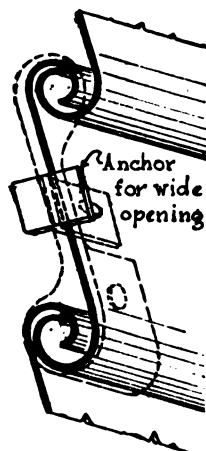
See details, showing this type of curtain with shield; and also safety grooves and anchors used for wide openings shown on the detail.



STYLE NO. 1
INTERLOCKING
STEEL ROLLING
DOOR



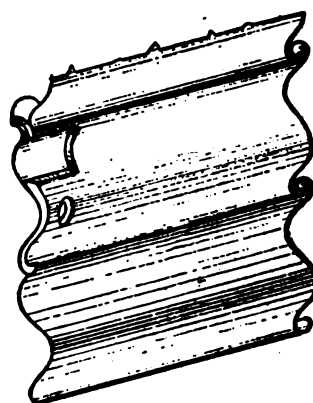
STYLE NO. 2
INTERLOCKING
STEEL ROLLING
DOOR



NO. 2 SLAT WITH
REGULAR SHIELD
Scale, 1/2 full size



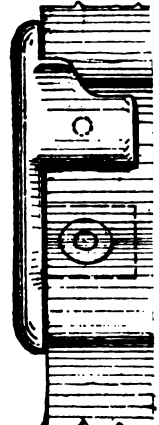
STYLE BIG 4
INTERLOCKING
STEEL ROLLING
DOOR



3-in. Scale Perspective Showing
Slat and Shield Assembled

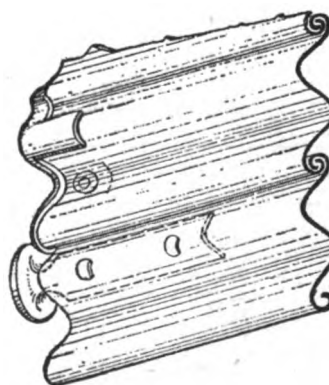


Section



Elevation of
Shield at End
of Slat

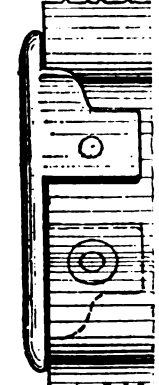
DETAILS OF NO. 1 SLAT
Scale, 1/2 full size



3-in. Scale Perspective Showing
Slat and Shield Assembled



Section



Elevation of
Shield at End
of Slat

DETAILS OF BIG 4 SLAT
Scale, 1/2 full size

Wilson Wood Rolling Doors and Shutters.

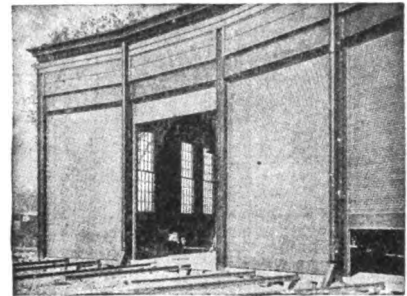
Uses—These doors are especially made to withstand the corrosive fumes so destructive to iron and steel. Their use is recommended especially for roundhouses, powerhouses, engine rooms and other places where corrosive fumes are generated. They are also recommended for use as closure doors for wood constructed warehouses and the like.

Construction—These doors are made of wood slats 2 in. wide and about $1\frac{1}{8}$ in. thick, fitted together with rule joints, edge to edge, and threaded upon bands of bronze metal running from the top to the bottom about 18 in. apart. Each band is riveted to the top slat and attached at the bottom to a strong spiral spring anchor of phosphor bronze, concealed in the baseboard or bottom bar. The whole construction is exceptionally heavy and durable, and will stand any amount of hard wear.

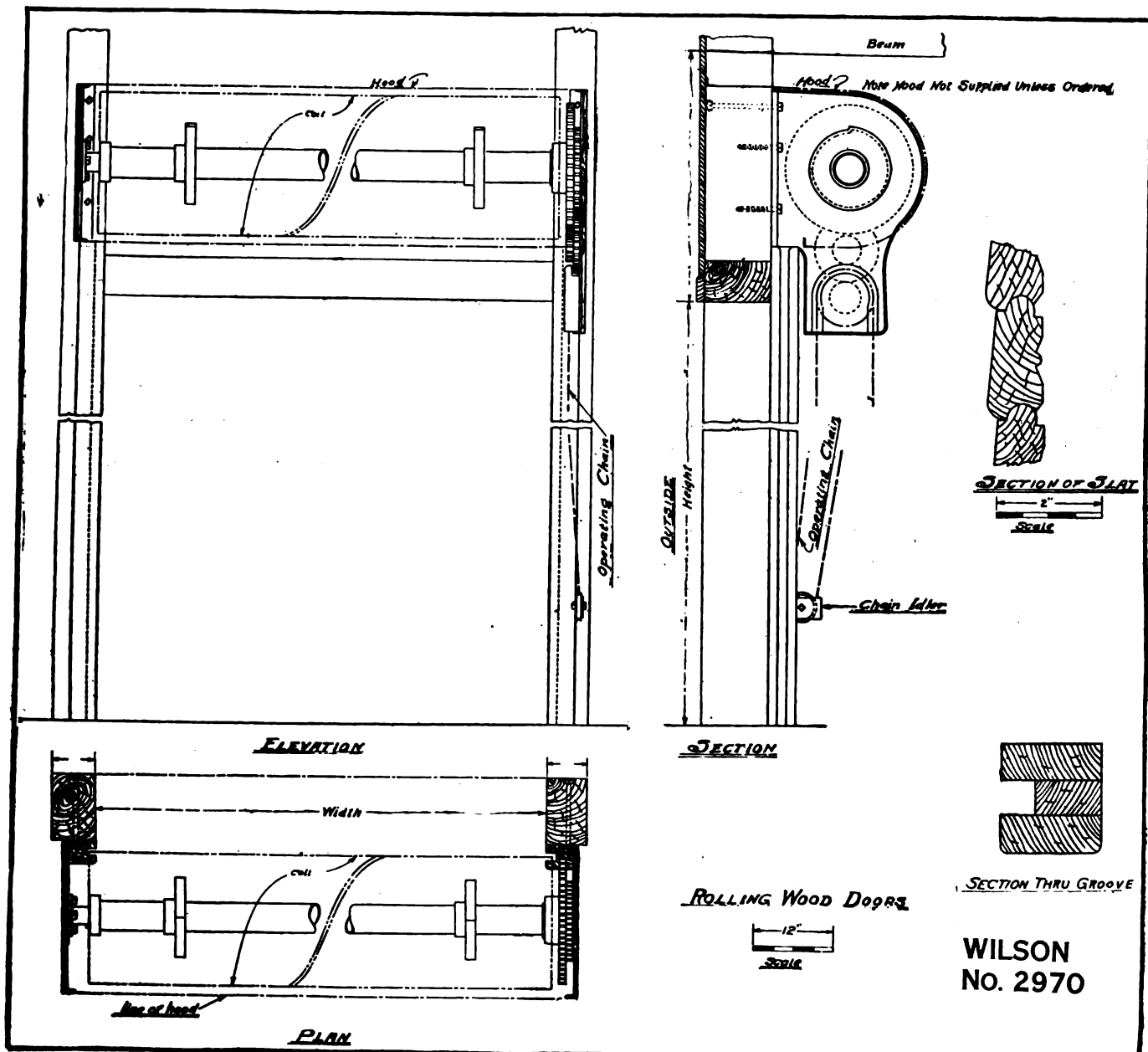
Operation—The doors are spring counterbalanced and are easily operated by an endless chain attached to gear at end of shaft.



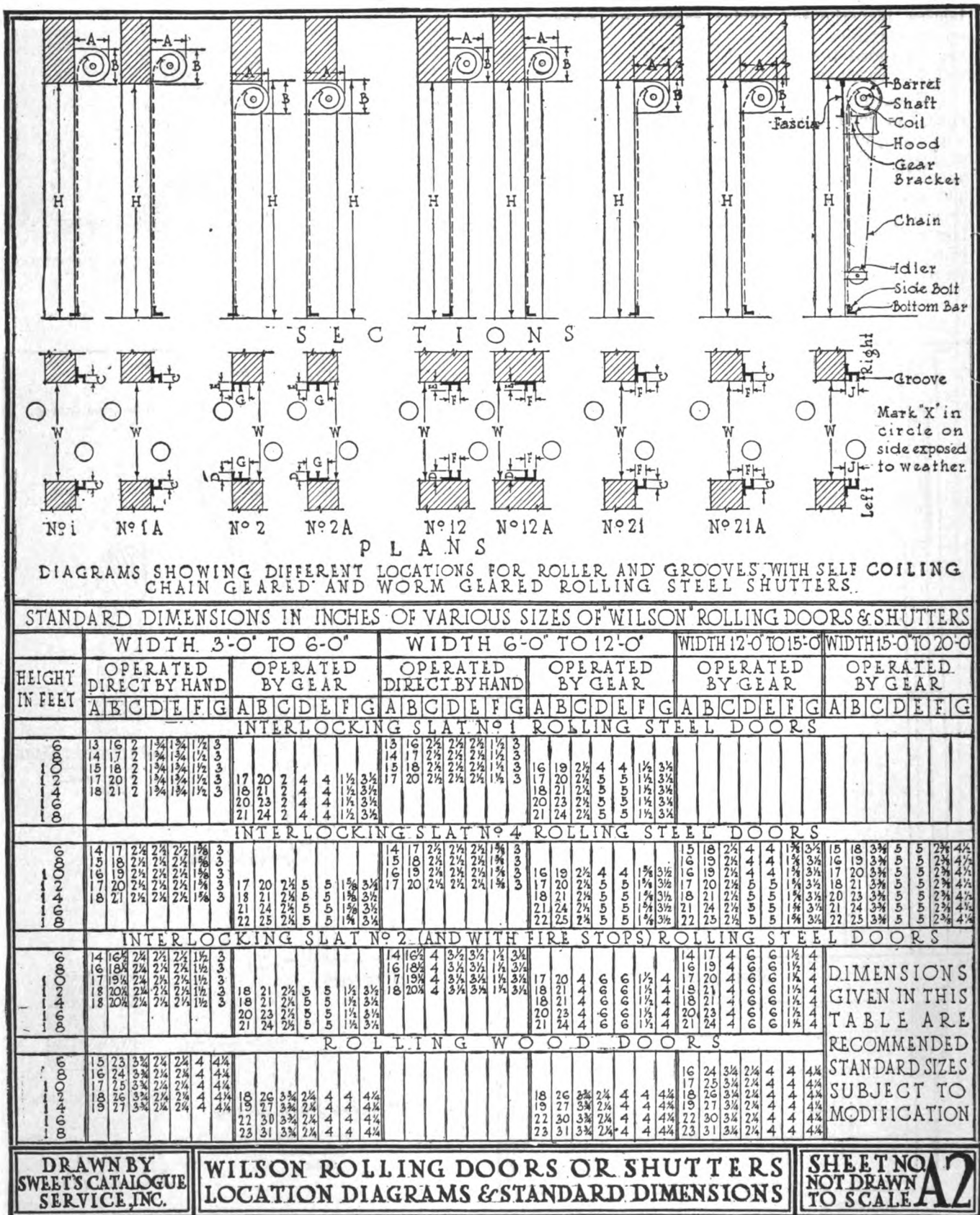
PLAN OF
BRACKET
WITH
STEEL
COLUMNS



WILSON ROLLING WOOD DOORS ON
ROUNDHOUSE



NO. 2970. DETAILS OF WILSON WOOD ROLLING DOORS



THE MOESCHL-EDWARDS CORRUGATING CO., INC.

Manufacturers of Metal Doors, Windows, Shutters and Sheet Metal Building Materials

CINCINNATI, OHIO

Products.

"MECCO" STEEL ROLLING DOORS.

Also manufacturers of "Mecco" Fireproof Kalamein Doors; Tin Clad Doors; "Mecco" Fireproof Metal Windows (Patented); "Mecco" Steel Rolling Shutters; Smoke Screens; "Mecco" Spanish Metal Tile; "Mecco" Roof Ventilators (Patented); Metal Ceilings, Cornices, Skylights, Columns, Culverts, Finials, Garages, Gutters, Metal Lath, Marquises, Shingles (Tin, Galvanized or Copper), Shutters, Painted and Galvanized Roofing, Siding and Corrugated Sheets.

Underwriters' Approval.

This company manufactures metal windows, steel rolling doors, kalamein and tin clad doors approved by the National Board of Fire Underwriters and bearing their labels.

Steel Rolling Doors.

Service Type—Doors of this type are designed and sold for the effective closure of openings against weather and intrusion, where it is desirable for the door to occupy a minimum amount of space.

Labeled—This door is constructed primarily as a fire retardant and is labeled by the National Board of Fire Underwriters as such. It incorporates, however, all the desirable features specified above.

Operation.

Three methods of operation are employed:

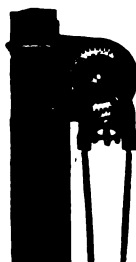
Manual—By means of handle at bottom of door.

Mechanical—By means of endless chain, sprocket and gear, or crank, shaft and gear.

Power—By means of electric motors.



Elevation



Vertical Section



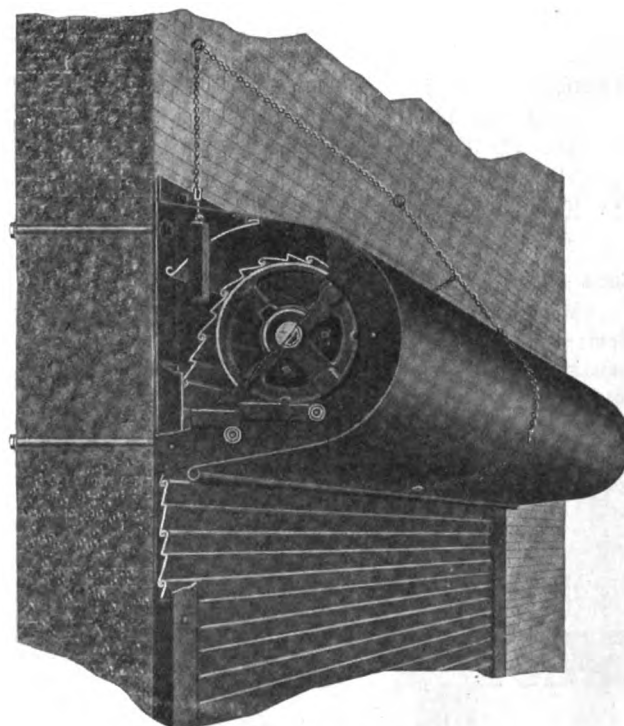
Cross Section



DETAILS OF "MECCO" STEEL ROLLING DOOR, SERVICE TYPE, CONSTRUCTION NO. 6

Mounted on face of wall, counterbalanced by spring, operated by endless chain and gear.

Note: Service type, Construction No. 2, is same general design as above, except manually operated by means of a handle attached to bottom bar of door



Detail Showing Automatic Closing Mechanism, Flame Stop and Other Salient Features



Cross Section



DETAILS OF "MECCO" LABELED STEEL ROLLING DOOR NO. 100

Cross section showing arrangement of guide for door mounted on face of wall

Erection.

Any good mechanic can erect "Mecco" products from details and instructions furnished by this company.

Slat Construction.

Most makers of steel rolling doors have a number of slat designs, but "Mecco" engineers have designed a single slat so superior in construction that it has been adopted for all types of doors.

The attention of architects and engineers is especially directed to the center member of the slat. Any pressure, wind or otherwise, exerted against the door is effectively resisted by this formed Z-bar.

The ends of the slats are thoroughly protected by malleable iron castings riveted to the end of the slats.



SLAT CONSTRUCTION OF "MECCO" STEEL ROLLING DOORS

THE BOGERT & CARLOUGH CO.

Manufacturers of Steel Sash, Doors and Partitions

PATERSON, N. J.

AGENCIES IN ALL PRINCIPAL CITIES

CANADIAN MANUFACTURERS: STEEL SASH, LTD., LONDON, ONT.

Products.

BOCA SOLID STEEL SIDEWALL SASH.

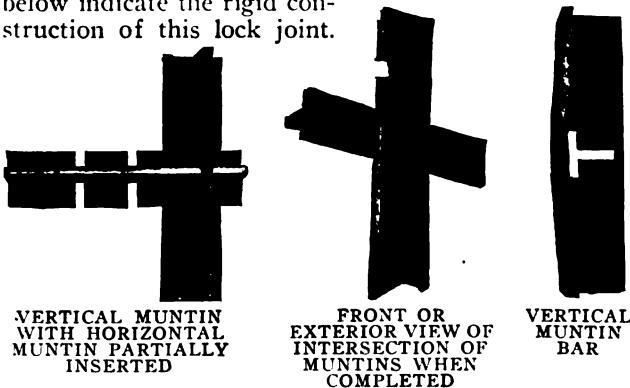
TOP HUNG and CENTER PIVOTED CONTINUOUS MONITOR SASH with Continuous Mechanical Operator.

BOCA TUBULAR STEEL DOORS and PARTITIONS.

Boca Solid Steel Sash.

Manufactured from heavy, specially rolled solid steel members. These sash are adapted to all types of construction—industrial buildings, schools, office buildings, etc.—whether of brick, concrete, terra cotta, steel or wood.

Patented Boca Lock Joint—Illustrations shown below indicate the rigid construction of this lock joint.



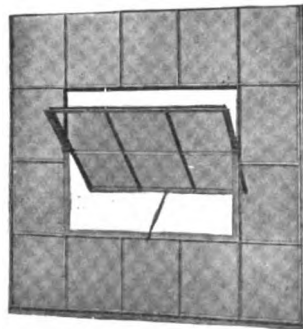
The metal is not distorted and the surface has a smooth and neat appearance.

This joint produces a rigid sash that does not get out of square.

Ventilators—

Equipped with specially patented 3-point weathering members.

This 3-point contact is new and has proved its worth as a positive weatherproof and windproof feature.



SASH UNIT OPERATED BY PUSH BAR

A special section is supplied at head of ventilator, forming a drip.

Glass for Ventilators—Glass must be trimmed 1 in. at sides, and $\frac{3}{4}$ in. at top and bottom of ventilators.

Putty Cushion—The grooves in the vertical muntin bar afford the best conditions for back puttying the glass. The smooth putty cushion absolutely prevents leakage and protects the glass from the usual breakage.

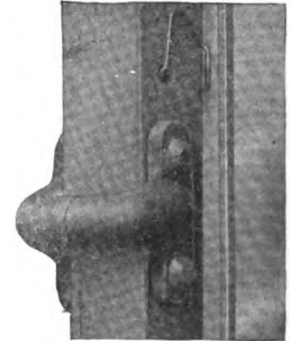
Glazing—Four special steel wire glazing clips are supplied for each light of glass. Glass is not included, unless by special arrangement.

BOCA
SOLID STEEL SASH
TRADE-MARK

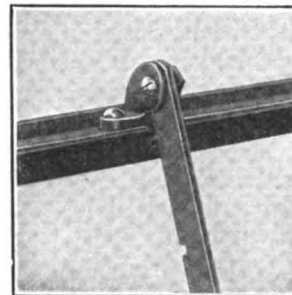
Boca Hinge—

This type of hinge permits a continuous weathering of ventilator, as the upper portion of weathering laps inside the lower.

Hardware—A notched push bar with attachment and catch for lower end is regularly supplied with sash. Other devices for operating ventilators, such as spring catch and chain, will be supplied where specified.



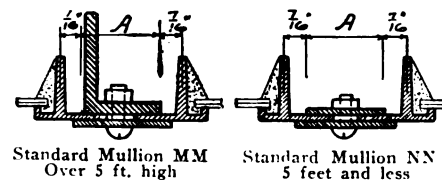
BOCA HINGE AND CLIP



PUSH BAR ATTACHMENT

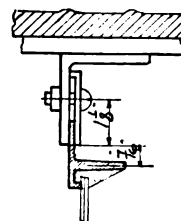


SPRING CATCH

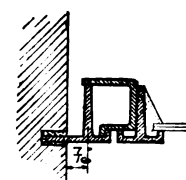


BOCA MULLIONS

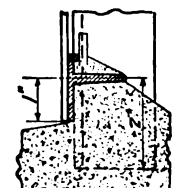
Mullion section MM	Dimension "A"	Mullion Section NN	Dimension "A"
2 1/2 by 2 in. angle and 2 in. flat	2 in.	2 flats 2 in. wide	2 in.
2 by 1 1/2 in. angle and 1 1/2 in. flat	1 1/2 in.	2 flats 1 1/2 in. wide	1 1/2 in.



SECTION AT HEAD (STEEL)
Angle under lintel provided with $\frac{3}{8}$ -in. holes, 1 ft. 6 in. centers (by others)

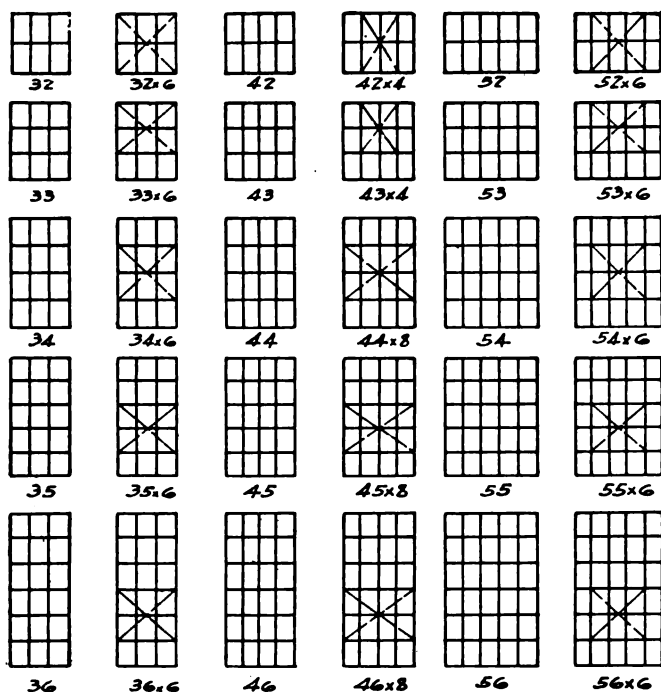


SECTION AT JAMB (BRICKWORK OR TERRA COTTA)
Showing sash built in joint of brick
Note 3-point contact of ventilator weathering member



SECTION AT SILL (CONCRETE)
Finished sill formed after sash is set

Boca Standard Stock Sash—The types shown below are standard and are in stock for prompt shipment in either 12 by 18-in. or 14 by 20-in. glass sizes.



BOCA STANDARD STOCK SASH

TABLE OF SINGLE AND MULTIPLE STANDARD UNITS
WIDTHS OF WALL OPENINGS USING STANDARD SASH

Units wide	Lights per unit	12 by 18-in. glass	14 by 20-in. glass
1	3	3 ft. 2 in.	3 ft. 8 in.
1	4	4 ft. 2 3/8 in.	4 ft. 10 3/8 in.
1	5	5 ft. 2 3/4 in.	6 ft. 0 3/4 in.
2	3-3	6 ft. 6 in.	7 ft. 6 in.
2	4-4	8 ft. 6 3/4 in.	9 ft. 10 3/4 in.
2	5-5	10 ft. 7 1/2 in.	12 ft. 3 1/2 in.
3	3-3-3	9 ft. 10 in.	11 ft. 4 in.
3	3-4-3	10 ft. 10 3/8 in.	12 ft. 6 3/8 in.
3	4-3-4	11 ft. 10 3/4 in.	13 ft. 8 3/4 in.
3	4-4-4	12 ft. 11 1/8 in.	14 ft. 11 1/8 in.
3	4-5-4	13 ft. 11 1/2 in.	16 ft. 1 1/2 in.
3	5-4-5	14 ft. 11 3/8 in.	17 ft. 3 3/8 in.
3	5-5-5	16 ft. 0 1/4 in.	18 ft. 6 1/4 in.
4	3-3-3-3	13 ft. 2 in.	15 ft. 2 in.
4	3-4-4-3	15 ft. 2 3/4 in.	17 ft. 6 3/4 in.
4	3-5-5-3	17 ft. 3 1/2 in.	19 ft. 11 1/2 in.
4	4-4-4-4	17 ft. 3 1/2 in.	19 ft. 11 1/2 in.
4	4-5-5-4	19 ft. 4 1/4 in.	22 ft. 4 1/4 in.
4	5-5-5-5	21 ft. 5 in.	24 ft. 9 in.

HEIGHTS OF WALL OPENINGS USING STANDARD SASH

Lights high	12 by 18-in. glass	14 by 20-in. glass
2	3 ft. 1 5/8 in.	3 ft. 5 5/8 in.
3	4 ft. 8 in.	5 ft. 2 in.
4	6 ft. 2 3/4 in.	6 ft. 10 3/8 in.
5	7 ft. 8 3/4 in.	8 ft. 6 3/4 in.
6	9 ft. 3 1/8 in.	10 ft. 3 1/8 in.



ILLUSTRATION OF BOCA STEEL SASH

SWEET'S CATALOGUE

Boca Continuous Monitor Sash.

Boca continuous monitor sash are made in top hung, fixed and center pivoted types.

A mechanical operator is furnished in either rack and pinion or rocker arm type, controlled from floor by gearing device operated either by shaft or chain.

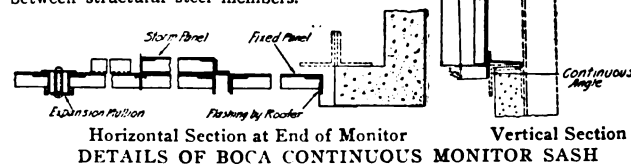
Continuous sash are made in standard lengths, 18 and 20 ft., and in standard heights given in table below.

Storm and fixed end panels are furnished with top hung sash.

STANDARD MONITOR SASH HEIGHTS

Height of sash (s)	2 ft.	3 ft.	4 ft.	5 ft.
	11 1/4 in.	11 1/4 in.	11 1/4 in.	11 1/4 in.
*Height of openings (o)	2 ft.	3 ft.	4 ft.	5 ft.
	10 1/2 in.	10 1/2 in.	10 1/2 in.	10 1/2 in.

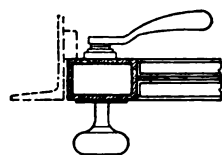
*Height of opening (o) is the clear distance between structural steel members.



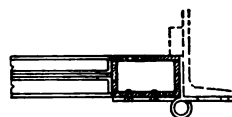
Horizontal Section at End of Monitor
Vertical Section
DETAILS OF BOCA CONTINUOUS MONITOR SASH

Boca Tubular Steel Doors.

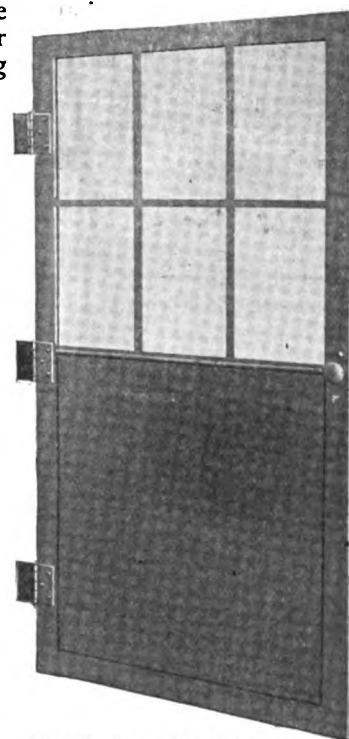
These doors are made in all sizes for swinging and sliding types.



SECTION THROUGH DOOR AT KNOB



SECTION THROUGH DOOR AT HINGE



STANDARD SWINGING DOOR

Boca Steel Partitions.

Constructed of regular sash units joined together with mullions, the lower part of units being of sheet steel.

Door jambs, transoms, and doors supplied as required.

Co-operative Service.

This company will co-operate with those having sash, partition and door problems to solve, and a satisfactory solution is assured.

Designs, suggestions and prices will be sent on receipt of the necessary details and information.

Catalogue sent on request.

THE WILLIAM BAYLEY CO.

Steel Windows for Industrial Buildings

SPRINGFIELD, OHIO

NEW YORK, 110 West 40th Street
Telephone, Bryant 1311

BRANCH SALES OFFICES
BOSTON 9, 73 Tremont Street
Telephone, Haymarket 3285

CHICAGO, 6 North Michigan Avenue
Telephone, State 7517

Products.

PIVOTED VENT WINDOWS.

Also manufacturers of Continuous and other forms of Monitor Windows; Steel and Glass Side Walls and Partitions; Window Operators; Steel Doors.

Experience and Service.

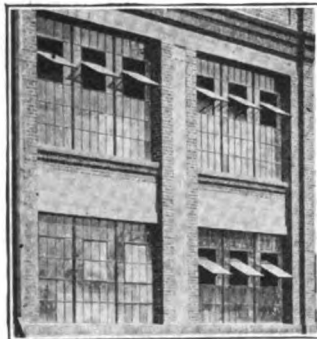
Bayley-Springfield merits are backed by a continuous manufacturing experience dating from 1881, and a steel window manufacturing experience dating from 1910. Bayley-Springfield steel windows are being extensively used in most American, and in many foreign cities. Write for illustrated descriptive booklets and for lists of installations.

Bayley-Springfield Warehouse Stock Windows.

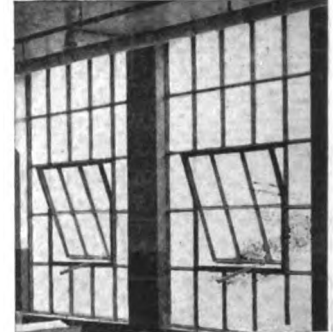
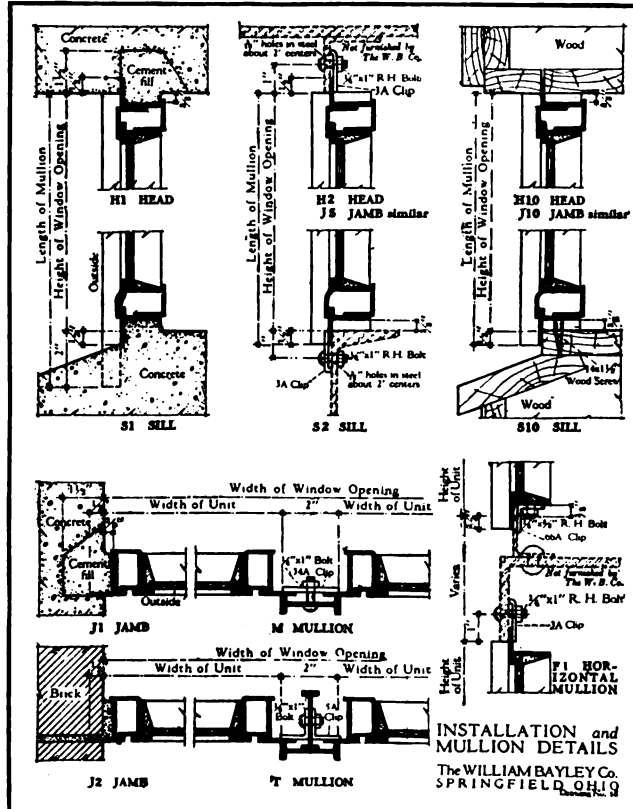
Thirty-three kinds and sizes, a variety sufficient in single and combination units to fill almost any desired masonry opening, and provide almost any required ventilation.

Horizontals and verticals are 1½ in. deep. Vents have double weathered contact, 1¼ in. deep at sides, and 1¾ in. deep top and bottom; are exceptionally strong and tight.

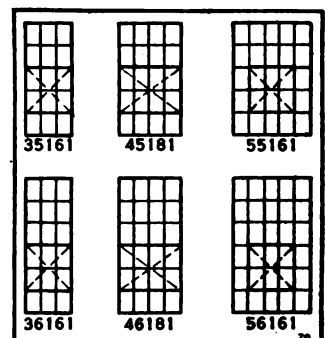
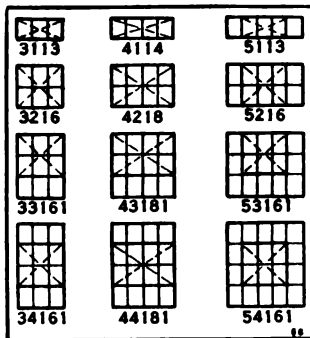
Glass pane sizes are 12 by 18 in. and 14 by 20 in. The latter is the more economical, and, consequently, the more frequently used. Consult our engineers about window problems.



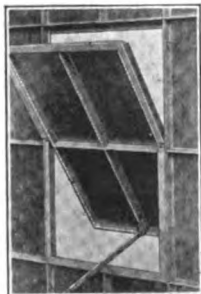
STANDARDS 56163 AND 55162



STANDARD UNITS 55161



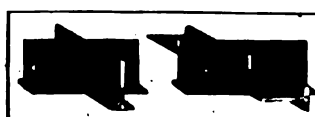
UNIT LAYOUTS WITH VENTS INDICATED BY X MARKS ARE SHOWN HERE AT LEFT AND RIGHT
Warehouse stock also includes like units without vents



VENT—STANDARD
HARDWARE



PIVOT



INTERSECTION OF MEMBERS

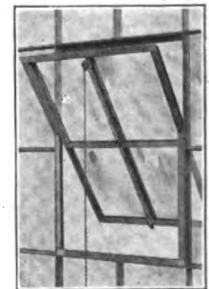
Our success depends upon the service we render. We desire opportunity to serve you.



C CATCH



H CAM



VENT—CHAIN
CONTROL

SWEET'S CATALOGUE

DETROIT STEEL PRODUCTS COMPANY

Manufacturers of Solid Steel Windows

2250 East Grand Boulevard

DETROIT, MICH.

BOSTON NEW YORK PHILADELPHIA WASHINGTON CHICAGO SAN FRANCISCO BIRMINGHAM
BUFFALO NEWARK RICHMOND BALTIMORE HARTFORD SYRACUSE INDIANAPOLIS

Branch Offices and Distributing Agents in all Principal Cities

Products.

The FENESTRA LINE: Fenestra Side Wall Sash; Fenestra Continuous Sash (top hung, center pivoted, and fixed types); Counterbalanced Sash; Horizontally Rolling Sash; Operators (Worm and Gear, and Continuous Tension Types); Underwriters' Side Wall and Counterbalanced Sash as Inspected and Labeled Under the Supervision of the Underwriters' Laboratories, Inc.

Also manufacturers of Fenestra Steel Doors and Partitions.

Engineering Service.

The Engineering Department of the DETROIT STEEL PRODUCTS COMPANY maintains service offices in all the principal cities to assist architects, engineers and contractors in making the most efficient and economical sash layouts for their jobs.

Catalogues and details for installations may be had on request.

Continuous Sash.

Fenestra continuous sash is manufactured in three types: top hung, center pivoted, and fixed. These types are designed to provide maximum light and ventilation, together with ample weather protection, for the industrial building with monitor or sawtooth roof construction.

These sash are made in standard sizes to be used in combination with standard steel truss construction. They may be operated in units between the columns, or in continuous runs on the outside of the columns.

Top Hung Sash—This type is designed primarily for use with the sawtooth or monitor roof construction in a sloping or vertical plane. See the upper left hand plate on the following page.

Center Pivoted Sash—Maximum ventilation is obtained by using center pivoted sash. It may be used in a vertical or sloping plane. Special care must be taken in designing the trusses with which center pivoted sash is used to have ample clearance for the portion of the sash that swings into the building. See the upper right hand plate on the following page.

Fixed Sash—When light is desired without ventilation, fixed sash is used in the continuous runs. However, it is more often used in combination with top hung or center pivoted types, the fixed portion of the run being placed below the ventilated units.

At the end of all swing sections, fixed panels of sash 1 ft. wide are installed, and between all swing sections, the fixed panels are 2 ft. wide.

Construction—All types of Fenestra continuous sash are made from solid rolled steel sections.

The vertical muntin bars are double riveted to the head and sill sections. All units are hung by means of malleable iron butts with heavy steel pins, spaced about 4 ft. on centers.

The most approved method of attaching flashing to continuous runs of sash is shown in the details on the following page. This is only for the convenience of the architect or engineer. Flashing is not furnished by



TRADE-MARK

the DETROIT STEEL PRODUCTS COMPANY.

Glazing—All glazing may be done from the outside; $\frac{1}{4}$ in. rough or wire glass is recommended for use with continuous sash. Fenestra glazing clips are used to

hold the glass, and are attached near the top and bottom of each light. The glass must be firmly embedded in the putty before the clips are attached.

Painting—All Fenestra continuous sash and accessories are given 1 coat of red mineral paint before shipment.

The Best Opening—Runs of swing sash 3 or 4 ft. in height afford the most effective opening. For this reason they are recommended for all swing sections, particularly those in sawtooth construction.

Frequently it is found that openings much larger than 4 ft. must be filled, and in these cases it has been found an advantage to install 2 or more units of sash, one above the other. Where 2 runs can be used, it is found satisfactory to have only the upper unit operated, while the lower unit remains fixed.

Fixed units up to 6 ft. in height may be used in a single run. On the following pages, vertical sections are shown through the top hung, center pivoted, and fixed units of continuous sash. These units may be used in any combination one above the other.

A horizontal section showing the end panels with the connection of the swing section is shown in the lower left hand plate on the next page. The standard truss spacing is shown in relation to the standard units of continuous sash. These details are the same both for top hung and center pivoted units. Details for punching of girts are also shown for use with standard units. It is necessary that this information be furnished the steel fabricator before the trusses and other steel members are manufactured.

Mechanical Operators.

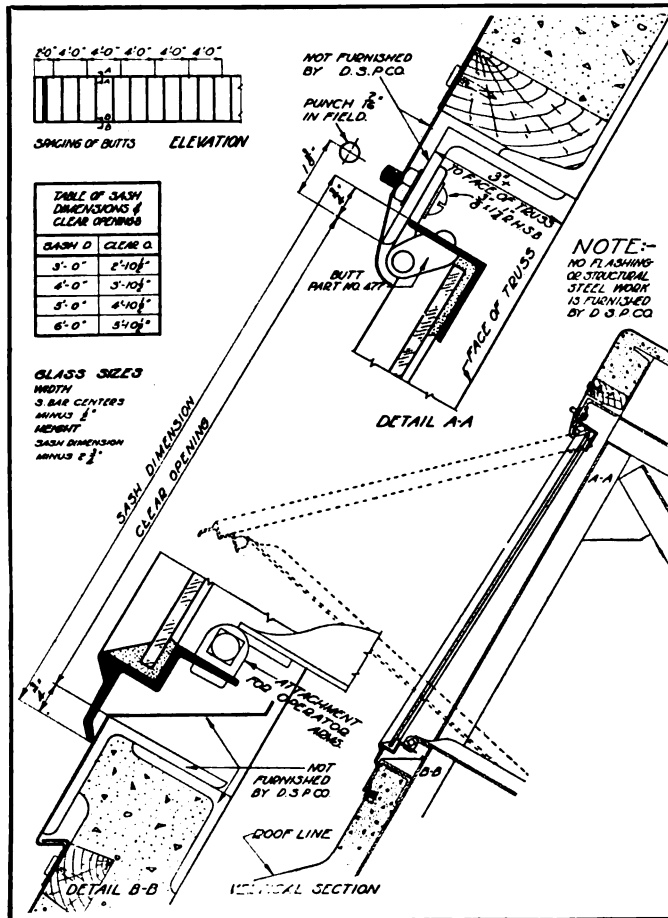
Fenestra continuous tension operators are designed especially for use with swing units of Fenestra continuous sash. Each type of power is designed for the particular duty it has to perform.

The standard power consists of a machine cut worm and gear, housed in a dustproof case, and operated in oil. The power is transferred to the tension pipe line by means of a rack and pinion gear which in turn operate the scissorlike arms which control the windows. These arms are made from 2 by 2-in. angles. Pressed steel fittings are used for the attachment of all arms to the tension line and malleable roller bearings are used to support the line.

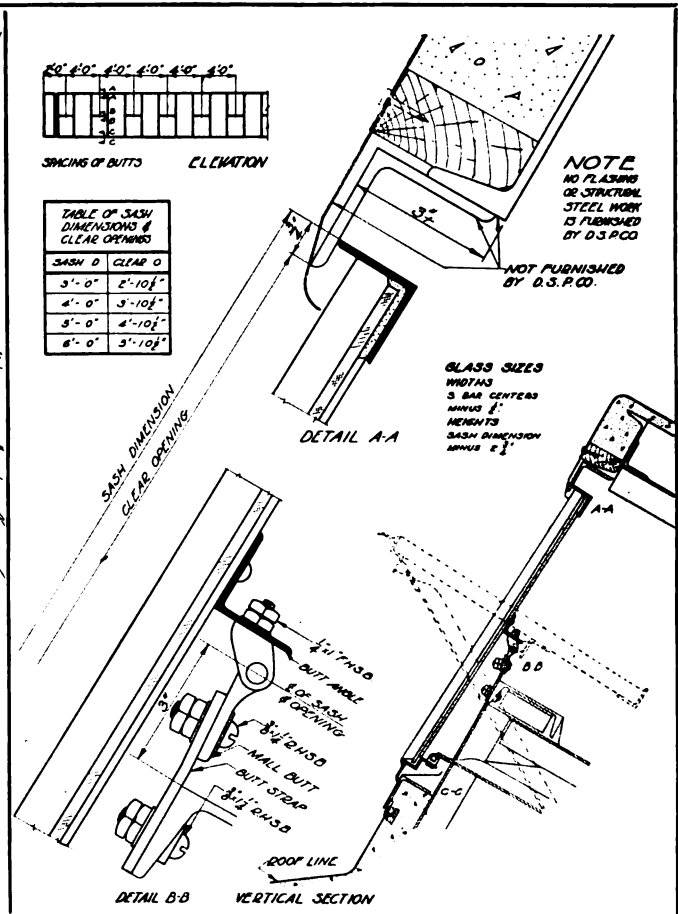
The operating devices are so designed that the power increases faster than the increasing load of the sash as the units are being opened.

All power should be located near the end of the run. Each power is operated by an endless chain extending down from the power to within easy reach of the floor.

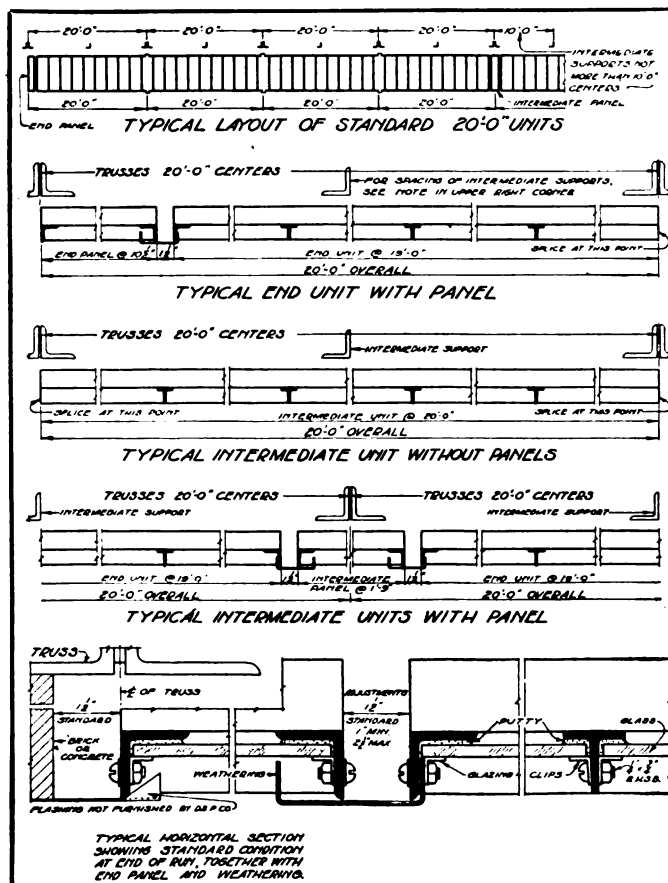
Fenestra powers are shipped assembled and tested, ready for installation.



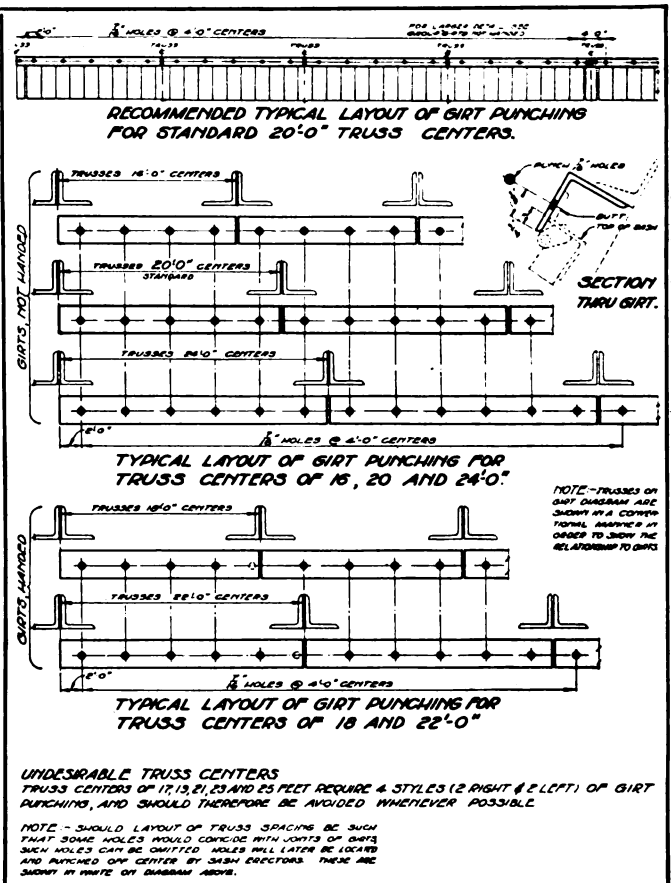
FENESTRA CONTINUOUS TOP HUNG SASH
Head and sill sections similar for fixed type sash



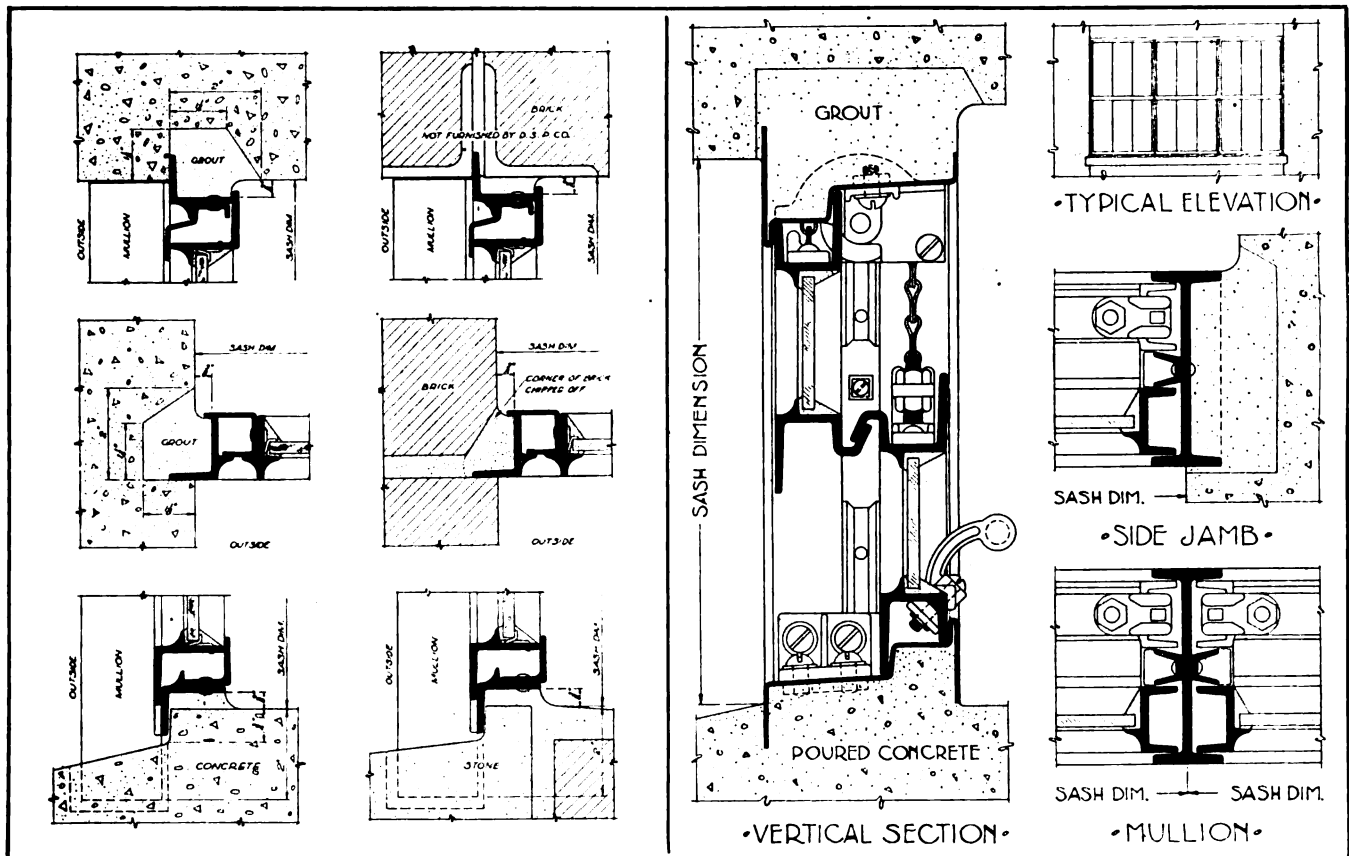
FENESTRA CONTINUOUS CENTER PIVOTED SASH
For sill sections see top hung detail



HORIZONTAL SECTIONS OF TOP HUNG AND CENTER PIVOTED SASH, SHOWING TYPICAL LAYOUT



STANDARD GIRT PUNCHING FOR INSTALLATION OF FENESTRA CONTINUOUS SASH UNITS



HEAD, JAMB AND SILL DETAILS OF FENESTRA SIDE WALL SASH IN CONCRETE AND BRICK CONSTRUCTION

INSTALLATION DETAILS OF HEAD, SILL, JAMB, AND MEETING RAIL OF FENESTRA COUNTERBALANCED SASH

Fenestra Side Wall Sash.

Material—Fenestra side wall sash are manufactured from solid rolled steel sections 1½ in. deep of special design.

Joint—Construction of Fenestra side wall sash is based upon the patented interlocking joint. Only 20% of the steel is cut away at the intersection of the muntin bars, which makes the sash units unusually strong, and resistant to wind pressure and the vibration of heavy machinery.

Butt—Ventilators are horizontally pivoted 2 in. above the centers by means of external adjustable solid rolled steel butts, double riveted to the sash bars and weathering. Double flat contact weathering is used on all sides of the ventilators.

Operators—All ventilators accessible from the floor are provided with cam latches and staybars. All others are provided with cam latches, chain, and pulley brackets, except those controlled with mechanical operating devices.

Mullions—Solid rolled steel T-bar mullions are used between all sash units when 2 or more are combined in a single opening. Mullions are carried in stock for all standard sizes of sash.

Painting—All units are given a dip coat of red mineral paint before shipment unless otherwise specified.

Glazing—The outside lights of the ventilators in Fenestra Sash are smaller than the lights in the fixed portion of the sash.

Ventilator lights that abut on the top and sides must be trimmed 1 in. along the abutting edge. Lights that abut on the sill of the ventilator must be trimmed ¾ in. on the abutting edge.

Fenestra Counterbalanced Sash.

Fenestra counterbalanced sash are designed for

use in buildings of an ornamental character such as office buildings, street elevations of factories, etc., or wherever side wall sash is not in keeping with the architectural design.

Any number of units of counterbalanced sash can be combined, making it possible to fill an opening of any desired width.

Construction—Each unit is composed of 2 counterbalanced vertically sliding units allowing 50% ventilation.

All frames and sash are made of solid rolled steel sections. The jambs and mullions are the I-beam type. Flaring channel guides are riveted to each section to provide weathering and proper movement of the sliding units.

The joints of all sliding units are welded, thus giving greater strength and adding to the appearance of the sash.

Fittings—All the fittings of counterbalanced sash permit adjustment in the field. The roller bearing pulleys are attached to the inside of the sash frame and are at all times easily accessible.

The chain catch on the lower sliding units is adjustable so that the slack in the chain can be readily taken up at any time.

Corner brackets for the sill, jambs, and mullions are malleable iron with slotted holes for adjustment in the field.

Malleable iron cam locking devices are attached to the meeting rail of each unit. When locked, the units are drawn together tightly, thus adding to the effectiveness of the weathering.

Handles are attached to the sill member of the lower sliding unit by means of a locking nut, making it impossible for the handles to come loose.

DAVID LUPTON'S SONS CO.

Daylight and Ventilation for Buildings

Allegheny Avenue and Tulip Street

PHILADELPHIA, PA.

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ATLANTA, GA., DAVID LUPTON'S SONS CO., 1024 Candler Building
BALTIMORE, MD., WALTER S. BRAUNS, Munsey Building

Products.

LUPTON STEEL SASH: PIVOTED FACTORY TYPE, POWER HOUSE TYPE, COUNTERBALANCED TYPE, COUNTERWEIGHTED TYPE; POND CONTINUOUS SASH; POND OPERATING DEVICE; LUPTON STEEL PARTITION; LUPTON STEEL TUBE DOORS; LUPTON ROLLED STEEL SKYLIGHT; WALDMIRE LOUVER.

Designing for Unusual Ventilation.

For a number of years DAVID LUPTON'S SONS CO. has specialized in applying sash to difficult ventilating requirements. This practical study has resulted in evolving two forms of sash—namely, Lupton Counterbalanced Sash and Pond Continuous Sash—which give unusually effective ventilation.

Lupton Counterbalanced Sash has the upper and lower sash hung over a single pair of pulleys. This insures equal top and bottom openings as close to the ceiling and floor as possible, and makes it impossible for workers opening the lower sash to neglect the top sash.

Pond Continuous Sash accomplishes two purposes: First, it gives effective weather protection when open; its 20-foot units are connected in long unbroken lines outside of structural work, and the details prevent rain from entering at the top or ends. Second, it gives mass control of ventilation. One man can open more than a thousand square feet in a few moments by hand power, or several thousand if electric motors are used. Pond Continuous Sash was originally designed for sawtooth roofs, but was soon applied to foundry monitors, and to side walls.

The ventilating possibilities of Lupton Counterbalanced Sash and Pond Continuous Sash go much beyond what can be realized with conventional building designs. By planning the buildings so that the sash and the floor layout fit each other, results can be secured which would be impossible otherwise. The effect has been practically to rewrite the science of ventilation as applied to large industrial buildings.

The following principles govern the successful use of these sash:

(1) The balanced top and bottom openings of Lupton Counterbalanced Sash make it preferable for industrial buildings to pivoted or single-hung sash. The average factory worker does not recognize "stale air," and opens the windows only if the temperature becomes oppressive. In that case only the top or bottom sash is usually touched, though either alone is useless without a wind. By using Lupton Counterbalanced Sash the building may be made wider than usual, with

reasonable assurance of fresh air reaching the center bays. In this way the rental charge is reduced and the sash becomes a profitable investment.

(2) The weatherproof details of Pond Continuous Sash adapt them especially to sawtooth and monitor roofs. Sash that must be shut for every shower are often left shut when they should be open.

(3) In certain industries Pond Continuous Sash is as useful in the side walls as in the roof. Among such are the rubber goods industry, foundries, chemical works, etc., where abundant ventilation is constantly demanded, and where entering rain would cause damage to equipment or product.

(4) Mass control of sash is especially desirable for large floor areas with many workers or heat-producing processes, since its practical effect is to place control in the hands of a responsible foreman who will attend to it. Instead of scattered workers each opening (or more likely neglecting) a few square feet of sash, one man should be able to open at least a thousand square feet at once.

(5) Where hundreds of workers are employed under a sawtooth or monitor roof, both inflow and outflow should be uniform for the entire floor. This is best done by operating Pond Continuous Sash in long lines or groups by electric motors, using Pond Operating Device, motor driven. Thus the air movement over many thousand square feet of floor may be regulated by a single switch; and by suitably locating switches, floor areas of any extent can be controlled from any desired points.

In designing a building to utilize the ventilating capabilities of the sash, the following points in particular must be observed:

(a) Inlet and outlet openings must be properly balanced. Either is useless without the other.

(b) A weak ascending air stream will not drag a long horizontal stream. Very wide sawtooth buildings are defective both in this and in the point just mentioned. Such air as enters from the side escapes before reaching the center if the roof sash be open, or remains stagnant if the sash be closed, as is too often the case.

(c) Where the roof is used, it must be formed to stimulate air movement. The sawtooth roof fails in this, because of the uniform level of its outlets; the conventional monitor roof fails to provide sufficient outlet in the right places, and the peak tends to pocket and chill the air or gases.

The Pond Truss roof avoids all three faults.

(d) Any heat-producing elements (furnaces,

ovens, etc.) under a Pond Truss roof must be so located as to cause air currents to rise at or near the outlets. Inlets in the roof must be kept free from heat.

(e) With sawtooth roofs, especially where the workers are crowded or heat is produced, individual openings of sash result in "spotty" outflow, and therefore an irregular distribution of fresh air. The way to get uniform distribution is to operate the roof sash simultaneously in groups by electric motors, and to provide correspondingly uniform inlets in the side walls by means of Pond Continuous Sash suitably located and operated.

(f) For very wide buildings, the sawtooth and conventional monitor should not be used. The only effective way to ventilate the center is by alternate raised outlets and low inlets in the roof. Several such buildings, embodying the Pond Truss type for outlets are shown on a following page. This roof gives also much better light distribution than the sawtooth, and is adapted to nearly all classes of industrial buildings. It usually costs less than a sawtooth.

(g) The old conception of stale air rapidly escaping from small outlets is illusory and misleading. Rapid air flow can only result from a considerable difference in pressure. This difference, unless forced draft is used, can only come from a corresponding difference in temperature. The idea of treating a foundry or forge shop as a "chimney" can only be realized in practice by raising the inside temperature to an unbearable extent. The proper way to ventilate such buildings is to use large inlet and outlet areas, so that a slow movement is sufficient, and to locate them so as to produce that movement over the entire floor. For this, a correctly designed roof and correctly placed inlets are just as necessary as correct type and arrangement of sash. The Pond Truss roof was originally designed for foundries and forge shops, and has been found to accomplish its object perfectly.

This company does not design complete buildings or sell designs, but assists architects and engineers in every way to get maximum lighting and ventilating results from the use of Lupton products, maintaining a large engineering department, and adapting each design which is recommended to the individual requirements of the customer's business. No charge is made for this service, and architects and engineers are invited to use it freely.

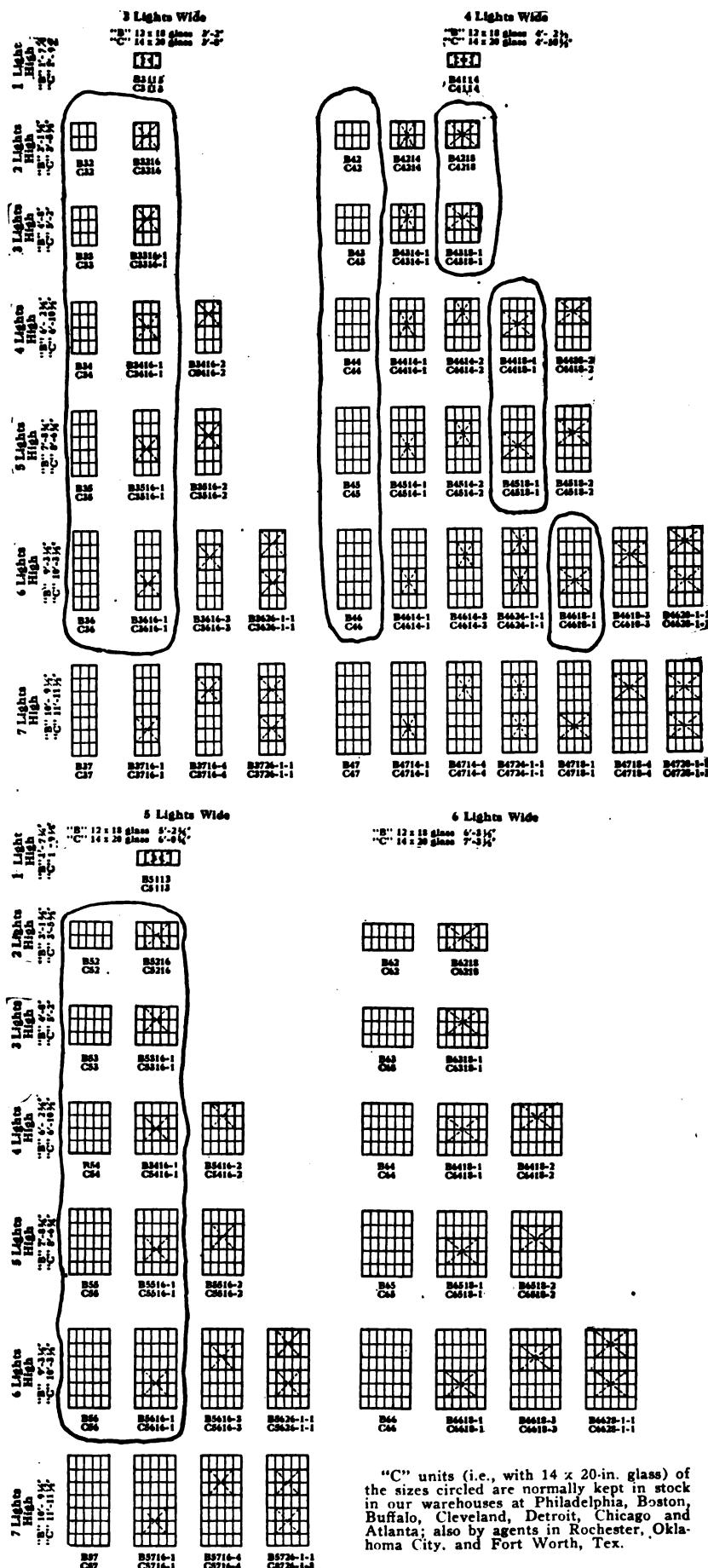
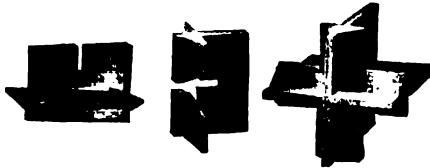


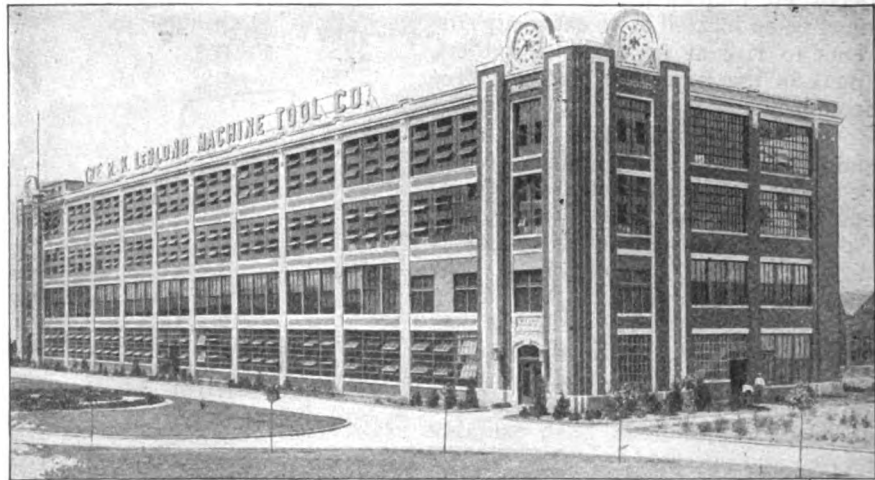
DIAGRAM SHOWING STANDARD AND STOCK SIZES OF LUPTON FACTORY SASH
Note nominal widths and heights above and to left of diagrams. These represent opening dimensions and are 1/4" less than over all dimensions of units

Lupton Factory Sash (Patented and Patents Pending).

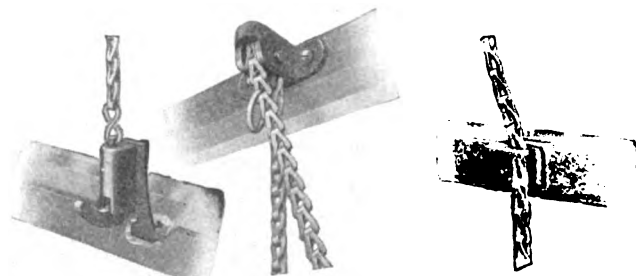
Has certain features which are deemed fundamental, namely: solid 1-piece rolled steel members, joints which resist corrosion and do not impair effective strength of sash, permanently weathertight ventilators and simple glazing. The members of Lupton Sash are specially rolled to give maximum strength without excessive weight. The muntin joints give maxi-



MUNTIN JOINT, LUPTON FACTORY SASH



LUPTON PIVOTED FACTORY SASH APPLIED TO A WIDE BUILDING

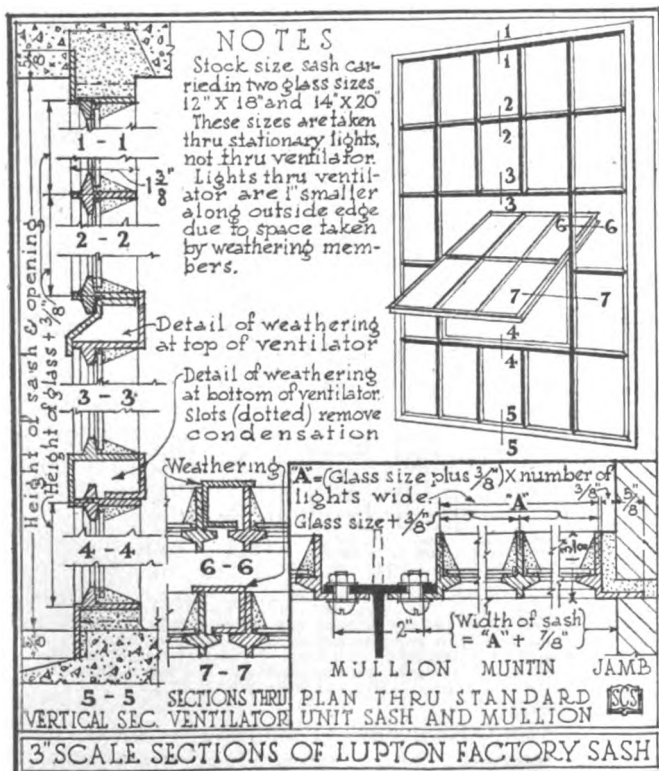


SPRING CATCH, LUPTON FACTORY SASH STATIONARY CLIP
Showing pulley attached to top member of ventilator To hold ventilator open

imum strength against wind, and are readily protected by painting. The muntins are fitted into frames and solidly riveted.

Ventilators make a close 2-point contact at all

PEG STAY, LUPTON FACTORY SASH



sides; when placed one above the other, they may be operated by a double arm connection, which closes them tight without slamming.

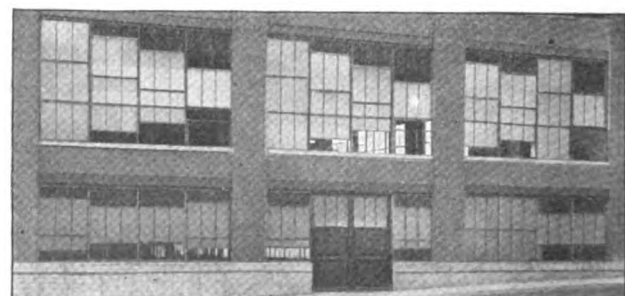
Standard and Stock Sizes—For quick delivery all commonly-used sizes of Lupton Factory Sash using 12 by 18 and 14 by 20-in. glass are carried in factory stock in the shape of pre-cut bars ready for assembling. The sizes most in demand, using 14 by 20-in. glass only, are also carried in warehouse stock in various cities, fully assembled. Angle frame members and T-bar mullions are used.

The diagram on preceding page shows the "Standard" sizes. Those circled (using 14 by 20-in. glass) are also classed as "Stock" sizes, and are carried in warehouse stock ready for shipment.

Lupton Counterbalanced Sash (Patented and Patents Pending).

Has the upper and lower sash balanced over a pair of pulleys, so that the upper sash descends as the lower sash is raised. Up to 12 ft. in height the windows are 2-sash high. From 12 to 18 ft., 3 sash are used, the middle one being stationary. Window units are made up to 6 ft. wide and may be used singly or in multiple. Heads and sill are formed of No. 14-gauge steel. Jambs and mullions are 1-piece rolled steel sections. For offices, schools and hospitals, rolled sheet zinc weathering is furnished in jambs and mullions at an additional cost. Sash members are heavy rolled steel sections, electrically welded at the corners. No horizontal muntins are used unless specified. Heavy chains and roller bearing pulleys are used. Glazing angle frames are recommended. Wind shields may be added if desired. Sash will be made to bear underwriters' label if desired, at an extra cost.

Data sheet with standard sizes and details will be furnished on request.



LUPTON COUNTERBALANCED SASH
2-sash and 3-sash high

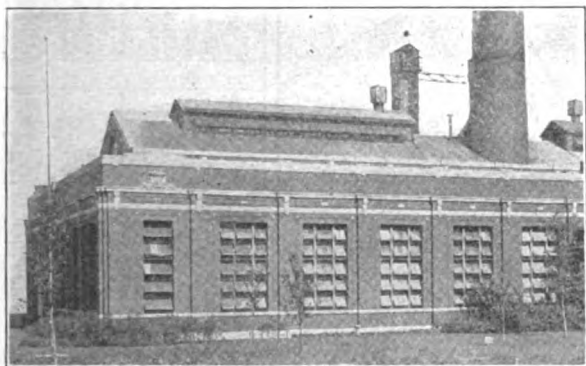
Lupton Power House Sash (Patented and Patents Pending).

Has the following features:

(1) The mullions and imposts are of unusual width for architectural effect and are formed from No. 12-gauge steel plate.

(2) All the sash are pivoted, except those having curved heads.

(3) All the sash in each wall are usually operated simultaneously by Pond Operating Device. The frames are formed of No. 12-gauge steel plate. The sash members are heavy 1-piece rolled steel sections and are oxy-acetylene welded. All pivoted sash are double weathered.



POWER HOUSE INSTALLATION

We advise the use of square heads where possible, on account of their lower cost.

Sizes are made to suit engineer's specifications.

Lupton Counterweighted Sash (Patents Pending).

Each sash is balanced by its own pair of weights. Special weather tightness is assured by having sash run in sheet zinc weathering members attached to the jambs. Sash members are oxy-acetylene welded. Heavy chains and roller bearing pulleys are used. Glazing angle frames and suitable hardware are included.

Pond Continuous Sash (Patented by Clarke P. Pond and Patents Pending).

Used in monitors, side walls, Pond Truss and Pond A-frames, to give weather protected ventilation with mass control. See illustrations under Pond Truss.

Hung under a continuous overhanging angle. At the ends it overlaps rain-excluding stationary panels 2 ft. wide. Its 20-ft. sections are connected by expansion joints, which exclude weather while giving flexibility for faulty alignment of structural work.

All the members are rolled 1-piece sections, and are much heavier than ordinary factory sash. They are welded at all joints, making each section a permanently rigid unit and preventing glass breakage.

Pond Continuous Sash is controlled by Pond Operating Device, which gives exceptional width of opening with minimum applied power. See table.

For factory buildings and power houses, Pond Continuous Sash is made in short lengths to fit window openings, and is operated in lines or groups as desired by Pond Operating Device.

OPENINGS FOR TOP-HUNG SASH CONTROLLED BY POND OPERATING DEVICE

No. 3 sash	3 ft. high	46°	28 in.
No. 4 sash	4 ft. high	47°	38 in.
No. 5 sash	5 ft. high	42°	43 in.
No. 6 sash	6 ft. high	36°	44 in.

Pond Operating Device (Patented by Clarke P. Pond and Patents Pending).

Pond Operating Device is guaranteed to open long lines of sash wider, with less friction and wear, than any other device. It works on the principle of tension transmission, and applies increasing leverage as the sash is raised. It may be used to control any form of sash in long lines; but its advantages are most conspicuous with top hung sash. Power is transmitted by 2 lines of steel rods, connected



IDLER

by chains operating over a sprocket at one end and an idler at the other. These rods actuate the sash arms through compound levers, the increasing leverage being due to the varying angles of the levers and sash arms.

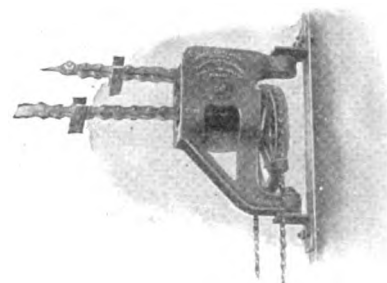
All hinged connections are bronze bushed.

The sprocket is driven by a worm gear and a hand chain. The worm gear is enclosed and runs in oil, hence has minimum friction and requires no attention.

For long lines of sash, a spiral and counterweight are advised in place of the idler pulley.

The varying radius of the spiral balances the varying load of the sash. By using a spiral, the practical length of line for hand chain operation is doubled; for shorter lines the time required to open is reduced. With motor operation the use of spirals and counterweights permits smaller motors to be used, and gives uniform load and speed from shut to full open.

Pond Operating Device, motor driven, is recommended for extra long lines, or for simultaneous control of several lines. It uses a 3-phase, 220-volt, 60-cycle alternating current motor, specially designed and furnished by this company.



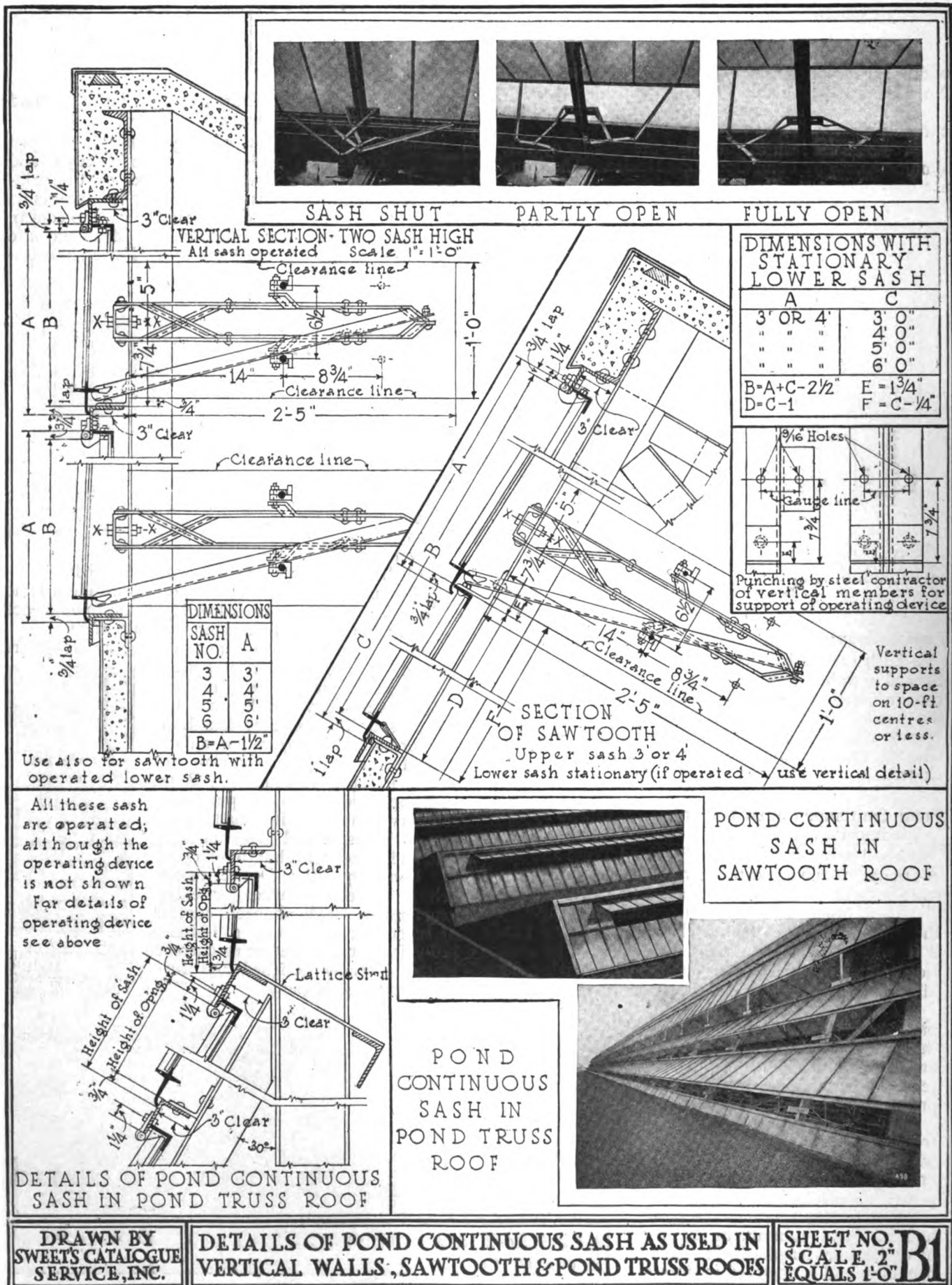
POND OPERATING DEVICE WITH HAND CHAIN



SPIRAL AND COUNTERWEIGHT FOR BALANCING WEIGHT OF LONG LINES OF SASH



MACHINE SHOP WITH TWO PARALLEL POND TRUSSES IN ROOF AND POND A-FRAMES BETWEEN FOR ADMITTING FRESH AIR AND LIGHT



Roof openings measure 14, 16, etc., wide, to any even number of feet desired—no inches. Between pilasters, ends of sash overlap weathering formed by Lupton to suit engineer's specifications, and set in brickwork. Opening widths are 10, 12, 14, etc., even feet, plus 3 in.

Pond Truss (Patented by Clarke P. Pond).

For foundries and other industrial buildings, Pond Truss construction allows the use of 1-story buildings of practically unlimited width, with perfect light and ventilation throughout. If the building is of extreme width, two or more Pond Trusses in the roof are arranged to alternate with low fresh-air bays having inlet openings hung with Pond Continuous Sash, or with Pond A-frames over the low sections of the roof. These are lines of A-shaped frames, running the length of the building, on which Pond Continuous Sash are hung.

In industries where certain processes, such as assembling, require unusual skill or many workers, a Pond Truss Roof on a multistory building gives ideal conditions for that work.

The use of the Pond Truss design is licensed where Lupton products are exclusively used. Its correct use is a matter of experience, and each roof is specially designed. This company should always be consulted before final plans are made.



INTERIOR VIEW IN MACHINE SHOP WITH POND TRUSS ROOF SHOWING UNIFORM LIGHTING

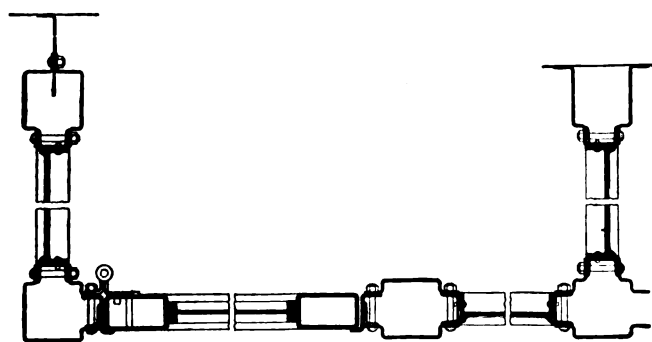
Lupton Steel Partition (Patents Pending).

Special—Lupton Special Steel Partitions consist of units of rolled steel members, set in and supported by heavy plate steel framing.

The units are of standard widths, 2, 4, and 6 ft. center to center of mullions, and 8, 9, 10, 11 or 12 ft. high. Each unit has a base of steel plate 4 ft. high; the upper part is glazed or filled with wire screen.

Mullions are set over and conceal standards secured to floor. Both mullions and head rails are formed of No. 14-gauge steel plate to receive partition units.

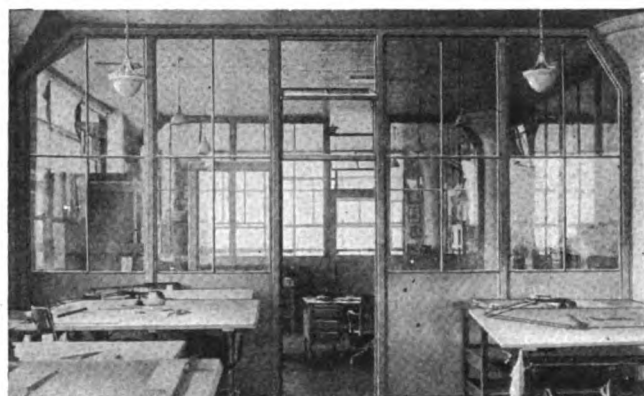
All units of like size are interchangeable.



LUPTON SPECIAL STEEL PARTITION

Horizontal section, showing interchangeability of section units, including door section. A door section may be moved, by interchanging it with a standard section

Standard—Lupton Standard Steel Partitions are made up of standard Lupton Factory Sash units, with channel instead of angle frame members, and with mullions of structural steel sections and formed plate. The doors are similarly made up from structural sections, bolted to formed plate and welded at the corners. This type of partition is intended for factory and warehouse use, and units have a limited interchangeability.

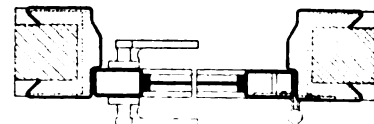


LUPTON SPECIAL STEEL PARTITION AND DOORS IN DRAFTING ROOM

Lupton Steel Tube Doors.

Made with stiles of seamless rectangular steel tube, welded at the corners. The lower part of door has a steel panel; the upper part is filled with glass or a steel panel as desired. These

doors are made in all sizes from partition doors up to craneway and locomotive doors, and in many styles suitable for factory or office use.

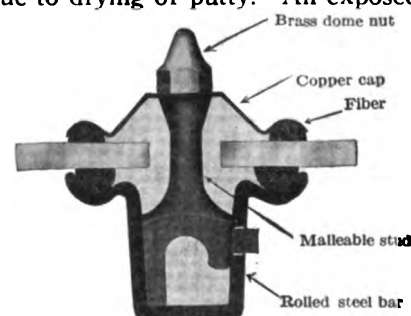


LUPTON STEEL TUBE DOORS
Horizontal section showing heavy formed steel jambs

Lupton Rolled Steel Skylight (Patented by Joah Brogden).

The construction of Lupton Rolled Steel Skylight prevents breakage of glass, leakage and corrosion. The glass is held between strands of specially saturated fiber, which permits some movement of the glass and eliminates leakage due to drying of putty. All exposed metal parts are non-corroding.

Cap is of copper, and both it and the bar are offset as required for overlap of lights. Condensation is carried by diagonal strands of fiber into the nearest bar, and drained to the roof by drip holes in the copper curb apron.



LUPTON STEEL SKYLIGHT
Showing skylight bar, stud and copper cap, also method of holding glass

Waldmire Louver (Patented).

Waldmire Louvers are made of No. 22-gauge galvanized Keystone metal. The slats are spaced 6 in. and are 10 ft. long, requiring vertical wood or steel supports on centers of 59½ in.

Literature.

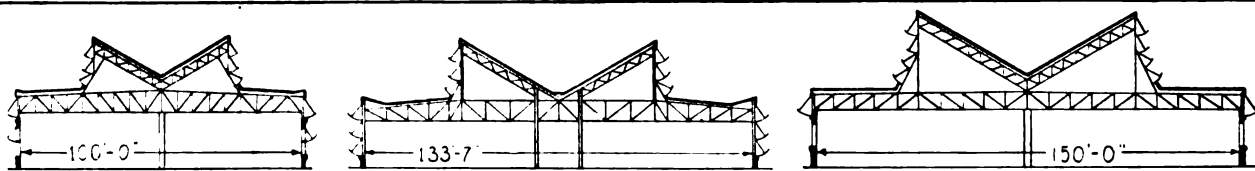
No. 10 Catalogue.
Air, Light and Efficiency (on Factory Design).
Air and Light in Foundries and Forge Shops.
Air and Light in Power Houses.
Air and Light in Machine Shops.



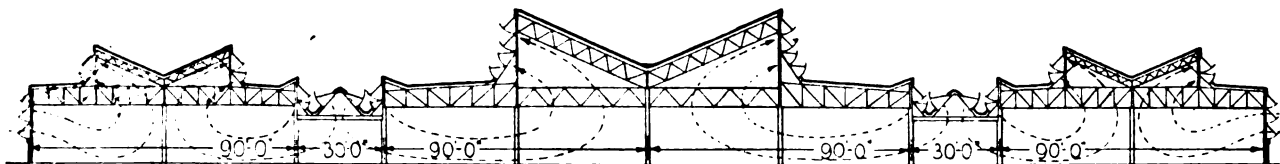
POND TRUSS OVER INTERNATIONAL HARVESTER CO
FOUNDRY, CHICAGO, ILL.



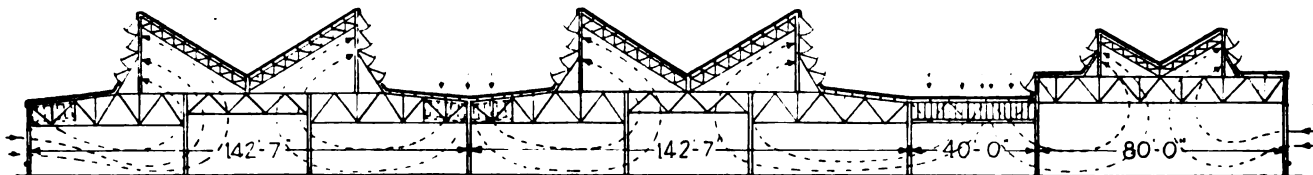
POND TRUSS OVER DAVID LUPTON'S SONS COMPANY
FACTORY, PHILADELPHIA, PA.



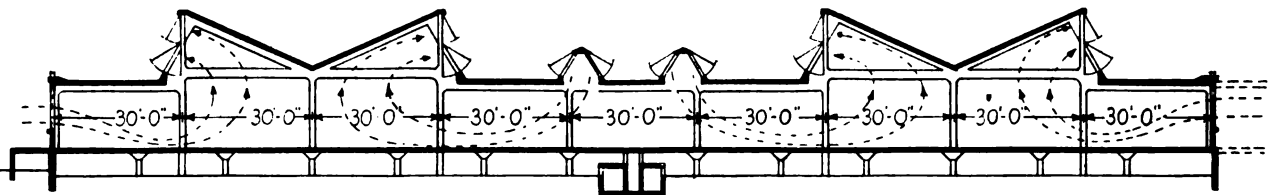
Sections showing the use of simple Pond Truss for ventilation and light.



Large Foundry: The dotted lines indicate how air enters at low sections in the roof and moves to areas where heat is produced.



Large Foundry: The dotted lines indicate how air enters at low sections in the roof and moves to areas where heat is produced.



Cross Section of Dayton-Wright Airplane Company's Building showing course of air currents. Two Pond 'A' Frames in center admit light and air.

IMPORTANT NOTE No attempt is made to give detailed information on these sections. The design of Pond Trusses for ventilation as well as light is an engineering problem to be solved for building

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SWEETS CATALOGUE
SERVICE, INC.

**SECTIONS SHOWING USE OF POND TRUSS
FOR VARIOUS TYPES OF BUILDINGS**

SHEET NO.
NOT DRAWN
TO SCALE **C1**

TRUSCON STEEL COMPANY

(TRUSSED CONCRETE STEEL COMPANY)

Manufacturers of Daylight Steel Sash
YOUNGSTOWN, OHIO

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Products.

All types of TRUSCON DAYLIGHT STEEL SASH, including Pivoted Side Wall Sash, Continuous Sash, Sliding Sash, Partitions, Doors, etc.

For Reinforcing Steel, see pages 151-53;
for Steel Buildings, see page 25.

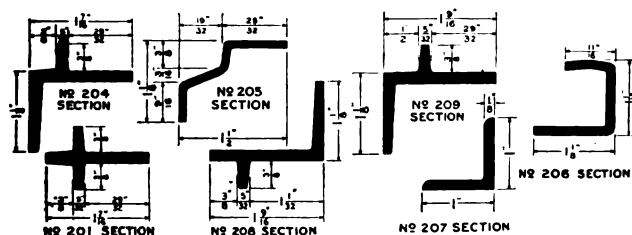
Service.

This company's specialists co-operate fully with engineers, architects, owners and contractors in selecting the proper window for any condition.

Truscon Daylight Steel Sash (Pivoted Types).

For industrial and commercial buildings.

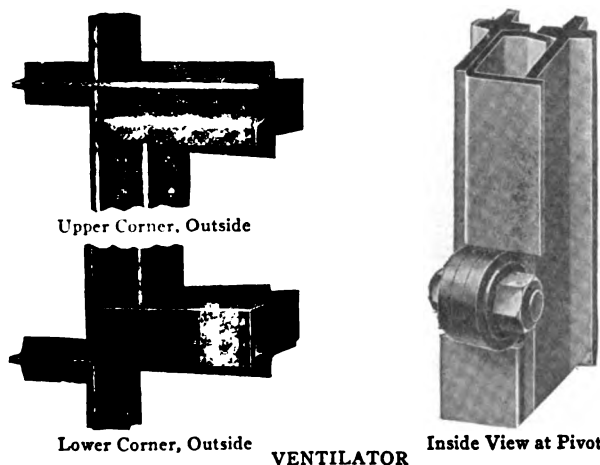
Sections—Deep, heavy, solid, one-piece, rolled, new billet steel sections. They are weatherproof and on good architectural lines.



SECTIONS USED IN PIVOTED TYPES OF TRUSCON DAYLIGHT STEEL SASH

- No. 201—Interior vertical and horizontal muntin bars
- No. 204—Vertical and horizontal outside bars
- No. 205—Weathering section of window frame above ventilator
- No. 206—Weathering section at both jambs of ventilators
- No. 207—Angle section of window frame below ventilator
- No. 208—Upper bar of ventilator
- No. 209—Lower bar of ventilator

Ventilators—Continuous double contact weathering; deep, heavy sections at top and bottom form drip.



VENTILATOR



TRADE-MARK

Joint—Horizontal and vertical muntin joints have dovetailed miter interlocking the bars, accurately formed by machine dies and assembled with a driving fit.

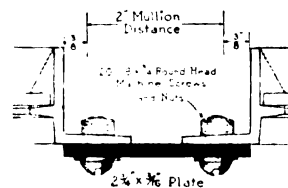
Glazing—Each light held by four special spring steel wire glazing clips, each of which supports the glass at two points.

Sufficiently elastic to absorb vibration shocks. Glass must be thoroughly bedded in Truscon steel sash putty and neatly face puttied.

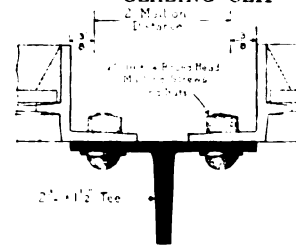


JOINT

SPRING STEEL WIRE GLAZING CLIP



Type T1 Mullion



Type T2 Mullion

DIAGRAMS OF MULLION BARS

T1, mullions are used with windows less than 6 ft. 3 in. high
T2, mullions are used with windows from 6 ft. 3 in. to 13 ft. 10½ in. high
Holes in mullions are slotted horizontally and in sash vertically to permit adjustability in erection

Stock Units of Truscon Daylight Steel Sash—

Pivoted windows are carried in warehouse stock in 33 types, each in 2 glass sizes 12 by 18 in. and 14 by 20 in., meeting practically all building requirements. Their use insures quick shipment, low cost and speedy building.

Standard Units of Pivoted Sash—

Large quantities of finished ventilators and machined muntin bars are carried in stock ready to be made up into standard units. These are stocked in 2 glass sizes: 12 by 18 in. and 14 by 20 in. Ventilators are stocked in 3 sizes: 4, 6 and 8 lights. The standard members are assembled to meet particular requirements of each building operation.

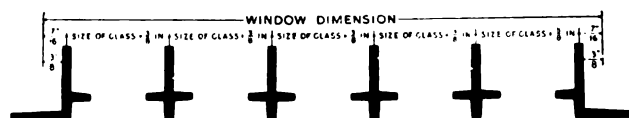


DIAGRAM FOR COMPUTING WINDOW DIMENSIONS FROM GLASS SIZES

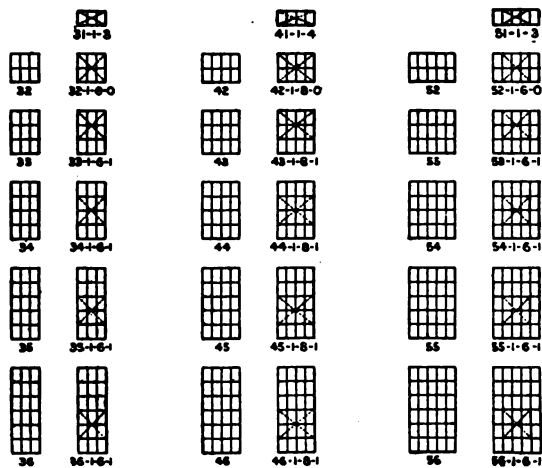
Width or height dimension of a single window is the same as width or height of window opening. These dimensions may be computed from glass sizes by the following formula:

$$W = n(s + \frac{1}{8} \text{ in.}) + \frac{1}{8} \text{ in.}$$

where n = number of lights

s = size of light; W = width or height of window

For window opening containing more than one unit add together dimensions of units as computed above plus mullion distances



STOCK UNITS OF TRUSCON DAYLIGHT STEEL SASH

Ventilators (indicated by crossed dash lines) are horizontally pivoted 2 in. above center

Important Note—Stock units are made in 2 glass sizes: 12 by 18 in. and 14 by 20 in. The 12-in. width of glass can be used only with 18-in. height of glass; 14-in. width of glass can be used only with 20-in. height of glass. For any one window opening, 12 by 18-in. glass sizes can not be combined with 14 by 20 in.

HEIGHTS OF WINDOW OPENINGS USING STOCK UNITS

Heights of openings		Lights high
12" x 18" glass	14" x 20" glass	
1'-7 1/4"	1'-9 1/4"	1
3'-1 1/4"	3'-5 1/4"	2
4'-8"	5'-2"	3
6'-2 3/4"	6'-10 3/4"	4
7'-8 3/4"	8'-6 3/4"	5
9'-3 1/4"	10'-3 1/4"	6

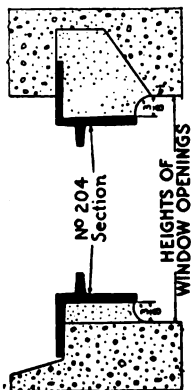


DIAGRAM OF HEIGHTS OF WINDOW OPENINGS

WIDTHS OF WINDOW OPENINGS USING STOCK UNITS

Widths of openings		Lights wide	Units	Mullion distance
12" x 18" glass	14" x 20" glass			
3'-2"	3'-8"	3	1	
4'-2 3/4"	4'-10 3/4"	4	1	
5'-2 3/4"	6'-0 3/4"	5	1	
6'-6"	7'-6"	6	2	2"
8'-6 3/4"	9'-10 3/4"	8	2	2"
9'-10"	11'-4"	9	2	2"
10'-7 1/4"	12'-3 1/4"	10	2	2"
10'-10 3/4"	12'-6 3/4"	10	3	2"
11'-10 3/4"	13'-8 3/4"	11	3	2"
11'-10 3/4"	13'-8 3/4"	11	3	2"
12'-11 1/4"	14'-11 1/4"	12	3	2"
13'-2"	15'-2"	12	4	2"
13'-11 1/4"	16'-1 1/4"	13	3	2"
13'-11 1/4"	16'-1 1/4"	13	3	2"
14'-11 1/4"	17'-3 1/4"	14	3	2"
15'-2 3/4"	17'-6 3/4"	14	4	2"
16'-0 1/4"	18'-6 1/4"	15	3	2"
16'-6"	19'-0"	15	5	2"
17'-3 1/4"	19'-11 1/4"	16	4	2"
17'-6 3/4"	20'-2 3/4"	16	5	2"
18'-6 3/4"	21'-4 3/4"	17	5	2"
18'-6 3/4"	21'-4 3/4"	17	5	2"
19'-4 1/4"	22'-4 1/4"	18	4	2"
19'-7 3/4"	22'-7 3/4"	18	5	2"
19'-10"	22'-10"	18	6	2"
20'-7 1/4"	23'-9 1/4"	19	5	2"
20'-7 1/4"	23'-9 1/4"	19	5	2"
21'-5"	24'-9"	20	4	2"
21'-7 3/4"	24'-11 3/4"	20	5	2"
21'-10 3/4"	25'-2 3/4"	20	6	2"
22'-8 3/4"	26'-2 3/4"	21	5	2"
22'-8 3/4"	26'-2 3/4"	21	5	2"
23'-8 3/4"	27'-4 3/4"	22	5	2"
23'-11 3/4"	27'-7 3/4"	22	6	2"
23'-11 3/4"	27'-7 3/4"	22	6	2"
24'-0"	28'-7"	23	5	2"
24'-0"	28'-7"	23	5	2"
25'-0 3/4"	29'-0 3/4"	24	5	2"
26'-0 1/4"	30'-0 1/4"	24	6	2"

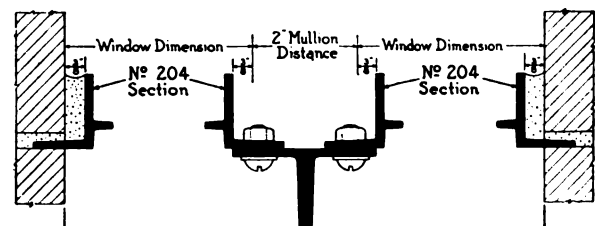
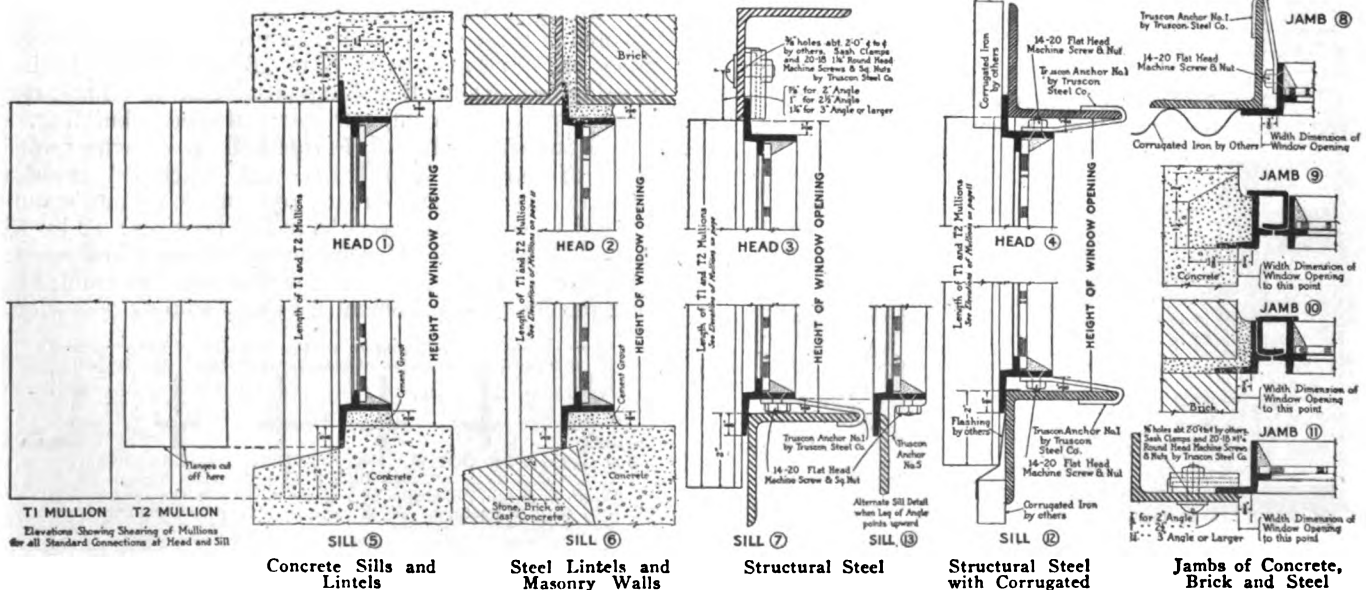


DIAGRAM OF WIDTHS OF WINDOW OPENINGS

Other Types of Sash.

The complete line of Truscon Daylight Steel Sash includes pivoted windows, continuous sash, counterbalanced sliding sash, steel and glass partitions, steel doors, steel fire windows and special types.



DETAILS OF TYPICAL CONNECTIONS

Truscon Continuous Sash.

For monitors and sawtooth roofs.

Improved method of support which consists of a continuous bearing, thereby eliminating the old style hinges which only supported the sash at wide intervals. There are no openings above the sash for rain or snow to enter as the contact is absolutely weathertight.

This continuous bearing distributes the weight of the sash evenly throughout its length, thus increasing its rigidity and ease of operation. There is perfect freedom for contraction and expansion.

At the end of a run of continuous sash perfect weathering is obtained by the combination of fixed and storm panels. A storm panel is placed behind each end light of the swinging sash, and thus prevents rain or snow from blowing in.

Sections—Formed of solid rolled sections of highest grade steel, being abundantly heavy to stand any strain to which a sash would be subjected.

The supporting member which is attached to the building is especially formed of heavy steel, providing accurate bearing and perfect flashing for the sash. The top member of the sash is of a heavy channel section, of which the outside flange bears evenly on the supporting member. The sill member is of special design with a wide projecting flange to insure greatest rigidity in the sash and to provide for the attachment of the operator. Formed with a bent flange to provide a weathertight contact at the sill. The vertical muntins are T sections, and the vertical end members are angle sections, all of ample weight.

The storm panel is made of heavy solid members of the same construction as the sash. The connection with the fixed steel panel is weathertight, the swinging sash has a continuous contact weathering, and a drip sill is provided in the storm panel itself, thus giving thorough protection against the severest rains and storms.

As an additional safeguard, occasional stay-clips are rigidly attached to the vertical muntins to prevent displacement of the sash through misuse.

Joints—The assembling of these members is by means of mortise and tenon joints, accurately punched and fitted. All joints are welded into a solid unit to insure a connection of unquestioned strength and weathertightness.

Sizes—Truscon continuous sash are made in standard heights as shown in the table below. The units are designed for a truss spacing of 20 ft. on centers. The

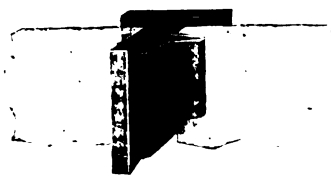
various units, however, can be combined to fit any length of run.

DATA, TRUSCON CONTINUOUS STEEL SASH

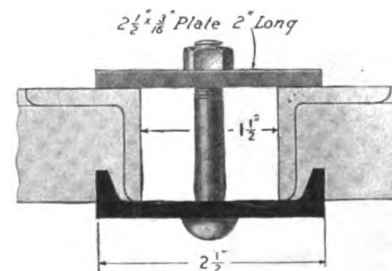
Sash No.	Height of sash, ft.	Height of opening, ft. in.	Glass size, in.
3	3	2 10 $\frac{1}{4}$	23 $\frac{3}{4}$ x 32 $\frac{3}{4}$
4	4	3 10 $\frac{1}{4}$	23 $\frac{3}{4}$ x 44 $\frac{3}{4}$
5	5	4 10 $\frac{1}{4}$	23 $\frac{3}{4}$ x 56 $\frac{3}{4}$
6	6	5 10 $\frac{1}{4}$	23 $\frac{3}{4}$ x 68 $\frac{3}{4}$

Glazing—Truscon continuous sash are glazed by means of heavy spring clips as illustrated. Note particularly that these clips are so designed as to give a substantial bearing—approximately 1 in. in width—against the sash as well as the glass.

The glass should be bedded in Truscon Sash Putty, and face puttied along the bottom section. No face putty is required at the sides or top.



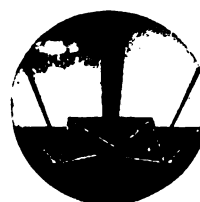
SPRING GLAZING CLIP



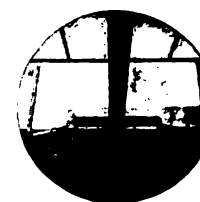
TYPE F MULLION

Used with all Truscon continuous sash

Sash Operator—Operator is of the tension type, with lever arms, continuous connecting rods and operating station. Toggle arrangement of operating arm gives 60% to 100% additional power.



Closed



Open Wide

TRUSCON SASH OPERATOR

DATA, SASH OPERATOR

Sash No.	Height of sash, ft.	Opening, degrees	Opening, in.
3	3	45	28
4	4	45	37
5	5	42	43
6	6	33	41

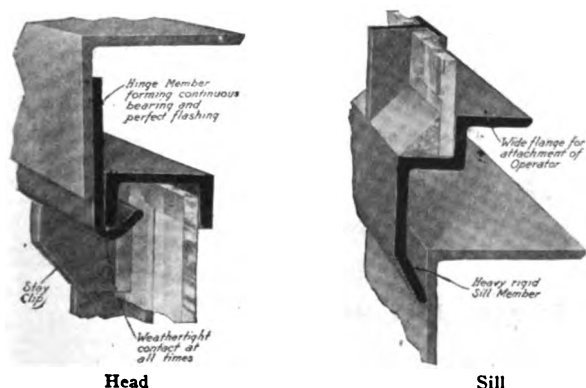
Counterbalanced Truscon Daylight Steel Sash.

In Truscon sliding windows the lower sash is counterbalanced against the upper. The outside members are especially heavy sections of rolled steel welded at the corners, thus giving the sash exceptional rigidity and ease of operation.

Counterbalanced windows are furnished in 2 types:

Type G—Consisting of 2 sash to a window, one balanced against the other, giving a maximum ventilation of 50%.

Type H—Consisting of 3 sash, the center third of which is fixed while the upper and lower sash are balanced against each other, giving a maximum ventilation of 66 $\frac{2}{3}$ %.



Head

Sill

SECTIONAL PERSPECTIVE OF TRUSCON CONTINUOUS SASH



VERTICAL SECTIONAL PERSPECTIVE, COUNTER-BALANCED STEEL SASH, TYPE G

MESKER BROTHERS IRON COMPANY

Manufacturers of Solid Steel Sash

ST. LOUIS, MO.

Products.

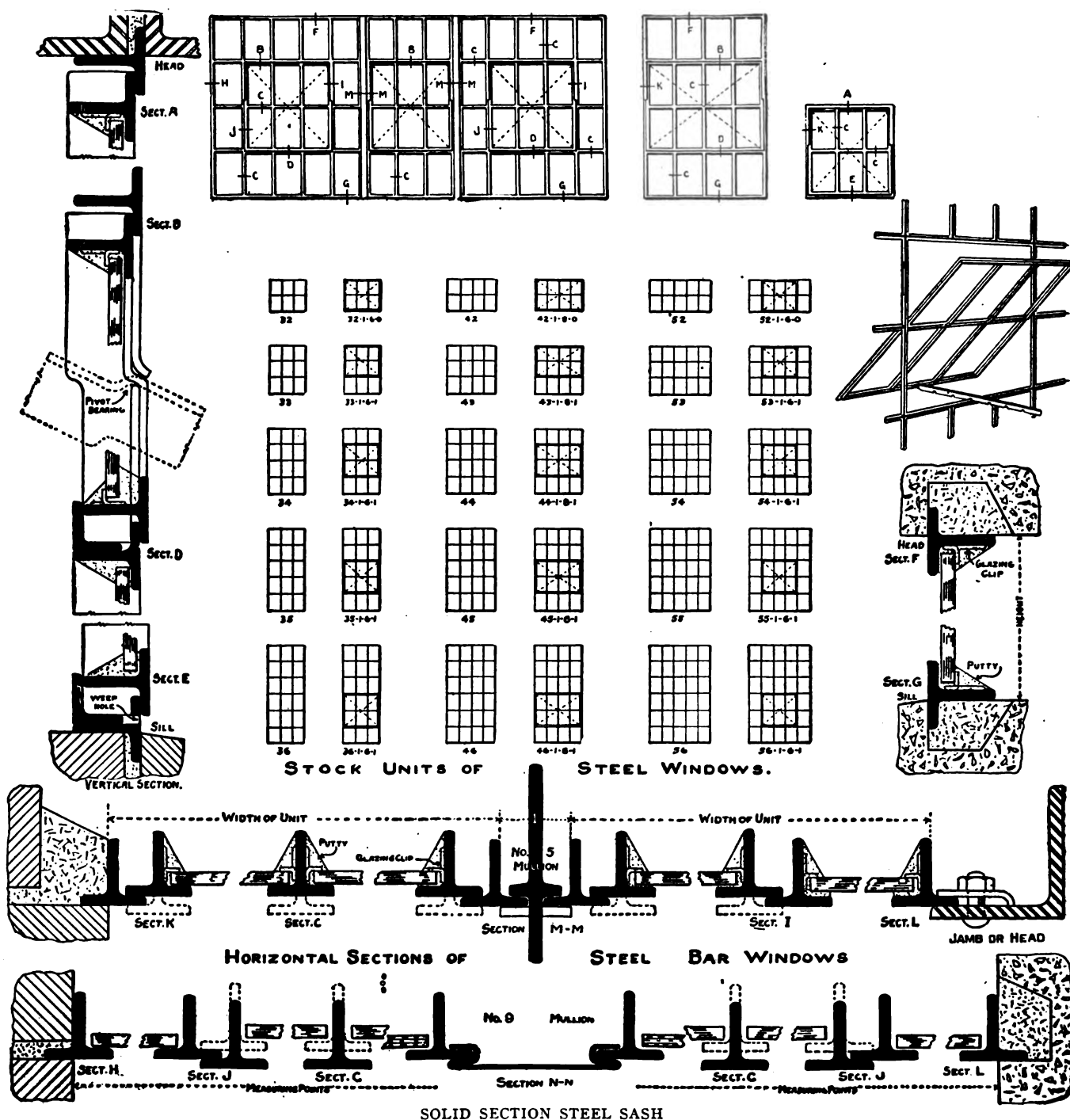
SOLID SECTION STEEL SASH.

Also Solid Section Steel Casement; Counter-balanced and Double Hung Windows; Hollow Metal Windows; Plate Steel Sash Doors; Steel and Glass Stair and Elevator Enclosures; Steel and Glass Corridor Partitions; Plate Steel Door Frames or Jambs; Metal Covered Wood Core Doors; Fireproof Doors and Shutters; Plate Steel Column Guards; Combination

Steel and Concrete or Slate or Marble Interior Stairs (patented).

Mesker Solid Section Steel Sash.

Adapted for use in structures of all kinds. Made of solid sections, rolled of mild steel. Horizontally or vertically pivoted, top or bottom hinged, casement, counter-balanced or double hung and monitors. Intersections of muntins are interlocked by special machinery, making sash exceedingly rigid.



Our pivot (patent applied for) is pressed directly into the solid sections by powerful presses, can not rust tight when ventilators are not used, absolutely non-breakable, no rusted bolts or nuts to loosen when ventilator is removed. Any inexperienced person can remove and replace ventilators.

Mullions Nos. 9 and 10 require no bolts nor clips to be attached in the field, greatly reducing the cost of installation.

Ample space is provided for expansion and contraction.



STANDARD MASONRY OPENINGS, STOCK UNITS, COMBINING VARIOUS UNITS WITH MULLIONS NOS. 9 AND 10

SIZES FOR 12' x 18' GLASS

Width of Window Opening	Total No. of Lights Wide	No. of Units	Number of Lights Wide				
			1st Unit	2nd Unit	3rd Unit	4th Unit	5th Unit
3'-11 1/4"	3	1	3	...	...	...	...
4'-1 1/8"	4	1	4	...	...	...	...
5'-2"	5	1	5	...	...	...	...
6'-6"	6	2	3	3	...	...	...
8'-6 3/4"	8	2	4	4	...	...	...
10'-7 1/4"	10	2	5	5	...	...	...
9'-10"	9	3	3	3	3	...	...
10'-10 3/8"	10	3	3	4	3	...	...
11'-10 3/4"	11	3	3	5	3	...	...
11'-10 3/4"	11	3	4	3	4	...	...
12'-11 1/8"	12	3	4	4	4	...	...
13'-11 1/8"	13	3	4	5	4	...	...
13'-11 1/8"	13	3	5	3	5	...	...
14'-11 1/8"	14	3	5	4	5	...	...
16'-0 1/4"	15	3	5	5	5	...	...
13'-2"	12	4	3	3	3	3	...
15'-2 3/4"	14	4	4	3	3	4	...
15'-2 3/4"	14	4	4	4	4	3	...
17'-3 1/8"	16	4	4	4	4	4	...
17'-3 1/8"	16	4	5	3	3	5	...
17'-3 1/8"	16	4	3	5	5	3	...
19'-4 1/8"	18	4	4	5	5	4	...
19'-4 1/8"	18	4	5	4	4	5	...
21'-5"	20	4	5	5	5	5	...
16'-6"	15	5	3	3	3	3	3
17'-6 3/8"	16	5	3	3	4	3	3
18'-6 3/8"	17	5	3	3	5	3	3
18'-6 3/8"	17	5	3	4	3	4	3
19'-7 1/8"	18	5	3	4	4	4	3
19'-7 1/8"	18	5	4	3	4	3	4
20'-7 1/8"	19	5	5	3	3	3	5
21'-7 1/8"	20	5	4	4	4	4	4
21'-7 1/8"	20	5	5	3	4	3	5
21'-7 1/8"	20	5	3	5	4	5	3
22'-8 1/4"	21	5	5	4	3	4	5
22'-8 1/4"	21	5	4	5	3	5	4
22'-8 1/4"	21	5	4	4	5	4	4
22'-8 1/4"	21	5	5	3	5	3	5
23'-8 5/8"	22	5	4	5	4	5	4
23'-8 5/8"	22	5	5	4	4	4	5
24'-9"	23	5	5	4	5	4	5
24'-9"	23	5	4	5	5	5	4
25'-9 3/8"	24	5	5	5	4	5	5
26'-9 3/8"	25	5	5	5	5	5	5

SIZES FOR 12'x18' GLASS

Height of Window Opening	No. of Lights High
3'-0 7/8"	2
4'-7 1/4"	3
6'-1 5/8"	4
7'-8"	5
9'-2 3/8"	6

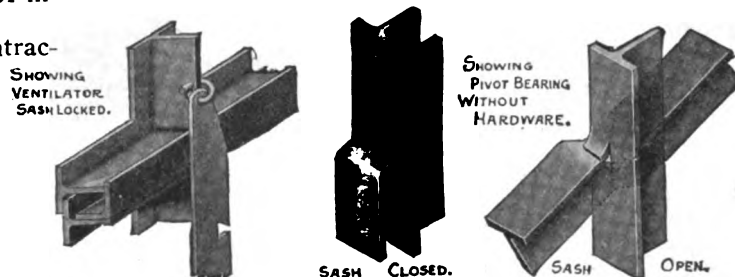
SIZES FOR 14'x20' GLASS

Height of Window Opening	No. of Lights High
3'-4 7/8"	2
5'-1 1/4"	3
6'-9 5/8"	4
8'-6"	5
10'-2 3/8"	6

Sash of similar type have been in use in European countries for upwards of 100 years and are still being fabricated there in large quantities, hence they have been tested and found to meet every requirement.

Catalogue.

Send for complete catalogue.



SIZES FOR 14' x 20' GLASS

Width of Window Opening	Total No. of Lights Wide	No. of Units	Number of Lights Wide				
			1st Unit	2nd Unit	3rd Unit	4th Unit	5th Unit
3'-7 1/4"	3	1	3	...	...	...	...
4'-9 5/8"	4	1	4	...	...	...	...
6'-0"	5	1	5	...	...	...	...
7'-6"	6	2	3	3	...	...	...
9'-10 3/4"	8	2	4	4	...	...	...
12'-3 1/2"	10	2	5	5	...	...	...
11'-4"	9	3	3	3	3	...	...
12'-6 3/8"	10	3	3	4	3	...	...
13'-8 3/4"	11	3	3	5	3	...	...
13'-8 3/4"	11	3	4	3	4	...	...
14'-11 1/8"	12	3	4	4	4	...	...
16'-11 1/2"	13	3	4	5	4	...	...
16'-11 1/2"	13	3	5	3	5	...	...
17'-3 7/8"	14	3	5	4	5	...	...
18'-6 1/4"	15	3	5	5	5	...	...
15'-2"	12	4	3	3	3	3	...
17'-6 3/4"	14	4	4	3	3	4	...
17'-6 3/4"	14	4	3	4	4	3	...
19'-11 1/8"	16	4	4	4	4	4	...
19'-11 1/8"	16	4	5	3	3	5	...
19'-11 1/8"	16	4	3	5	5	3	...
22'-4 1/4"	18	4	4	5	5	4	...
22'-4 1/4"	18	4	5	4	4	5	...
24'-9"	20	4	5	5	5	5	...
19'-0"	15	5	3	3	3	3	3
20'-2 3/8"	16	5	3	3	4	3	3
21'-4 3/4"	17	5	3	3	5	3	3
21'-4 3/4"	17	5	3	4	3	4	3
22'-7 1/8"	18	5	4	4	4	4	3
22'-7 1/8"	18	5	4	3	4	3	4
23'-9 1/4"	19	5	5	3	3	3	5
24'-11 1/8"	20	5	4	4	4	4	4
24'-11 1/8"	20	5	5	3	4	3	5
24'-11 1/8"	20	5	3	5	4	5	3
26'-2 1/4"	21	5	5	4	3	4	5
26'-2 1/4"	21	5	4	4	5	4	4
26'-2 1/4"	21	5	5	3	5	3	5
26'-2 1/4"	21	5	4	5	3	5	4
27'-4 5/8"	22	5	4	5	4	5	4
27'-4 5/8"	22	5	5	4	4	4	5
28'-7"	23	5	5	4	5	4	5
28'-7"	23	5	4	5	5	5	4
29'-9 3/8"	24	5	5	5	4	5	5
30'-11 1/4"	25	5	5	5	5	5	5

Mullions for 2 units are 3 1/2" wide. Openings may be increased or decreased in width 1 1/2".
Mullions for 3 units are 3 1/8" wide. Openings may be increased or decreased in width 2 1/4".
Mullions for 4 units are 3 1/4" wide. Openings may be increased or decreased in width 3".
Mullions for 5 units are 2 5/8" wide. Openings may be increased or decreased in width 3 3/4".
No. 5 Mullions are used for windows any height.
No. 9 Mullions are used for windows less than 6—9 5/8" high.
No. 10 Mullions are used for windows more than 6—9 5/8" high.

THE AEROSHADE COMPANY

Ventilating Window Shades

193 Oakland Avenue
WAUKESHA, WIS.

Product.

AEROLUX VENTILATING SHADES for factories, offices, stores, schools, public buildings, living porches, sun parlors and sleeping porches.

AEROLUX
VENTILATING
WINDOW SHADES

TRADE-MARK

several years of industrial shading experience, are ready to assist in solving problems.

In writing for further information, drawings or blue prints showing complete details of sash and wall openings, should be sent.

Construction.

All Aerolux shades are constructed from a splint fabric composed of tough, weather resisting linwood splints which are woven together with a hard twist seine twine.

The shades are adjusted by means of cords and special stop pulleys—no spring rollers are used. All necessary fixtures for installation are included.

Types of Factory and Office Shades.

For factory use, the three types of shades most commonly employed are those illustrated.

Single Type with Regular Hangings—Equipped to hang at the top and roll up from the bottom. May be used wherever the shades hang far enough away from the windows to clear open ventilators without interfering with workmen or machines.

Single Type with Top Drop—Especially adapted to very wide rooms. Protection against the sun's heat and glare is provided for the workers close to the windows without cutting off the light farther back in the room.

Besides dropping from the top, the shades will roll up from the bottom so that any desired lighting effect is obtained. When not in use they may be rolled entirely to the top.

Duplex Type—A type to use where open ventilators extend inside of wall line and where shades must occupy a minimum of room space. Upper section clears ventilator but does not interfere with workers or machines.

The two sections operating independently permit any desired lighting effect.

Sizes.

Shades may be made in any width up to 20 ft. and in any desired length. Because of the great variety of sash types and sizes, and also bay construction, shades are made to order only.

Advantages of Aerolux Ventilating Shades.

Exclude the sun's direct rays.

Admit a good working light.

Diminish glass intensified heat.

Permit ventilation even when the shades entirely cover the windows.

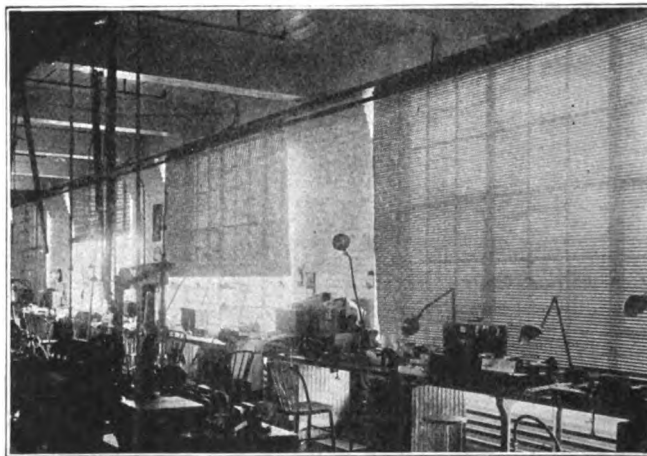
Are durably constructed to withstand many years of hard industrial usage with no expensive upkeep or replacements.

Answer the purpose of both awning and shade and since they are used inside are not subject to destructive effects of wind and weather.

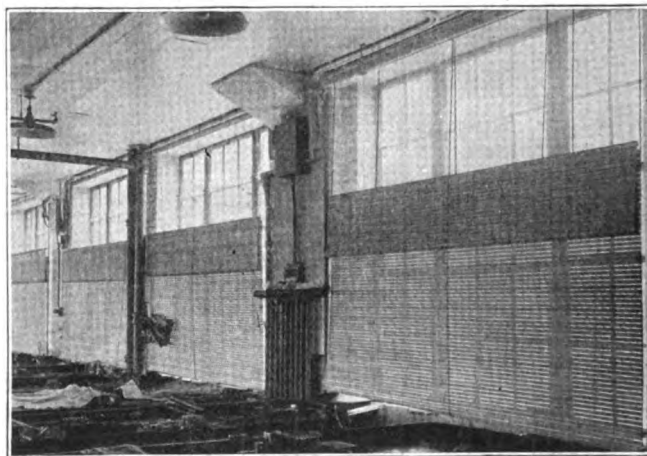
Are equipped with simple fixtures which are durable, positive in action and foolproof.

Co-operative Service.

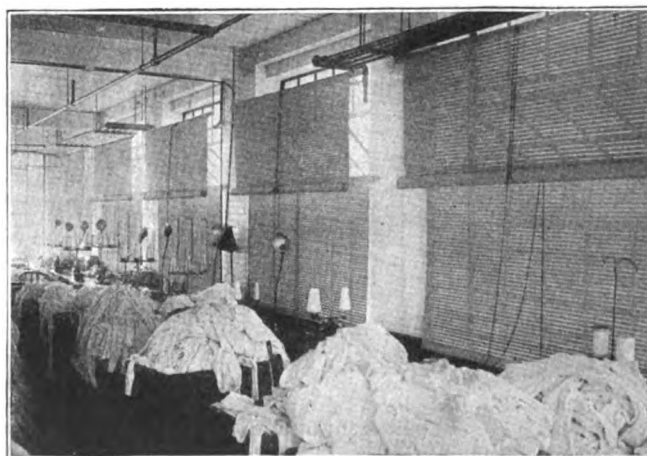
Efficient window shading is often more complex than appears on the surface, and our specialists, with



Single Type with Regular Hangings



Single Type with Top Drop



Duplex Type
AEROLUX VENTILATING WINDOW SHADES

PORETE MANUFACTURING CO.

Manufacturers of Porous Concrete Products

TELEPHONE:
BRANCH BROOK 6700

26 Verona Ave.
NEWARK, N. J.

Product.

PORETE (POROUS CONCRETE).

What Porete Is.

Porete is a composition of portland cement and sand, made porous like a sponge by a special process. Porete consists of approximately one-third solid matter and two-thirds air cells. It has therefore about one-third the weight of solid concrete.

Since it is made of the same materials, Porete is as durable a material as portland cement concrete. Its strength is not affected by water or steam and improves with age. Porete is as light as wood, can be nailed, and, on account of its air cell structure, is a good heat and sound insulator.

Porete is Especially Suited for Fireproof Roof Decks.

Porete roof decks require no false work and no plastering from underneath, and present a smooth, light colored, clean appearance on the underside.

Slabs Are Easy to Handle—Porete roofing slabs are made to a standard size, 24 in. wide by 32 in. long by $1\frac{1}{8}$ in. thick; they contain a wire netting and are designed like a reinforced concrete slab. Since they weigh only 30 lbs. each, one man can easily carry them. They are laid on a light steel structure, consisting usually of steel channels set on 32-in. centers, and are held in place with heavy galvanized sheet metal clips. A thin cement grout is brushed over the surface, and it is then ready for the waterproofing, which can be any of the standard composition roofings. On account of the ease and simplicity of this construction, Porete roof decks can be put up in record time.

Porete roof decks thus laid weigh only 7 lbs. per sq. ft., or half as much as similar fireproof roof decks.

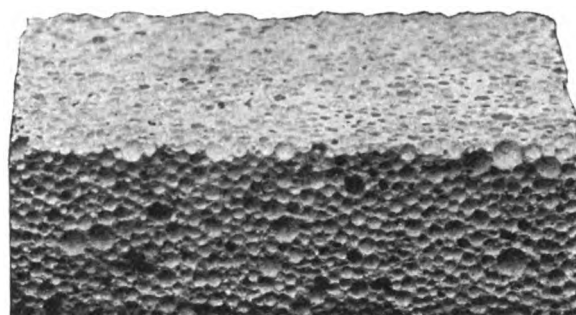
Porete Roof Decks Are Strong and Durable—The breaking load with a 32-in. free span is over 300 lbs. per sq. ft. Porete roof decks become stronger with age, and their strength is not impaired by exposure to heat, steam or water. Tests made on roofing slabs that have been submerged in water or exposed to live steam for 24 hours show the same breaking strength as unexposed slabs. Porete roof decks keep the heat and cold out as Porete has the same insulating value as wood of the same thickness.

Porete as Sheathing for Stucco Walls.

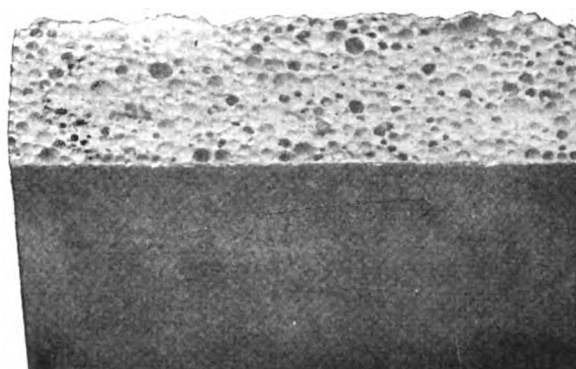
Porete siding slabs 24 by 32 by 1 in. thick are applied with clips to steel frame or are nailed to wooden frame and covered with cement stucco. On wooden frames they save the sheathing boards, metal lath and at least one coat of stucco.

This type of structure is used on dwelling houses, etc. On small garages and industrial buildings where no plastering is done on the interior, such a wall has the advantage of good appearance with a smooth stone finish on the inside.

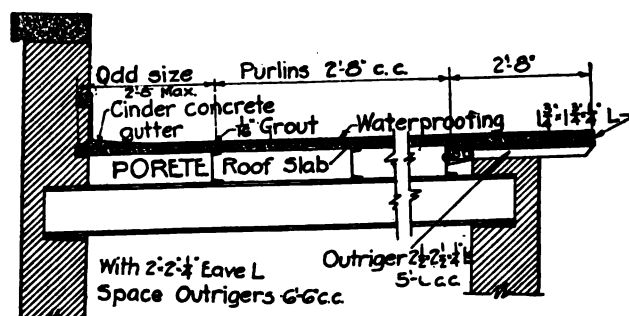
Porete has been used with good results for the thin walls of drying rooms, thin partitions for furring brick and concrete walls and for fireproofing existing combustible structures.



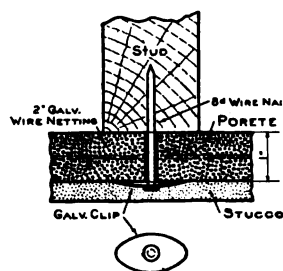
PORETE HAS A ROUGH SURFACE ON TOP



PORETE HAS A SMOOTH SURFACE ON THE BOTTOM

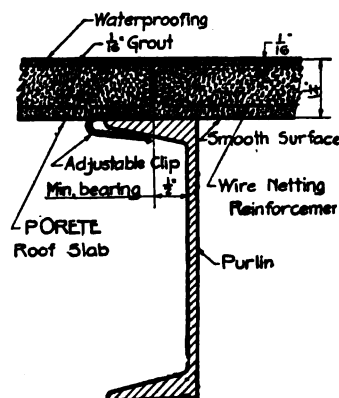


DETAIL OF FLAT ROOF; PARAPET AND OVERHANG



DETAIL OF PORETE SLAB USED AS STUCCO SHEATHING

Slab is nailed direct to stud with an 8d nail and a galvanized washer. Note that galvanized wire netting in the Porete slab is protected with cement so that it can not rust



DETAIL OF PORETE SLAB ROOF AT PURLIN

AMERICAN CEMENT TILE MFG. CO.

Manufacturers of Cement Tile Roofing

Oliver Building
PITTSBURGH, PA.

BRANCH OFFICES

NEW YORK, N. Y., 50 Church Street

BIRMINGHAM, ALA., 509 Brown-Marx Building

PHILADELPHIA, PA.

WORKS: WAMPUM, PA.; LINCOLN, N. J.; BIRMINGHAM, ALA.

Products.

Manufacturers of AMERICAN (formerly BONANZA) REINFORCED CEMENT TILE ROOFING; INTERLOCKING TILE; FLAT TILE; CHANNEL TILE.

Services.

This company specializes in the design, construction and erection of American (formerly Bonanza) cement tile roofs. The units of its personnel devote their entire energies to the development of this one objective. The company has passed through the various stages of experiment to a condition of knowledge of the subject, and, on the basis of its reputation for satisfactory results and long and successful experience, it solicits further inquiries for specific data.

DESIGN—The AMERICAN CEMENT TILE MFG. CO. maintains an Engineering Department, the services of which are available to its clientele without charge. Engineers and others will find that the co-operation of this department will prove of great economic value in the development of their plans and it is requested that inquiries be made and recommendations asked for at the earliest possible stage of the contemplated work. This department prefers to design the roof construction where the products of the company are installed; it is especially desirable that it be consulted to avoid the frequent complications that arise, particularly in the solution of unusual problems.

ESTIMATES—Approximate estimates as well as definite proposals will be furnished on request. Where approximate estimates are desired as much information as possible should accompany the request.

INSTALLATION—The erection of the products of the AMERICAN CEMENT TILE MFG. CO. is performed only by the erection crews maintained by the company itself; the use of experienced and efficient erectors is of the utmost importance to satisfactory results.

GUARANTEE—All materials and workmanship are guaranteed for a period of years.

American (Formerly Bonanza) Cement Tile Roofing.

A roof covering, the units of which are large reinforced cement tile of pleasing architectural shape and with a permanent red outer surface. They are produced in two distinct types, each of which is designed for specific requirements and manufactured by this company's particular process which combines clean sharp sand and portland cement, accurately reinforced, in a dense, hard dependable mass, impervious to water and proof against the elements.

STRENGTH—American (formerly Bonanza) cement tile is accurately reinforced with metal, so placed as to secure the most positive results; and the reinforcements are heavily coated to prevent corrosion. The average



TRADE-MARK

breaking down load, shown by tests at Columbia University, is 350 lbs. per sq. ft.

This product has been approved for general use as fireproof roofing material as required by Section 94 of the Building Code, City of New York.

APPLICATION—The tile is placed directly over steel purlins—no roof boarding, wood sheathing, nailing strips, or other fastenings are required or used.

The construction required for either pitch or flat roof, is simply an economically designed superstructure of standard structural shapes, arranged to properly support a total roof load of from 45 to 50 lbs. per sq. ft. and so placed as to accommodate the roofing units.

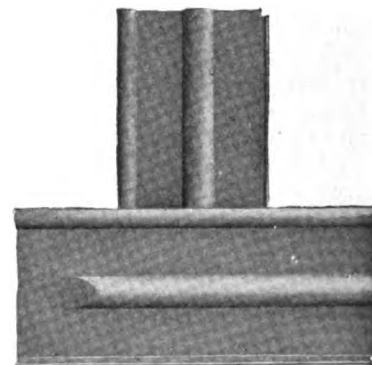
The tile overlap and interlock in the formation of the completed roofing unit thus provide an expansion joint at every side and cross connection of the individual tile.

American (Formerly Bonanza) Interlocking Tile (Plates A1, A2, A3).

Designed for pitched roofs, forming in itself a finished watertight roof.

Made 26 in. wide, 52 in. long and 1 in. thick with a roll along one edge and a rabbet on the opposite edge. When placed on the roof, the roll interlocks with the rabbet on the next tile, and with the addition of elastic rubber cement, forms watertight joints. The cross joints are formed by capping and staggering each row of tile over the next lower row about 4 in., these joints also being pointed with elastic cement.

The tile are held in place by means of an offset at the top, extending the full width of the tile. The exposed surface is finished with a pleasing brick-red finish while the underside has a smooth white finish, obtained by our own patent process.



AMERICAN (FORMERLY BONANZA) INTERLOCKING TILE

DIMENSIONS AND WEIGHTS

Size of tile	26 by 52 in.
Thickness of tile	1 in.
Surface exposed to weather	24 by 48 in.
Number of tile per square of roof (100 sq. ft.)	12½
Weight of single tile	128 lbs.
Weight per square of roof	1600 lbs.
Weight per sq. ft.	16 lbs.

Guaranteed to carry a uniformly distributed load of 200 lbs. per sq. ft. over a 4-ft-span.

ROOF DESIGN—The minimum pitch desirable for slope of roof is one-sixth pitch which is 4 in. to 1 ft.

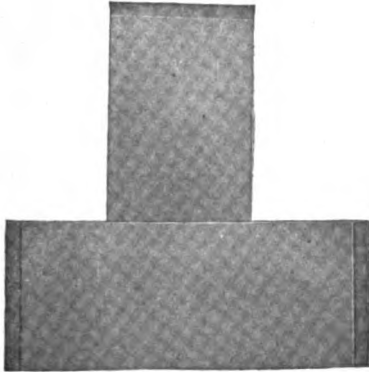
In laying out spacing for spans, always start at the eaves. After determining the eave space, use standard spacing of 3 ft. 10 in. to 4 ft. $\frac{1}{2}$ in., placing short course, if any, at the ridge. The short courses at the ridge can be varied from 1 ft. 4 in. to 3 ft. 8 in. To eliminate courses shorter than 1 ft. 4 in., use special 60-in. tile for eave course and adjacent course if necessary.

The roof purlins should in all cases be steel channels or I-beams, held in alignment by the rods.

GLASS INSERT TILE—To provide light, glass insert tile are always desirable (Plate No. 1). These interlock with standard length tile and can be placed wherever required.

American (Formerly Bonanza) Flat Tile (Plate B2).

Designed for flat or pitched construction. Requires the application of some standard composition roof covering to make watertight. Slabs are $1\frac{1}{2}$ in. thick by 24 in. wide by 60 in. long for purlin spacing of 5 ft. The ends are laid directly on flange of I-beam purlins, after which the joints are pointed with elastic cement and the entire roof covered with some form of composition roofing.



AMERICAN (FORMERLY BONANZA) FLAT TILE

DIMENSIONS AND WEIGHTS

Thickness of tile	$1\frac{1}{2}$ in.
Size of standard tile	24 by 60 in.
Surface exposed	24 by 60 in.
Weight per sq. ft.	17 lbs.
Weight per square of roof	1700 lbs.

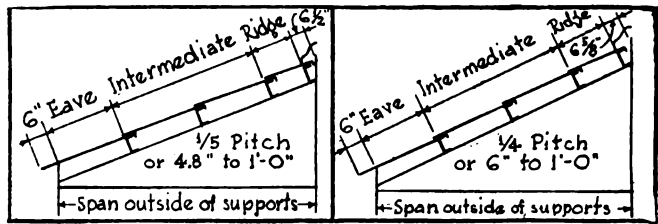
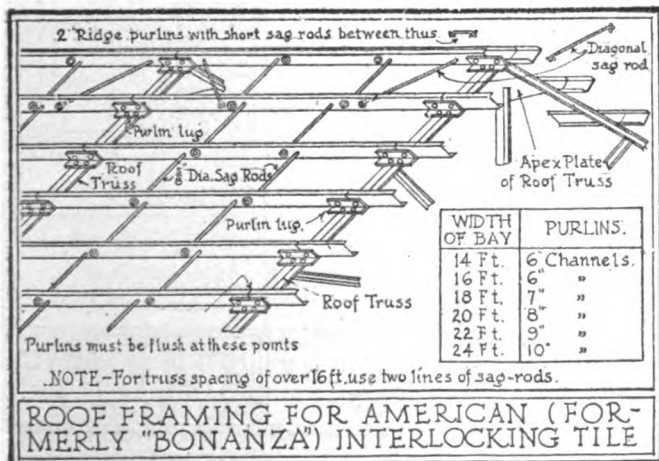
Guaranteed to carry a uniformly distributed load of 150 lbs. per square foot over a span of 5 ft.

Special tile is furnished for spaces over or under 60 in. and for flashing.

ROOF DESIGN—Flat tile is laid on I-beam purlins spaced 5 ft. center to center. Channels of equivalent strength having a flange width of not less than $2\frac{1}{2}$ in. may be used. After tile is laid the joints are thoroughly pointed.

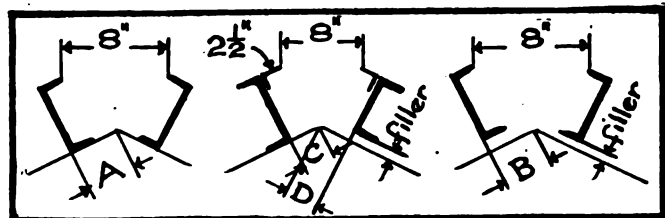
Channel Tile.

Also manufactured by this company. For details, see drawing No. 3. Further information and data will be furnished on request.



SPACING OF PURLINS

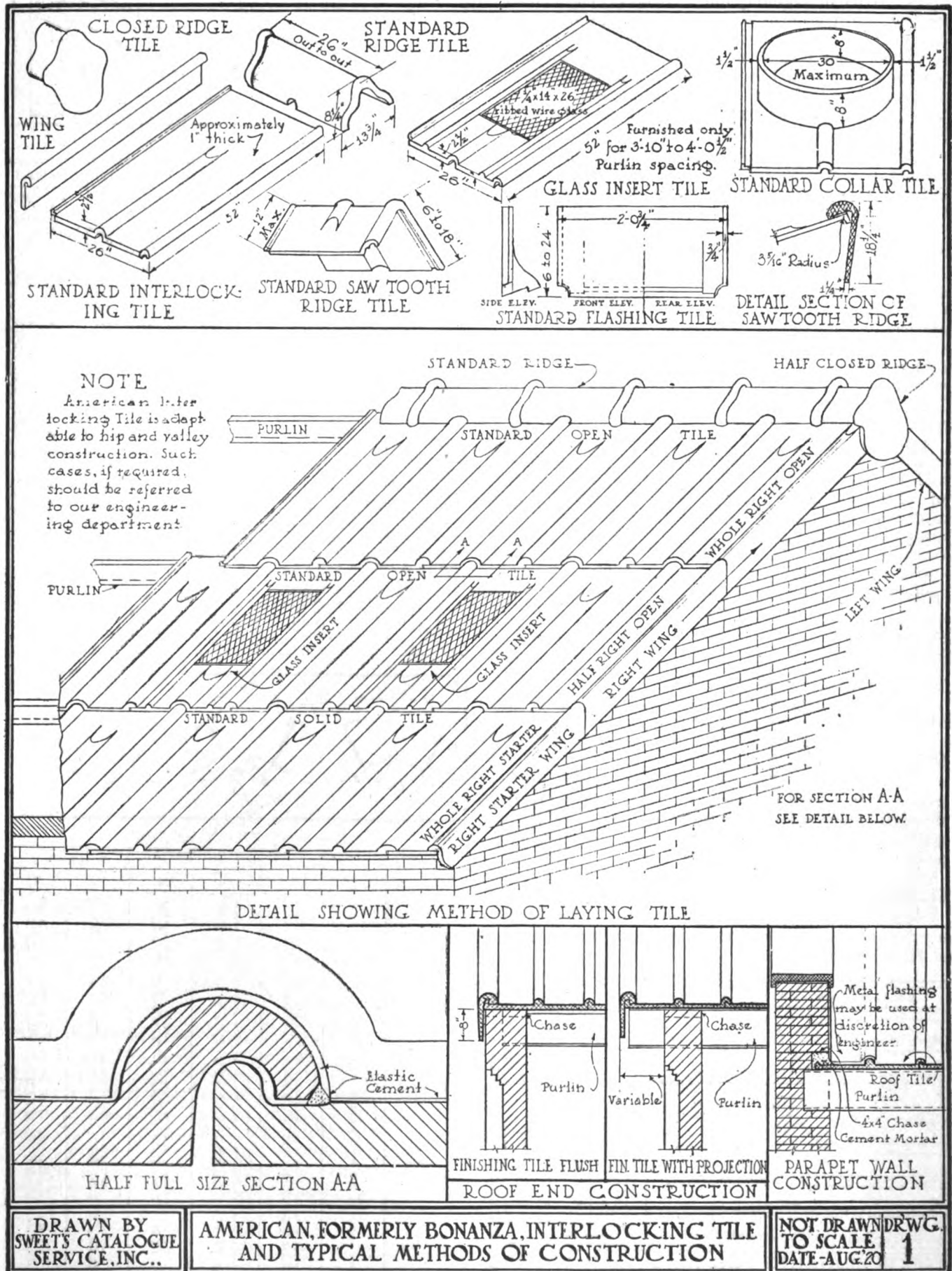
Span	Eave	Intermediate	Ridge	Eave	Intermediate	Ridge
35'	3'-7"	3 @ 4'-0 1/4"	2'-8"	3'-7"	3 @ 4'-0 1/4"	3'-4 3/8"
36'	3'-7"	3 @ 3'-11 3/4"	3'-4"	3'-7"	3 @ 4'-0"	3'-11 3/8"
37'	3'-7"	3 @ 3'-11 3/4"	3'-11 1/4"	3'-7"	3 @ 3'-11 3/4"	3'-11 3/8"
38'	3'-11"	3 @ 4'-0"	4'-0"	3'-7"	1 @ 4'-8 3/4"	3 @ 3'-11"
39'	4'-3"	1 @ 4'-4 1/4"	3 @ 3'-11 1/2"	3'-7"	4 @ 4'-0"	1'-8"
40'	4'-3"	1 @ 4'-8 3/8"	3 @ 4'-0 1/4"	3'-7"	4 @ 3'-11 3/4"	1'-3 3/4"
41'	3'-7"	4 @ 4'-0"	2'-8"	3'-7"	4 @ 4'-0 3/4"	2'-8 1/2"
42'	3'-7"	4 @ 3'-11 1/2"	2'-8"	3'-7"	4 @ 4'-0"	3'-4 3/8"
43'	3'-7"	4 @ 4'-0"	3'-0 3/8"	3'-7"	4 @ 3'-11 3/4"	3'-11 3/8"
44'	3'-7"	4 @ 3'-11"	3'-11"	3'-7"	4 @ 3'-11 1/2"	3'-11 3/8"
45'	3'-7"	4 @ 4'-0 1/4"	4'-0"	3'-7"	1 @ 4'-4 1/4"	4 @ 4'-0"
46'	4'-3"	1 @ 4'-4 3/8"	4 @ 4'-0 1/4"	3'-7"	5 @ 3'-11 3/4"	1'-7 3/8"
47'	4'-3"	1 @ 4'-8 3/8"	1'-8 1/4"	3'-7"	5 @ 3'-11 1/2"	2'-4 3/8"
48'	3'-7"	5 @ 4'-0 3/8"	2'-8 1/4"	3'-7"	5 @ 4'-0"	2'-8 1/4"
49'	3'-7"	5 @ 4'-0"	2'-8 1/4"	3'-7"	5 @ 3'-11 3/4"	3'-3 3/8"
50'	3'-7"	5 @ 4'-0 1/4"	3'-4 3/8"	3'-7"	5 @ 3'-11 1/2"	3'-11 3/8"
51'	3'-7"	5 @ 3'-11 3/4"	3'-11 3/4"	3'-11"	5 @ 4'-0 3/8"	4'-0 1/4"
52'	3'-11"	5 @ 4'-0 1/4"	4'-0"	3'-7"	1 @ 4'-4"	5 @ 3'-11 3/4"
53'	4'-3"	1 @ 4'-8 3/8"	5 @ 4'-0"	3'-7"	6 @ 3'-11 3/4"	1'-7 3/8"
54'	3'-7"	6 @ 3'-11 3/4"	1'-8"	3'-7"	6 @ 4'-0"	2'-0 3/4"
55'	3'-7"	6 @ 4'-0"	2'-0 3/4"	3'-7"	6 @ 4'-0"	2'-7 3/8"
56'	3'-7"	6 @ 3'-11 3/4"	2'-0 3/4"	3'-7"	6 @ 3'-11 1/2"	3'-3 3/8"
57'	3'-7"	6 @ 4'-0 1/4"	3'-0"	3'-11"	6 @ 4'-0 3/8"	3'-8"
58'	3'-7"	6 @ 3'-11 3/4"	3'-0"	3'-11"	6 @ 3'-11 1/2"	3'-11 3/8"
59'	3'-7"	6 @ 4'-0 1/4"	3'-0"	3'-7"	7 @ 4'-0"	4'-0 1/4"
60'	3'-11"	6 @ 3'-11 3/4"	3'-11 3/4"	3'-7"	7 @ 3'-11 1/2"	1'-11 3/8"
61'	4'-3"	6 @ 4'-0 1/4"	4'-0 3/8"	3'-7"	7 @ 4'-0"	2'-8"
62'	4'-3"	1 @ 4'-8 3/8"	6 @ 3'-11 3/4"	3'-7"	7 @ 3'-11 1/2"	3'-0 3/8"
63'	3'-7"	7 @ 3'-11 3/4"	1'-11 3/4"	3'-7"	7 @ 4'-0 3/8"	3'-7 3/8"
64'	3'-7"	7 @ 4'-0"	2'-4 3/8"	3'-7"	7 @ 4'-0"	4'-0 1/4"
65'	3'-7"	7 @ 3'-11 3/4"	2'-11 3/4"	3'-7"	7 @ 4'-0 3/8"	4'-0 3/8"
66'	3'-7"	7 @ 4'-0 1/4"	3'-11 3/4"	4'-3"	7 @ 4'-0 3/8"	7 @ 4'-0"
67'	3'-7"	7 @ 3'-11 3/4"	3'-11 3/4"	3'-7"	8 @ 3'-11 3/4"	1'-11 3/8"
68'	4'-3"	1 @ 4'-8 3/8"	7 @ 4'-0 1/4"	3'-7"	8 @ 4'-0 3/8"	2'-4 3/8"
69'	3'-7"	8 @ 3'-11 3/4"	1'-8"	3'-7"	8 @ 4'-0"	3'-0"
70'	3'-7"	8 @ 4'-0 1/4"	2'-8"	3'-7"	8 @ 3'-11 3/4"	3'-7 3/8"
71'	3'-7"	8 @ 3'-11 3/4"	2'-8"	3'-7"	8 @ 4'-0 1/4"	3'-11 3/8"
72'	3'-7"	8 @ 4'-0"	3'-3 3/8"	4'-3"	8 @ 4'-0"	4'-0 3/8"
73'	3'-7"	8 @ 3'-11 3/4"	3'-8"	4'-3"	1 @ 4'-7 3/8"	8 @ 3'-11 3/4"
74'	3'-7"	8 @ 4'-0 3/8"	3'-11 3/4"	3'-7"	9 @ 4'-0 3/8"	1'-8 3/8"
75'	3'-11"	8 @ 4'-0"	3'-11 3/4"	3'-7"	9 @ 4'-0 1/4"	

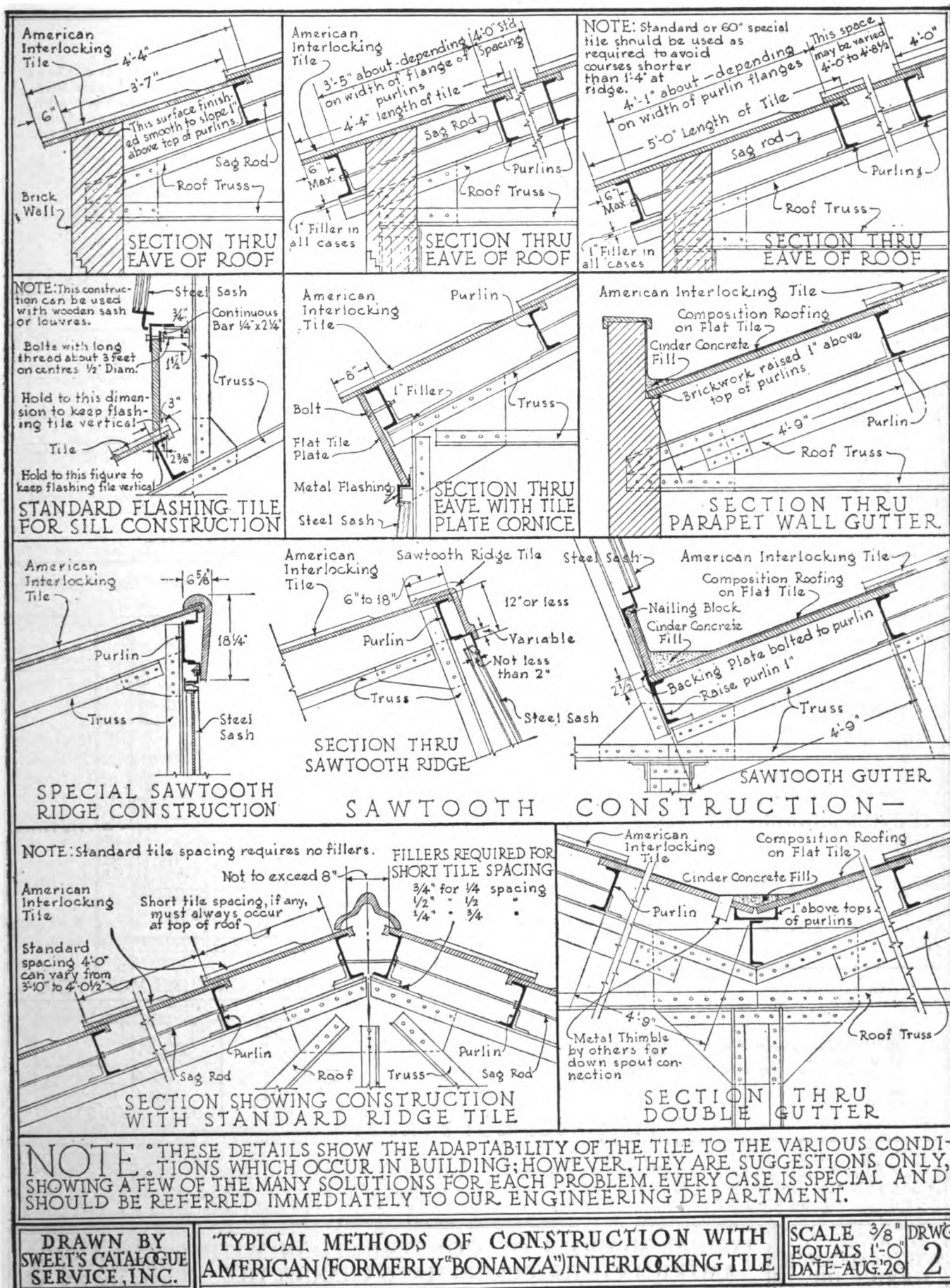


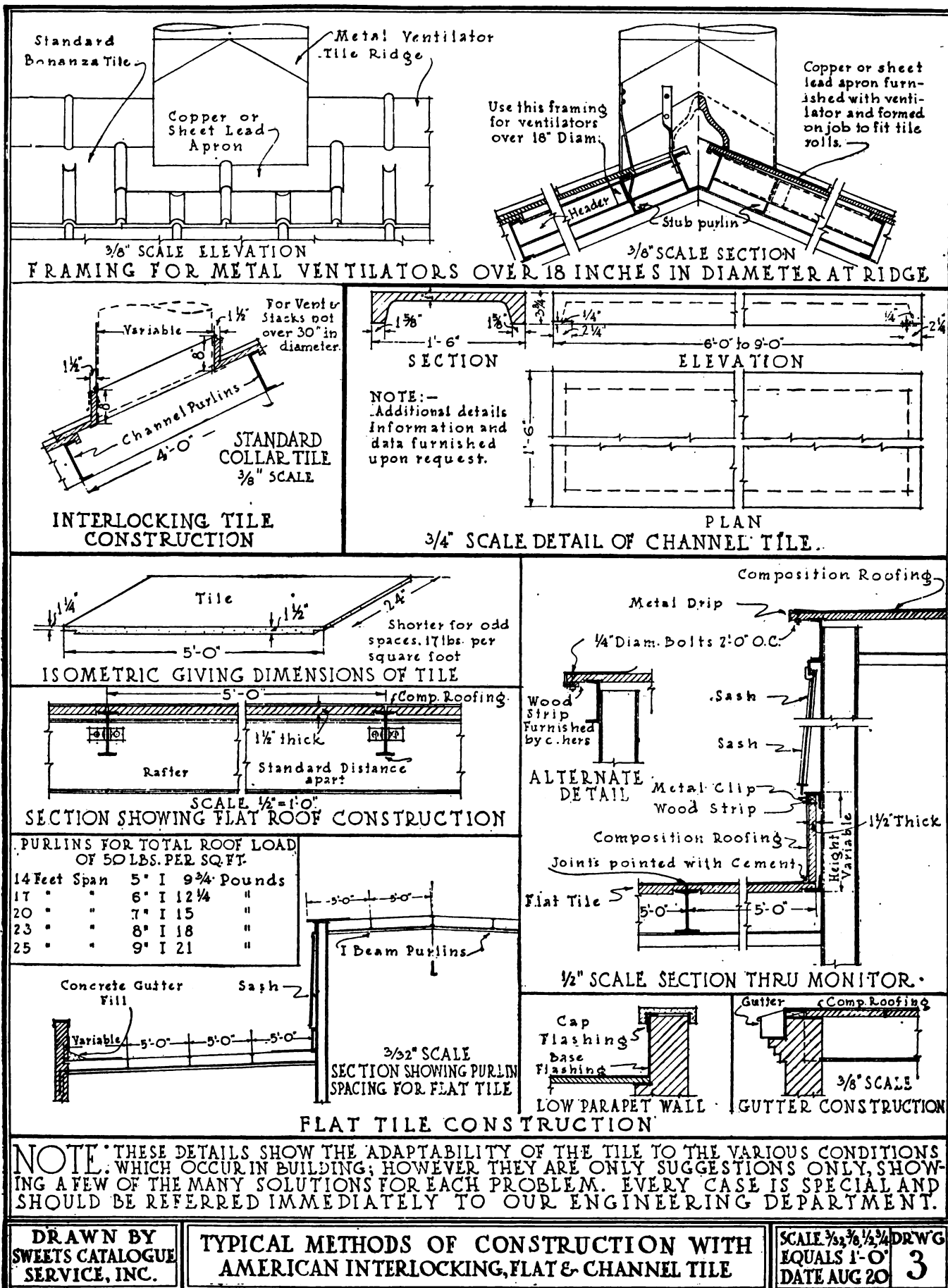
SPACING OF PURLINS AT RIDGE

	I	A	Flange width	Distance B with fillers		
				1/4"	1/2"	3/4"
1/5 pitch 4 1/2" in 12"	5	4 1/4"	1.75	4 1/4"	4 1/4"	4 1/4"
	6	4 1/4"	1.92	4 1/4"	3 1/4"	3 1/4"
	7	3 1/4"	2.09	3 1/4"	3 1/4"	3 1/4"
	8	3 1/4"	2.26	3 1/4"	3 1/4"	3 1/4"
	9	3 1/4"	2.43	3 1/4"	3 1/4"	3 1/4"
1/4 pitch 4 1/2" in 12"	10	3 1/4"	2.60	3 1/4"	3 1/4"	3 1/4"
	5	4 1/4"	1.75	3 1/4"	3 1/4"	3 1/4"
	6	3 1/4"	1.92	3 1/4"	3 1/4"	3 1/4"
	7	3 1/4"	2.09	3 1/4"	3 1/4"	3 1/4"
	8	3 1/4"	2.26	3 1/4"	3 1/4"	3 1/4"
1/3 pitch 5" in 12"	9	3 1/4"	2.43	3 1/4"	2 1/4"	2 1/4"
	10	2 3/8"	2.60	2 1/4"	2 1/4"	2 1/4"
	5	4 1/4"	1.75	3 1/4"	3 1/4"	3 1/4"
	6	3 1/4"	1.92	3 1/4"	3 1/4"	3 1/4"
	7	3 1/4"	2.09	3 1/4"	3 1/4"	3 1/4"
1/2 pitch 6" in 12"	8	2 1/4"	2.26	2 1/4"	2 1/4"	2 1/4"
	9	2 1/4"	2.43	2 1/4"	2 1/4"	2 1/4"
	10	1 1/4"	2.60	1 1/4"	1 1/4"	1 1/4"
	5	3 1/4"	1.75	3 1/4"	2 3/4"	2 3/4"
	6	2 3/4"	1.92	2 3/4"	2 3/4"	2 3/4"
3/4 pitch 8" in 12"	7	2 1/4"	2.09	2 1/4"	2 1/4"	2 1/4"
	8	1 1/4"	2.26	1 1/4"	1 1/4"	1 1/4"
	9	1 1/4"	2.43	1 1/4"	1 1/4"	1 1/4"
	10	1 1/4"	2.60	1 1/4"	1 1/4"	1 1/4"
	5	3 1/4"	1.75	3 1/4"	2 3/4"	2 3/4"

* for C & D.







UNITED STATES GYPSUM CO.

Pyrobar Roof Tile

205 West Monroe Street

CHICAGO, ILL.

SALES OFFICES

NEW YORK, N. Y., 1170 Broadway
 BUFFALO, N. Y., Ellicott Square
 BOSTON, MASS., 166 Devonshire Street
 WASHINGTON, D. C., 219 Woodward Building
 PHILADELPHIA, PA., 401 Franklin Building
 PITTSBURGH, PA., 1226 Oliver Building
 CLEVELAND, OHIO, Schofield Building
 CINCINNATI, OHIO, 405 Builders' Exchange Building

DETROIT, MICH., Penobscot Building
 MILWAUKEE, WIS., Grove and Oregon Streets
 MINNEAPOLIS, MINN., 650 Builders' Exchange
 ST. LOUIS, MO., 2192 Railway Exchange Building
 KANSAS CITY, MO., 513 Railway Exchange Building
 OMAHA, NEBR., 522 Peters Trust Building
 DENVER, COLO., 1820 West 13th Avenue
 LOS ANGELES, CAL., 902 Citizens' National Bank Building

Product.

Manufacturers and erectors of PYROBAR ROOF TILE (made of Structolite) for Roof Decks; PYROFILL MONOLITHIC GYPSUM ROOF DECK.

Engineering Service.

An Engineering and Construction Department is maintained for the purpose of assisting engineers and architects in designs and estimates, and is desirous of submitting bids on Pyrobar and Pyrofill Roofs erected in place.

Twenty-one producing mills, located at advantageous points, insure prompt delivery for any quantity.

Pyrobar Roof Tile.

Pyrobar roof tile are made of Structolite, a specially prepared, hard, dense gypsum, reinforced with steel and designed to carry the full required roof load. These tile are manufactured in two general types: Long span (either hollow or channel sections), and 30-in. type (solid and hollow).

The long span tile are made either with or without lap joint, the lap joint tile being designed to furnish ample bearing when purlins are small or not in alignment. Lap joint tile are used for general roofing construction or for re-roofing to replace clay tile, concrete or wood roof decks.

Advantages—STRENGTH—Pyrobar roof tile are designed to carry 50 lbs. per sq. ft., total uniform load, with a factor of safety of 4.

FIREPROOF—Pyrobar is acknowledged to be one of the best fire resisting materials known. Pyrobar will not support combustion nor conduct heat, and has no appreciable contraction nor expansion; consequently, it will not warp, buckle nor spall under severe fire.

ADAPTABILITY—Suited to any form of roof design, flat or peaked, and easily cut and fitted. Any form of roof covering may be directly applied. Nailing strips are entirely eliminated. By use of extra thick nailing deck, slate, baked clay or Ludowici tile are nailed directly to Pyrobar.



PYROBAR LONG SPAN TILE
Spanning from purlin to purlin



STEEL FRAME READY FOR
30-IN. TYPE PYROBAR



PYROBAR APPLIED TO
STEEL.

MINIMIZES CONDENSATION—Superior heat insulation is a salient feature of Pyrobar tile. Tests give the following values of B.t.u. transmitted per sq. ft. per hour, per degree Fahrenheit difference in temperature, for various roof deck materials:

	B. t. u.
2-in. yellow pine plank.....	0.385
3-in. solid concrete slab (1-2-4).....	0.750
1¼-in. solid cement tile.....	0.990
3-in. solid Pyrobar roof tile.....	0.250
4-in. hollow Pyrobar roof tile.....	0.200

Less heat is transmitted through gypsum than through any of the other materials. On account of its low conductivity, the under surface of Pyrobar roof deck remains at practically the same temperature as the air of the interior of the building, regardless of changes of external temperature. Under these conditions, no "sweating" or "dripping" can occur and condensation of moisture is eliminated.

HEAT SAVING—The superior heat insulation value shows a decided saving compared to a concrete slab, in tons of fuel used for heating purposes and heating plant installation.

LIGHT WEIGHT—Pyrobar tile are 50% lighter than concrete per square foot of surface for equal thickness, which, therefore, results in considerable saving in steel framing.

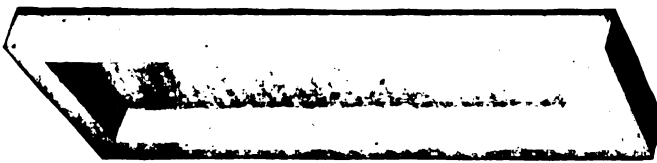
QUICKLY ERECTED—The large light weight units are very quickly installed during any weather conditions and their erection does not interfere with plant operations going on below.

LIGHT DIFFUSIVE—The under surface of the roof is white, uniformly smooth and light reflecting, assisting in the solution of the lighting problem.

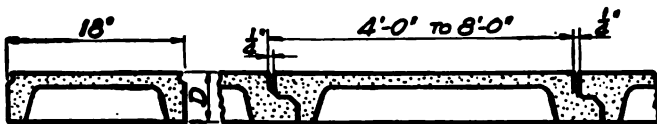
PERMANENCY—The permanency of Pyrobar tile has been established through many years of use. The tile are not affected by the chemical action of smoke or the deteriorating action of sulphuric acid fumes; thus maintenance cost is eliminated.

Pyrobar Long Span Roof Tile.

Long Span Channel Type—This type of tile is manufactured in 4- to 8-ft. lengths. The tile are laid directly on steel or wood framing.



PYROBAR LONG SPAN CHANNEL TYPE

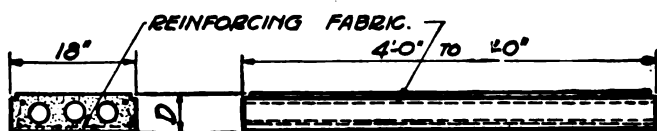
PYROBAR LONG SPAN CHANNEL TYPE WITH LAP JOINT
SPANS FROM 4 TO 8 FEET

Safe load, 50 lbs. per sq. ft.; factor of safety, 4

Span, ft.	4	5	6	7	8
Depth, "D," in.	5	5	5	6	6
Weight, lbs. per sq. ft.	17.5	17.5	17.5	19.5	19.5

In general, all tile on one continuous roof deck to be of depth required for maximum span.

Long Span Hollow Type—The "hollow" type tile are manufactured in the same lengths as the "channel" type up to 8 ft.; the hollow type, however, provides a flat and better light reflecting ceiling, with maximum insulation. This type can also be furnished with lap joint.



PYROBAR LONG SPAN HOLLOW TYPE

Depth, 6 in.; weight per sq. ft., 25 lbs.

PURLIN TABLE FOR LONG SPAN CHANNEL OR HOLLOW TYPE TILE

Total uniform load of 50 lbs. per sq. ft.

PURLIN SPAN - FT.	8	10	12	14	16	18	20	22	24
SHAPE	I	C	C	C	C	C	C	C	C
DEPTH - INS.	3 4	4 4	4 4	5 5	5 5	5 7	6 7	7 7	8 10
WGT. PER FT. LB.	5 1/2	5 1/2	5 1/2	6 1/2	6 1/2	8 1/2	9 1/2	12 1/2	15 1/2
DEPTH - INS.	3 4	4 4	5 5	6 6	7 7	8 8	9 9	10 10	12 12
WGT. PER FT. LB.	5 1/2	5 1/2	6 1/2	8 1/2	9 1/2	12 1/2	15 1/2	18 1/2	21 1/2
DEPTH - INS.	4 4	4 4	5 5	6 6	7 7	8 8	9 9	10 10	12 12
WGT. PER FT. LB.	7 1/2	7 1/2	8 1/2	9 1/2	10 1/2	12 1/2	15 1/2	18 1/2	21 1/2
DEPTH - INS.	4 5	5 5	6 6	7 7	8 8	9 9	10 10	12 12	15 15
WGT. PER FT. LB.	7 1/2	8 1/2	9 1/2	10 1/2	12 1/2	15 1/2	18 1/2	21 1/2	25 1/2
DEPTH - INS.	4 5	5 5	6 6	7 7	8 8	9 9	10 10	12 12	15 15
WGT. PER FT. LB.	7 1/2	8 1/2	9 1/2	10 1/2	12 1/2	15 1/2	18 1/2	21 1/2	25 1/2

30-Inch Type Pyrobar Roof Tile.

Made in hollow and solid types, surface measurements 12 by 30 in.; solid type 3 in. thick; hollow or cored type 4 in. thick. Adapted for curved or other intricate roof designs and easily cut to fit any requirements. The tile are placed on T-iron subpurlins spaced 30 1/2 in. on centers.

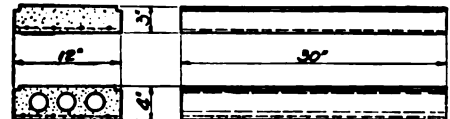
Curbs or walls for monitor and sawtooth sash are built of 3-in. solid Pyrobar tile; the end walls of monitors and sawteeth are similarly built, the roof covering being extended to cover curbs and end walls.

Where it is necessary to build up roof for drainage purposes, a material known as "drainage fill" is supplied, which is a combination of gypsum and cinders or wood chips that sets within 30 minutes after being placed, permitting application of roof covering without delay.



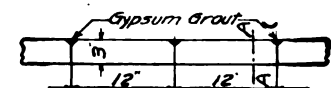
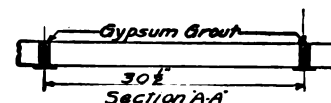
30-INCH PYROBAR ROOF TILE

Depth	Solid 3 in.	Hollow 4 in.
Length	30 in.	30 in.
Wt. sq. ft.	16 lbs.	15 lbs.
Wt. of 3 in. extra dense,	18 lbs.	

**DESIGNING DATA**

Spans for various T-irons spaced 30 1/2 in. on centers

Span	Up to 5' 3"	5' 3" to 5' 10 1/2"	5' 10 1/2" to 6' 5 1/2"	6' 5 1/2" to 8'
Size T-iron	2 1/4" x 2 1/4" - 4.2 lbs.	2 1/4" x 2 1/4" - 5 lbs.	2 1/4" x 2 1/4" - 5.6 lbs.	3" x 3" - 6.8 lbs.



SECTIONS OF 30-INCH TILE SHOWING JOINTS OF GYPSUM GROUT

SIZE OF CHANNEL PURLINS FOR 30-INCH TILE

Total uniform load of 50 lbs. per sq. ft.

Purlins C. to C. in.	10	12	14	16	18	20	22	24
ft. in.	in. lbs.	in. lbs.	in. lbs.	in. lbs.	in. lbs.	in. lbs.	in. lbs.	in. lbs.
4 0	4 5 1/2	5 6 1/2	6 8	7 9 1/2	7 9 1/2	8 11 1/2	9 13 1/2	10 15
4 6	5 6 1/2	5 6 1/2	6 8	7 9 1/2	8 11 1/2	9 13 1/2	9 13 1/2	10 15
5 0	5 6 1/2	6 8	7 9 1/2	7 9 1/2	8 11 1/2	9 13 1/2	10 15	12 20 1/2
5 6	5 6 1/2	6 8	7 9 1/2	8 11 1/2	9 13 1/2	10 15	12 20 1/2	12 20 1/2
6 0	5 6 1/2	6 8	7 9 1/2	8 11 1/2	9 13 1/2	10 15	12 20 1/2	12 20 1/2
6 6	6 8	7 9 1/2	7 9 1/2	8 11 1/2	9 13 1/2	10 15	12 20 1/2	12 20 1/2
7 0	6 8	7 9 1/2	8 11 1/2	9 13 1/2	10 15	10 15	12 20 1/2	12 20 1/2
7 6	6 8	7 9 1/2	8 11 1/2	9 13 1/2	10 15	10 20	12 20 1/2	12 20 1/2
8 0	6 8	7 9 1/2	8 11 1/2	9 13 1/2	10 15	10 20	12 20 1/2	12 25

Specifications for Pyrobar Roof Tile.

Long Span Channel Type; Long Span Hollow Type—All roofs as shown on drawings, unless otherwise noted, shall be constructed of Pyrobar Long Span Reinforced Roof Tile (specify whether channel or hollow type and also if lap joint shall be used), manufactured by the UNITED STATES GYPSUM CO. The tile shall be placed directly upon roof supports without mortar and with sides tight together. All joints on top surface of roof are to be pointed with gypsum mortar composed of 1 part unfibred gypsum cement plaster and 3 parts of clean, sharp sand.

Curbs under monitor and sawtooth sash, also end walls of monitors and sawteeth, shall be constructed of 3-in. solid Pyrobar Tile set in gypsum cement mortar, the joints being well bedded and struck.

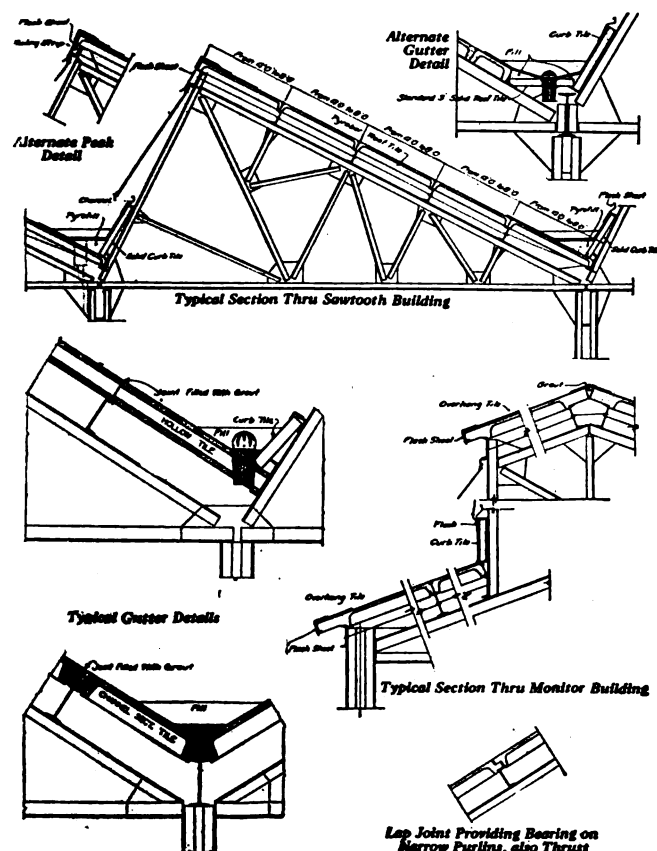
Note: Where roof covering is to be nailed directly to the roof deck, the above specifications should read "shall be constructed of Pyrobar Long Span Channel Type Reinforced Roof Tile with extra thick nailing deck."

Cut nails or barbed slaters' nails shall be used to fasten roof covering; and nails shall have at least 1½-in. penetration into the gypsum tile.

30-in. Type, 3-in. Solid or 4-in. Hollow—All roofs as shown on plans, unless otherwise noted, shall be constructed of (3 x 12 x 30-in. solid) or (4 x 12 x 30-in. hollow) Pyrobar Reinforced Roof Tile manufactured by the UNITED STATES GYPSUM CO. The tile shall be laid tightly together on T-irons without mortar, all joints on top surface of roof to be pointed with gypsum mortar composed of 1 part unfibred gypsum cement plaster and 3 parts clean, sharp sand.

Curbs under monitor and sawtooth sash, also the end walls of monitors and sawteeth, shall be constructed of 3-in. solid Pyrobar set in gypsum cement mortar, joints to be well bedded and struck. (The foregoing curb specifications can also be used for 4-in. solid tile.)

Note: Where roof covering is to be nailed directly to the roof deck, specification above should read—"to be constructed of Solid Pyrobar Reinforced Extra Dense Nailing Roof Tile."

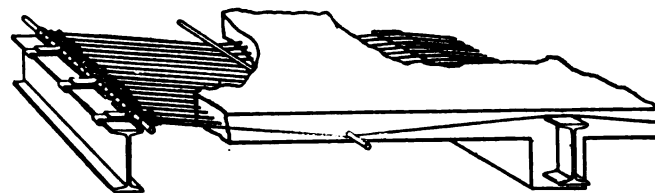


CONSTRUCTION DETAILS OF PYROBAR ROOF TILE

Cut nails or barbed slaters' nails shall be used to fasten roof covering, and shall have at least 1½-in. penetration into gypsum tile.

Pyrofill Monolithic Slabs for Floors and Roofs.

Pyrofill is a specially calcined gypsum mixed with a definite proportion of wood shavings. Pyrofill requires the addition of water only, and this mixture is poured over the reinforcing to the specified thickness of slab.



PYROFILL POURED IN PLACE FOR FLOORS AND ROOFS

Specifications for Pyrofill Monolithic Slabs.

Unless otherwise shown, all slabs shall be constructed of poured gypsum, using the system of the UNITED STATES GYPSUM CO., known as Pyrofill Slab. This contractor shall provide necessary forms, reinforcing cables, Pyrofill and all labor required.

The forms shall be made in a workmanlike manner of suitable material and shall be carefully leveled up so as to insure a uniform depth of slab. Forms shall be cleaned before each re-use and shall be wet down immediately before placing the Pyrofill. All openings in slabs for down spouts, soil pipes, vents, etc., must be located by purchaser before slab is poured; otherwise this contractor will not be responsible for any damage resulting from cutting cables to provide openings. Forms shall not be removed until at least two hours after Pyrofill has set.

Reinforcing shall consist of galvanized steel cables made by twisting 2 No. 12 wires. These cables shall be calculated to take the entire slab load and shall be fastened at their ends in such manner to develop the full strength required. In no case shall the stress in the cables exceed 20,000 lbs. per sq. in., nor more than 20% of the ultimate strength. The spacing of these cables and the depth of slabs to conform to the standards of the UNITED STATES GYPSUM CO. The cables shall be fastened to suitable anchors and brought to uniform tension. Care shall be used in placing the tension rods to see that the cables shall not be brought closer than ½ in. to the under surface of the slab. After cables are in place all workmen of this and other contractors shall be prohibited from walking thereon.

The Gypsum composition making the slabs shall consist of a uniform mixture of calcined gypsum and water, into which is stirred not over 15% by weight of wood fiber. The first batch poured in each section shall be a rich mixture with less wood fiber in order to insure a smooth under surface of slab. If it is necessary to do any patching of under side of slab due to material sticking to forms or any other causes, same must not be done until after the waterproof covering has been applied to slab. In case slab is to be painted same shall not be done until after waterproof covering has been applied and the slab dry. The top surface of this slab shall be screeded smooth so as to leave an even surface to receive the roof covering.

All curb walls, ends of monitors, etc., shall be constructed of 3-in. Pyrobar Tile, neatly laid up in gypsum mortar unless shown otherwise on the drawings.

The steel contractor shall provide steel framing around all openings such as vent stacks, ventilators and such steel bracing as required to take the horizontal pull of cables at end bays and at all openings.

The waterproof covering must be applied just as soon as possible after slab is set. If the slab gets wet from rain before application of waterproof covering no workmen shall be allowed on the roof until slab is dry. Plank runways must be laid on the slab before any wheeling whatever is done. Also plank supports must be laid from purlin to purlin to take any heavy or concentrated loads that may be applied to the slab.

FEDERAL CEMENT TILE COMPANY

Westminster Building
CHICAGO, ILL.

Works: HAMMOND, IND., DETROIT, MICH.

Products and Services.

"FEDERAL" REINFORCED CEMENT SLABS for flat and pitched roofs. Our sales department, together with the engineering department, will assist engineers in effecting the most economical distribution of structural steel for carrying "Federal" cement slabs.

"Federal" Reinforced Cement Slabs.

Impervious to severest elements. Not affected by heat, cold, fire or water; strengthen with time. Laid directly on steel purlins, making a fireproof construction. All pitched tile joints interlock and overlap. Require no painting, repairing, or other maintenance. Where flat slabs and composition covering are used, the joints are butted.

"FEDERAL" SLAB DATA FOR STANDARD PITCHED ROOFS

Covers 24 by 48 in.
Over all length, 52 in.
12½ tile per square (100 sq. ft.)
16 lbs. weight per sq. ft.
Thickness, 1½ in.
Wire reinforcement

Purlin spacing, 4 ft. 0 in.
Least allowable slope, 1/5 pitch
Safe carrying load, 100 lbs. per sq. ft.
Breaking load, 300 lbs. per sq. ft.

Cost.

"Federal" slabs make the best and cheapest roof on the market, because they are indestructible and everlasting; no expense for maintenance; cut the rates if fire insurance is carried; save steel in the building frame; eliminate wood sheathing, also repairs and renewals.

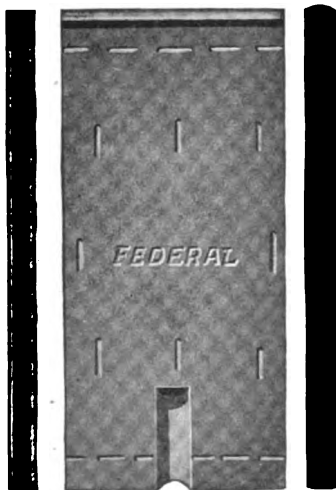


TRADE-MARK

References.

"Federal" slabs cover a large variety of structures, as shown by the following partial list of contracts:

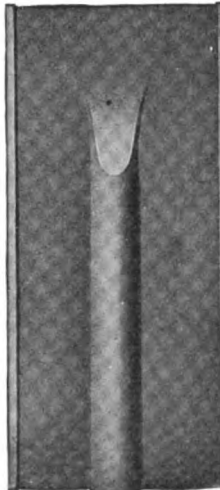
United States Steel Corporation, 6 plants
International Harvester Co., 5 plants
Studebaker Corp., South Bend, Ind., and Detroit, Mich.
Crane Co., Chicago, Ill.
National Malleable Castings Co., Chicago, Ill.
American Steel Foundries Co., Indiana Harbor, Ind.; Granite City, Ill.; Alliance, Ohio
New Kansas City Station and Train Sheds
Illinois Central Railroad, Memphis, Tenn.
Pennsylvania Railroad, Chicago Ill.; Indianapolis, Ind.
Ford Motor Co., Detroit and Dearborn, Mich.
General Motors, Flint and Detroit, Mich., and Janesville, Wis.
Willys-Overland Company, Toledo, Ohio
Maxwell Motor Co., Detroit, Mich.
Packard Motor Car Co., Detroit, Mich.
Texas Co., Texas City, Tex.
Gulf Refining Co., Port Arthur, Tex.
Standard Oil Co., Tulsa, Okla.
Pawling & Harnischfeger Co., Milwaukee, Wis.



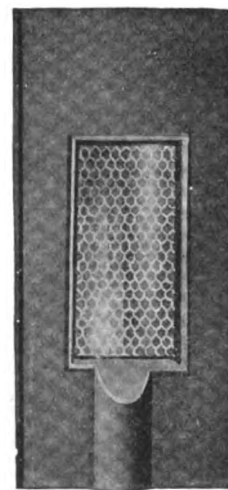
Joint Cap

Back

Joint Cap



Front



SMALL GLASS SLAB
2 sq. ft. lighting area



LARGE GLASS SLAB
5 sq. ft. lighting area

"FEDERAL" INTERLOCKING SLAB



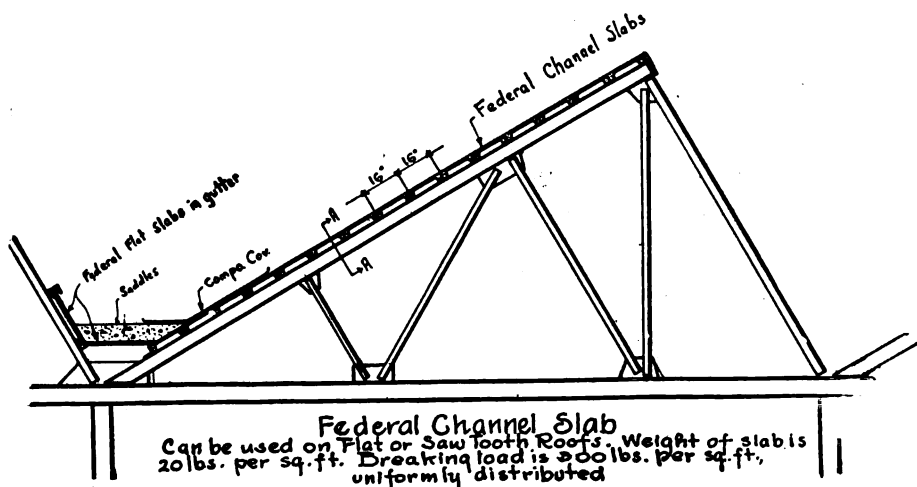
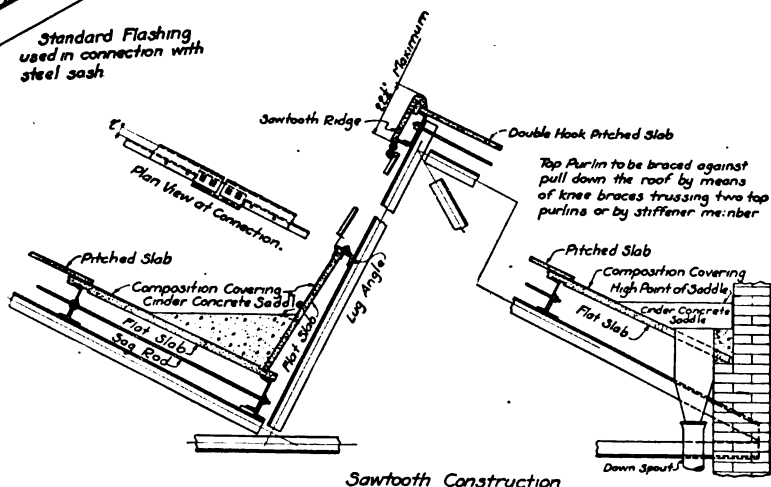
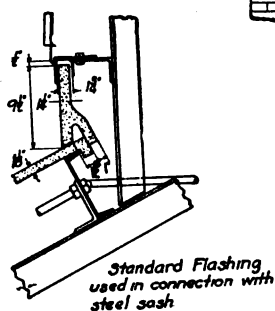
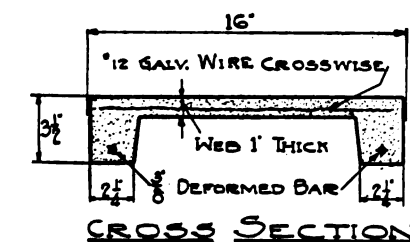
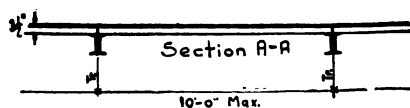
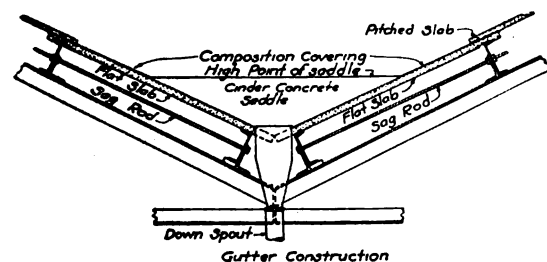
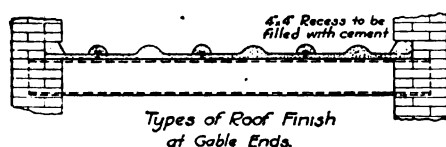
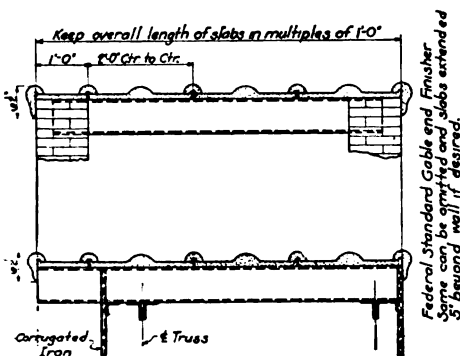
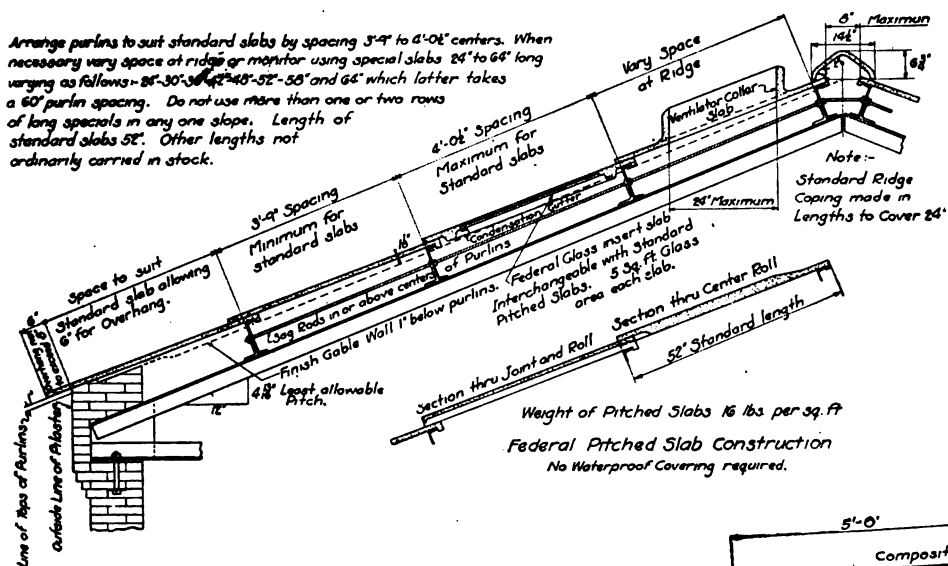
FACTORY WHERE "FEDERAL" REINFORCED SLABS ARE MADE

Two main buildings, each 100 by 600 ft. "Federal" slabs cover roofs. "Federal" glass slab light factories. Strictly fireproof; no fire insurance required or carried



"FEDERAL" ALL-GLASS SLAB ROOF
Great Western Smelting and Refining Co., Chicago, Ill.

Arrange purlins to suit standard slabs by spacing 3'-4" to 4'-0" centers. When necessary vary space at ridge or monitor using special slabs 24" to 64" long varying as follows: 24"-30"-36"-42"-48"-52"-56" and 64" which latter takes a 60" purlin spacing. Do not use more than one or two rows of long specials in any one slope. Length of standard slabs 52". Other lengths not ordinarily carried in stock.



Federal Channel Slab
Can be used on Flat or Sawtooth Roofs. Weight of slab is 20 lbs. per sq. ft. Breaking load is 300 lbs. per sq. ft., uniformly distributed.

DETAILS OF FEDERAL ROOF CONSTRUCTION

KEYSTONE GYPSUM FIREPROOFING CORPORATION

Marbridge Building, 34th Street and Broadway
NEW YORK, N. Y.

BRANCH OFFICES

PHILADELPHIA, PA., North American Building
WASHINGTON, D. C., Real Estate Building

PITTSBURGH, PA., First National Bank Building
MONTREAL, QUE., 609 New Birks Building

Products and Service.

The erection of METROPOLITAN SYSTEM of FIREPROOF FLOOR, ROOF and CEILING CONSTRUCTION.

Also, erection of Gypsum Blocks for fireproof partitions, wall furring and column protection; Book Tile for steep roofs.



TRADE-MARK

Metropolitan System in Use for Quarter of a Century.

For more than 25 years the Metropolitan System of fireproof floor and roof construction has demonstrated its practical advantages on installations scattered all over the United States and Canada, enduring under wide extremes of climatic conditions.



FORMS SET—DEFLECTION RODS IN POSITION

Repeat orders from the largest corporations in the country bear convincing testimony to its superior qualities; 72% of the orders booked in the last 2 years have been repeat orders. The following important installations are representative:

Bureau of Yards and Docks U. S. N. (12 installations), 556,000 sq. ft.
Bethlehem Steel Co. (24 installations), 1,629,000 sq. ft.
Baldwin Locomotive Works (15 installations), 1,391,000 sq. ft.
Ingersoll-Rand Co. (5 installations), 595,000 sq. ft.
Scoville Mfg. Co. (6 installations), 332,000 sq. ft.
Midvale Steel Co. (6 installations), 468,000 sq. ft.
National Tube Co. (2 installations), 230,000 sq. ft.

Points of Superior Merit of Interest to Every Engineer.

(1) **Safety and Strength**—Unlike ordinary reinforced concrete, which depends on compressive strength of concrete, tensile strength of steel and also on the assumption that a perfect bond between the two is formed, the Metropolitan System of construction is supported by continuous steel wire cables, securely fastened at each end, and brought into deflection and tension, thus forming a system of suspension. Stresses are calculated by approved formulae, but crushing strength of Metropolitan composition is entirely disregarded. The combined high factor of safety makes Metropolitan System unqualifiedly the safest and strongest floor and roof slab construction.



POURING THE SLAB

(2) **Economy of First Cost**—Extreme lightness of Metropolitan construction permits us to replace other

less sturdy floors without either strengthening existing frame or overloading it. Light weight also permits wider purlin spacing, thus saving tons of structural steel. The fact that composition can be mixed and placed faster than concrete, and sets more quickly makes for rapid construction—

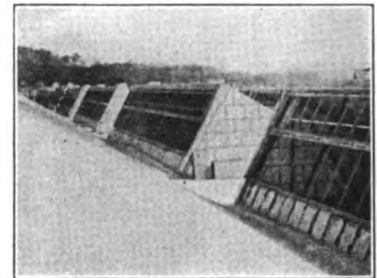
another point of economy.

(3) **Non-conductivity**—With consequent absence of condensation and substantial reduction in heating cost.

(4) **Durability**—Sections cut out of Metropolitan floors 20 years old have shown the steel to be in perfect condition.

(5) **Fire Resisting**—Its superior fire resisting qualities will enable you to write low insurance rates (see our booklet "Actual Tests").

(6) **Low Maintenance**—Great elasticity enables it to resist vibrations of moving loads without cracking.



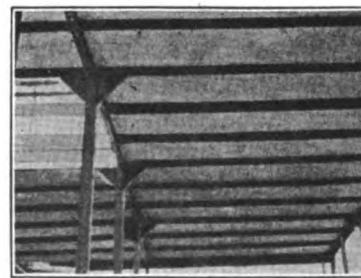
READY FOR FLASHING

(7) **It has Never Failed in Actual Fire**—We guarantee every square foot of roofing or floor construction we lay against failure from any cause, under the conditions for which it was designed.

(8) **Service**—Each contract is a sale of service as well as of material and workmanship. Work completed is our greatest asset and we are just as interested in it 25 years later as on the day contract was signed.

The Lightest Type of Fireproofing Floor or Roof Construction.

Weights but 4 lbs. per sq. ft. per inch of thickness. For floors minimum thickness is 4 in.; for roofs, 3 in. Saving of steel that this affords is remarkable.



NOTE THE SMOOTH UNDER SURFACE

In a certain large structure this was shown to amount to 5 lbs. per sq. ft. or 35% of total steel required in original design. In submitting bids our engineers will guarantee the estimate they make of saving of steel through the use of our system.

Can Be Installed More Rapidly Than Other Forms of Fireproof Construction.

Metropolitan composition sets within 30 min. after slab is poured; forms can be dropped within 60 min., leaving slab good for calculated loads.

Compare this with other systems such as concrete where the centers must remain in place at least 2 weeks tying up 5 to 6 floors at a time. Figure carrying charges on a big building that may be eliminated by our system in this way alone. Moreover, low temperatures do not interfere with work, nor do extremely high ones.

Develops the Highest Degree of Fire Resistance.

Calcined gypsum, of which the composition is made, develops the highest degree of fire resistance and non-conductivity ever obtained in any material for this purpose. Some interesting tests made by Professor C. L. Norton of Massachusetts Institute of Technology (a copy of report of which will be mailed free on request) prove conclusively that our composition is superior as a non-conductor to all other fireproofing materials on the market.

High Insulating Value.

Differences between exterior and interior temperatures cause "sweating" and condensation. A striking proof of the high insulating value of our product is found in an experience of a certain power station in Canada. Prior to our installation, they found it necessary to construct a hung ceiling below the concrete roofs to their turbine rooms to prevent condensation. In 1914 they installed the Metropolitan system in a new turbine station, and although the difference in exterior and interior temperatures was over 130°, they found no trace of moisture under the Metropolitan slab.

Specifications for the Metropolitan System.

Fireproof Floors and Roofs—Cables, each composed of two No. 12 (or equivalent) galvanized wires twisted, shall be carried over the tops of the beams or purlins to outside wall beams or end purlins and be secured to them by strong hooks or anchors. These cables shall be laid parallel, 1 to 3 in. apart, according to spans and loads, and shall pass under round iron bars, midway between the purlins, so as to cause the cables

(finished roofing or grading), and with the underside left as smooth as practicable. The slab shall be designed to carry safely the live load with a factor of safety of 4.

NOTE—For fireproof floors, fireproofing beams and girders (not trusses) shall be used, according to the local building laws.

Information for Designing.

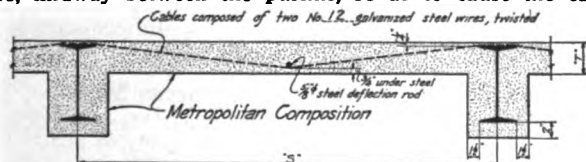
Services of Engineering Department—Our Engineering Department should be consulted before steel design of building be completed. We will gladly send our engineers to confer with you without expense or obligation.

Economical Spans—The construction can be installed between supports spaced up to 10 ft. in clear. Our experience has shown that under average conditions a spacing of 6 ft. 6 in. to 7 ft. is the most economical. For monitor roofs an extremely simple design is shown in lower illustration.

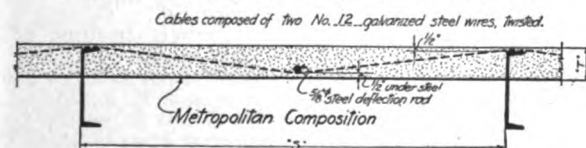
Waterproof Roofing—Any kind of waterproof roofing may be successfully applied. The form most generally applied, however, is a 4- or 5-ply built-up slag or gravel roofing. The true and even surface of Metropolitan slab, and its nail-holding quality, appeal to roofing contractors.

Some Buildings in Which Metropolitan System was Used:

Naval Ordnance Plant, So. Charleston, W. Va.; Navy Dept., Bureau of Yards and Docks
Dirigible Hangar, Langley Field, Va.; Army Dept., Construction Division
Building No. 33, General Electric Co., Pittsfield, Mass.; M. M. Thrane, Chief Engineer
Plant, J. H. Williams Co., Buffalo, N. Y.; J. W. Ferguson & Co., Paterson, N. J.
Powerhouse, Berwind-White Co., Windber, Pa.; Berwind-White Coal Mining Co., Philadelphia, Pa.
Armour Piercing Projectile Shop, Bethlehem Steel Co., So. Bethlehem, Pa.; Chas. E. Lehr, Chief Engineer, Sparrows Point, Md.
Building No. 35, Scoville Manufacturing Co., Waterbury, Conn.; Hugh L. Thompson, Waterbury, Conn.
Extension to Drill Dept., Ingersoll-Rand Co., Phillipsburg, N. J.; Wm. Prellwitz, Chief Engineer, Phillipsburg, N. J.
Cylinder Shop, American Locomotive Works, Schenectady, N. Y.; Plant Engineer, R. H. White, Schenectady, N. Y.

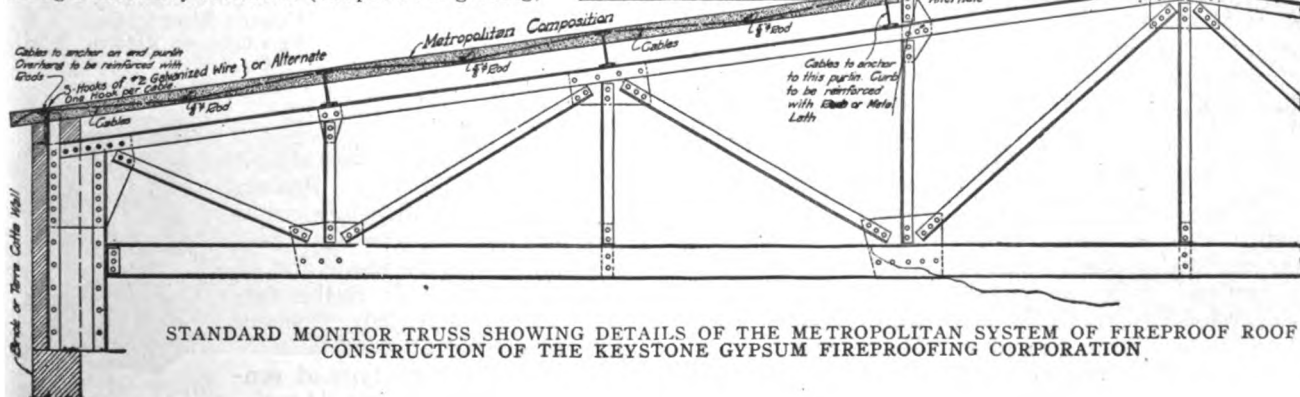


TYPE B. FIREPROOF FLOOR CONSTRUCTION



TYPE C. FIREPROOF ROOF CONSTRUCTION

to deflect uniformly. Forms or centers shall be put in place about 1 in. below the round iron bars mentioned above. The Metropolitan composition shall then be poured in place, and brought to an even surface about 1/2 in. above the top of the beams, forming a slab ready to receive (sleeper fill or grading)



STANDARD MONITOR TRUSS SHOWING DETAILS OF THE METROPOLITAN SYSTEM OF FIREPROOF ROOF CONSTRUCTION OF THE KEYSTONE GYPSUM FIREPROOFING CORPORATION.

H. H. ROBERTSON COMPANY

Manufacturers of Robertson Process Metal, Gypsum and Asphalt Products
PITTSBURGH, PA.

FACTORIES: AMBRIDGE, PA.; WALTHAM, MASS.; AKRON, N. Y.; SARNIA, ONT., CAN.

BRANCH OFFICES

BALTIMORE, MD.
BIRMINGHAM, ALA.
BOSTON, MASS.
BUFFALO, N. Y.
CHICAGO, ILL.

DETROIT, MICH.
NEW YORK, N. Y.
ST. LOUIS, MO.
SAN FRANCISCO, CAL.
PHILADELPHIA, PA.

INDIANAPOLIS, IND.
DENVER, COLO.
SALT LAKE CITY, UTAH
HOUSTON, TEX.
KANSAS CITY, MO.
CLEVELAND, OHIO

MINNEAPOLIS, MINN.
NASHVILLE, TENN.
NEW ORLEANS, LA.
SEATTLE, WASH.
PORTLAND, ORE.

EXPORT DIVISION

NEW YORK, N. Y., 31 Union Square, West, and LONDON, E. C., ENGLAND, EDW. LeBAS & Co., Dock House, Billiter Street

FOR CANADA:

H. H. ROBERTSON Co., LTD., Sarnia, Toronto, Montreal, St. John, N. B., Halifax, N. S., Vancouver, Winnipeg

Products.

ROBERTSON PROCESS METAL: Flat Corrugated, and Mansard Sheets and Bars for Roofing and Siding, Flashing, Ridge Caps, Louvers, Gutters, Down-spouts, Ventilators and Skylights.

ROBERTSON PROCESS GYPSUM: Poured-in-place Roofs, Pre-cast Roof Slabs.

Also manufacturers of Robertson Process Asphalt, Protective Coatings, Plastic Cements, Saturation Compounds, Insulation Compounds, Mineral Rubber, Battery Sealing Compounds.

Robertson Process Metal.

A metal building material which is fully protected from the most severe weather conditions, smoke, gases, fumes, condensation and salt sea air, by means of three impervious coatings: (1) asphalt, (2) asbestos, (3) waterproofing. It is made in sheets and bars for use in industrial and commercial buildings on roofing, siding, down-spouts, gutters, general building trim, skylights and ventilators.

Robertson Process Metal is low in first cost and keeps down maintenance and depreciation charges. It withstands rust and corrosion and does not need frequent painting. It has all the *light weight, structural steel* and *foundation* cost-saving features of plain or galvanized sheets and at the same time is corrosion-proof. Its light weight insures a substantial reduction in freight charges. A square of R.P.M. weighs, on the average, only 200 lbs. The covering area of a ton of R.P.M. is far greater than any other building material of equal durability. An actual sample of Robertson Process Metal like that illustrated will gladly be sent on request.

Forms, Color and Sizes—Robertson Process Metal is made in a variety of standard forms and sizes which good practice has demonstrated to be the most useful, economical and attractive. It is made in flat, corrugated, and mansard roofing and siding sheets. It is also made in various forms for building purposes, such as ridge caps, down-spouts, gutters, flashing, louvers, etc. Robertson Process Metal forms an important part of Robertson Ventilators and Robertson Skylights.

Robertson Process Metal is supplied in black and red. Sizes and weights will be given on application. All necessary materials needed in fastening—such as nails, rivets, hooks, straps, bolts, etc., can be supplied.



TRADE-MARK



ROBERTSON
PROCESS OF
METAL PRO-
TECTION



ROBERTSON
PROCESS
METAL CORRUGATED SHEET

Advantages—Robertson Process Metal has stood every test on buildings in the service of railroads, chemical and fertilizer concerns, coal mines, and the iron and steel industry, and is used and endorsed by engineers and architects throughout the country. The fact that it is immune to the corroding action of gases, acid and alkali fumes, all weather conditions, and salt sea air, makes it exceptionally well suited to building construction where protection against severe corrosion conditions is essential.

Robertson Process Metal has insulating qualities that greatly reduce the tendency toward condensation of moisture. Buildings in which it is used are, therefore, drier, easier to heat in winter and remain cooler and more comfortable in summer.

The light weight, strength and permanency of Robertson Process Metal renders construction as a whole, less costly by comparison with other building material. Furthermore, first cost is the total cost. There is no upkeep, no repair; *frequent painting* is unnecessary. It saves on *first cost* and *maintenance cost*.

Well Known Users of Robertson Process Metal—

Aetna Explosive Co.	International Harvester Co.
Aluminum Co. of America	Illinois Steel Co.
American Cellulose & Chemical Co.	Inland Steel Co.
American Locomotive Co.	International Nickel Co.
American Steel & Wire Co.	Link-Belt Co.
American Zinc Co.	Massachusetts Institute of Technology
Armour & Co.	Packard Motor Car Co.
Austin Co.	Pennsylvania R. R. Co.
Baldwin Locomotive Co.	Pierce Arrow Motor Car Co.
Bethlehem Steel Co.	Remington Arms U. M. C. Co.
Cadillac Motor Car Co.	Saxon Motor Car Corp.
Carnegie Steel Co.	Scott Paper Co.
Crucible Steel Co.	Sherwin-Williams Co.
Detroit Steel Products Co.	Tennessee Coal, Iron & Ry. Co.
Henry Disston & Sons	Union Pacific Ry. Co.
Dodge Brothers	U. S. Steel Corp.
Eastman Kodak Co.	U. S. Government
Firestone Tire & Rubber Co.	Western Electric Co.
General Chemical Co.	Westinghouse Electric & Mfg. Co.
General Electric Co.	Willys Corp.
B. F. Goodrich Rubber Co.	
Gulf Refining Co.	

Robertson Ventilator.

This Robertson product is built completely of Robertson Process Metal, and it will, therefore, withstand the most severe gases, fumes, smoke, etc., from the inside and all weather conditions from the outside. Does not need frequent painting or repairs.

It is a stationary type of ventilator, designed to provide the



ROBERTSON PROCESS
METAL VENTILATOR

greatest development of air current under all conditions. It does not rely upon mechanical adjustment or moving parts which are not permanently operative. It gives an exceptionally large, definite and reliable exhaust capacity under the most adverse conditions.

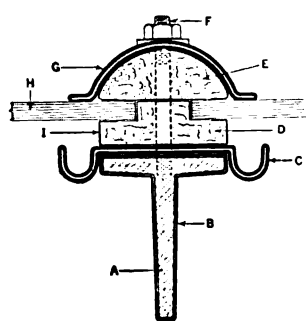
Made in a variety of sizes with special bases to meet all requirements. Complete information sent on request.

Robertson Skylight Construction.

A condensed description of Robertson Skylight components follows:

(A) Standard Rolled Steel Tee, Angle or Channel Bar Beam—Always initially stiff enough, regardless of span, to carry its load without deflection—which is the main cause of glass breakage.

(B) Robertson Process Protective Coating—Proof against acid, alkali, fumes and moisture. Preserves steel beam from corrosion and consequently loss of initial stiffness. Obviates expensive periodical painting.



CROSS SECTION, ROBERTSON PROCESS METAL SKYLIGHT CONSTRUCTION

(C) Robertson Process Metal Condensation Gutter—Not a part of the beam. Collects condensation from glass. Can not corrode.

(D) Asphaltic Glass Cushion and Separator—Provides a non-absorbent, resilient, permanent and insulating bed for glass. Positively keeps glass from contact with hard substances, even the bolts, and gives it a broad and continuous bearing; hence preventing destructive strains. It is composed of very high grade asphalt and asbestos.

(E) Asphaltic Cap Filler—Leaves no hollow spaces. Follows contour of glass surface, and adheres to it, hence absolutely excludes water. Made of same material as the cushion.

(F) Cap Bolt and Nut—Clamps the glass between flexible cushion and filler, insuring permanently waterproof joints. Supports cleaners' bridge planks without straining glass. Usually made of brass.

(G) Robertson Process Metal Cap—Protects filler and distributes pressure evenly and continuously. Spring tension locks the cap nuts. Of pleasing appearance and does not allow snow and dirt to lodge.

(H) Glass—As specified.

(I) Saturated Asbestos Felt—In sawtooth and continuous monitor sash, the condensation gutter illustrated, C, is usually omitted.



SIZER FORGE COMPANY, BUFFALO, N. Y.

These buildings fully protected by roofing, siding, ventilators and skylights of Robertson Process Metal

Finish—The bar, A, may be merely painted if desired. C and G made of galvanized iron or copper if ordered.

Versatility in Glazing Construction.

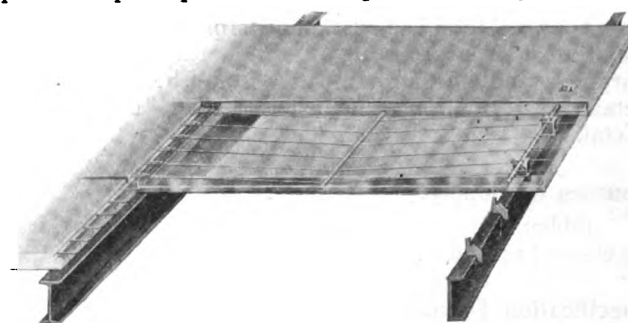
Robertson glazing construction is pre-eminently suited to other uses besides skylights, such as: monitor sash, sawtooth fronts, etc., both single and double glazed.

Widely used on all kinds of public, commercial and industrial buildings. Particularly adapted to extreme fume and moisture conditions. Gives maximum durability in chemical plants, foundries, silk and paper mills. Manufactured in a variety of shapes and sizes.

Pre-cast Roof Construction.

The principle upon which the Robertson pre-cast gypsum roof is designed, obviates all of the usual objectionable features of pre-cast slab or tile construction, giving, in effect, a monolithic roof.

Robertson pre-cast slab construction is designed upon the principle of the suspension bridge. Being



DETAILS OF ROBERTSON PROCESS PRE-CAST SLAB ROOF CONSTRUCTION

strictly a metal system, its strength is as readily calculable as that of a steel beam. In effect, it may be said to be a Robertson poured-in-place gypsum roof, pre-moulded, taken apart and put together again upon the building.

The slabs are set in place upon the purlin with ends abutting, the projecting ends of the opposite cables in each slab are tied together by a mechanical device which draws them taut at connections, and as the slab ends are rabbetted where the cables emerge, these ties lie in a depression filled with a grout of the same composition, firmly embedding the ties and troweled off with the top surface of the slab.

Bulletins.

Interesting Bulletins containing valuable engineering data and completely describing any of the Robertson Process products, together with an actual sample of Robertson Process Metal will be sent on request.



PACKARD MOTOR CAR COMPANY, DETROIT, MICH.

ALBERT KAHN, Architect, Detroit; AUSTIN & Co., Contractors
Interior view showing Robertson skylight construction, embodying use of 11,600 ft. One of several orders from this company

THE STARK ROLLING MILL CO.

Manufacturers of Toncan Metal Rust and Corrosion Resisting Sheets,
Roofing, Siding and Accessories

MILLS AND MAIN OFFICE
CANTON, OHIO

Products.

TONCAN METAL BLACK and GALVANIZED RUST and CORROSION RESISTING SHEETS, used extensively for Roofing, Siding, Cornice, Eaves Trough, Conductor Pipe, Lath, Shingles, Window Frames, Blower Systems, Ventilators, Skylights, Reinforcing, Tanks, Refrigerators, Expanded Metal Lath, Culverts and all other purposes where durable sheet metal is needed.

Description.

Toncan Metal is a rust and corrosion resisting sheet metal made from iron ore. Its reputation for thorough durability and efficiency is firmly established. For more detailed information, send for and read "Better Sheet Metal."

Sources of Supply.

Jobbers and tanners everywhere sell Toncan Metal sheets and products.

Specification Data.

Data necessary for specifying and estimating Toncan Metal will gladly be mailed on request. Our "Better Sheet Metal" book gives convenient tables for use in specifying Toncan Metal for siding and for roofing—corrugated, V-crimp and pressed standing seam; also bundling weights, standard sizes and gauges, comparative weights of roofing materials, etc. Send for it.

Dimensions of Toncan Metal Corrugated Sheets.

2½-IN. CORRUGATIONS

Width, 26 or 27½ in. Lays 24 in. center to center.

All gauges 12 and lighter.

Lengths, 5, 6, 7, 8, 9, 10, 11 and 12 ft.

2-IN. CORRUGATIONS

Width, 26 in. Lays 24 in. center to center.

All gauges 18 and lighter.

Lengths, 5, 6, 7, 8, 9, 10, 11 and 12 ft.

1¼-IN. CORRUGATIONS

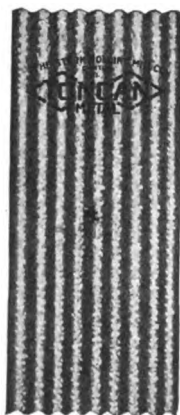
Width, 25 in. Lays 24 in. center to center.

All gauges 20 and lighter.

Lengths, 5, 6, 7, 8, 9, 10, 11 and 12 ft.

Also made with ¾-in. and 3-in. corrugations.

Note—26 gauge Black and 28 Galvanized are lightest Toncan Metal sheets made.



TONCAN METAL
CORRUGATED SHEETS
Painted or galvanized.
Suitable for roofing and
siding



STANDING SEAM ROOFING

Painted or galvanized. Suitable for sloping roofs. Covering width, 24 in. Lengths, 5, 6, 7, 8, 9, 10 or 12 ft. Gauges, 20 or lighter



ROLL ROOFING

Painted or galvanized. Suitable for slightly sloping roofs. Covering width, 24 in. Each roll lays 100 sq. ft. on the building



Expanded Metal Lath.

Toncan Metal expanded metal lath should always be used where the construction is subject to excessive moisture or other corrosive conditions. Its use as

backing for all exterior stucco is an extra assurance of permanence.

References.

Thousands of installations in all parts of the country are proving the lasting qualities of Toncan Metal. A few are mentioned below; others will be supplied on request.

Destroyer Plant, Bethlehem Ship Building Corp., Squantum, Mass.—100 tons Toncan used for Skylights, etc.

Grand Central Palace, New York, completed 1911. Warren & Wetmore, Architects—Toncan used for all sheet metal work in good condition today

Forest City Live Stock Barns at North Randall near Cleveland, Ohio—Roofs of Toncan Metal

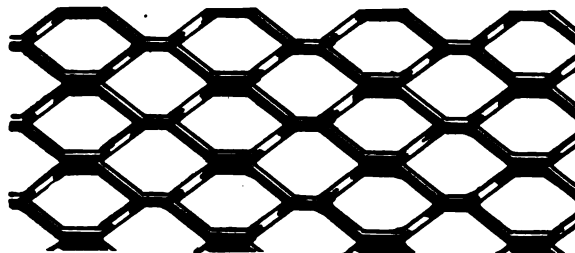
Oliver Chilled Plow Works, South Bend, Ind.—Toncan Metal ventilators

Chateau Frontenac Hotel, Quebec, Canada—Toncan used for roofing and flue work

Cleveland-Cliffs Iron Co., Shaft No. 3 Negaunee Mine in Michigan—No. 16 gauge Toncan used in 1911 to case off skip roads from cage road. Metal is in good condition today

Pier No. 3, San Francisco Bay—Toncan used for gutter, cornice, flashing, skylights, etc.

State Pier, New London, Conn.—Partitions and covering for doors, window frames and woodwork all Toncan



TONCAN METAL EXPANDED METAL LATH



CORRUGATED RIDGE
ROLL

2½-in. or 1¼-in. corrugations. Lengths, 27 and 96 in.



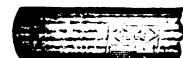
PLAIN (ROUND) RIDGE
ROLL

With or without nailing flange. Lengths, 8 and 10 ft. Girths, 6, 7, 8, 10, 12 and 14 in.



CORRUGATED END
WALL FLASHING

Flat side on wall, 2 in. Corrugated apron, 4 in. Lengths, 27 and 96 in.



TONCAN METAL CON-
DUCTOR PIPE

Round corrugated, square corrugated, and plain round conductor pipe. Lengths, 8 and 10 ft. All diameters. Elbows, miters and cut-offs to match



CORRUGATED SIDE
WALL FLASHING

2½-in. or 1¼-in. corrugations. Any length up to 96 in. Corrugated apron, 8 in. Flat side, 5½ in.



TONCAN METAL
EAVES TROUGH

Length, 10 ft. All widths; and gauges 28, 26, and 24

AMERICAN SHEET METAL WORKS

P. O. Box 547
NEW ORLEANS, LA.

Products.

PATTERSON CLIPS (Patented) for fastening corrugated roofing and siding to structural steel.

Also, Hollow Metal Windows, Metal Covered Doors, General Sheet Metal Work.

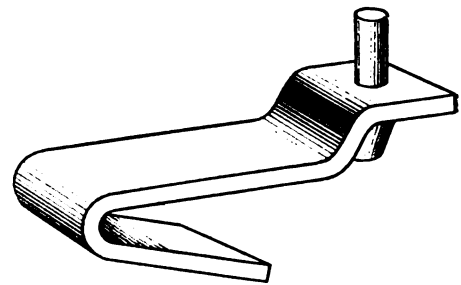
Patterson Clips.

Made of No. 12 by $\frac{5}{8}$ -in. soft steel, hot galvanized.

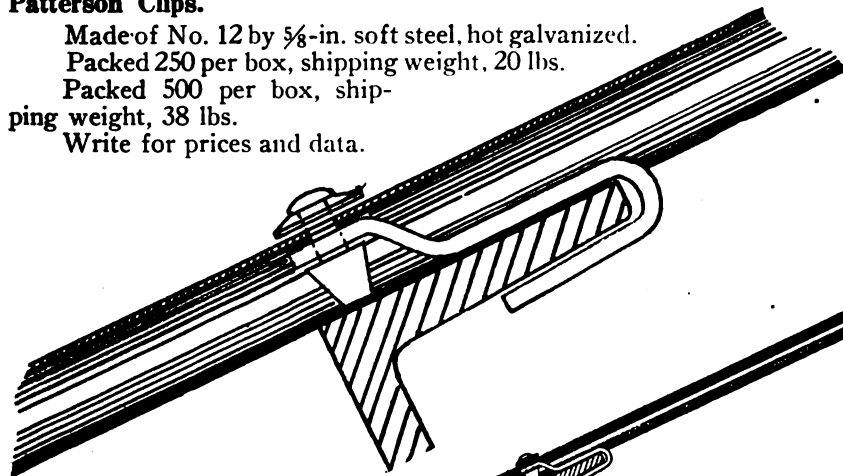
Packed 250 per box, shipping weight, 20 lbs.

Packed 500 per box, shipping weight, 38 lbs.

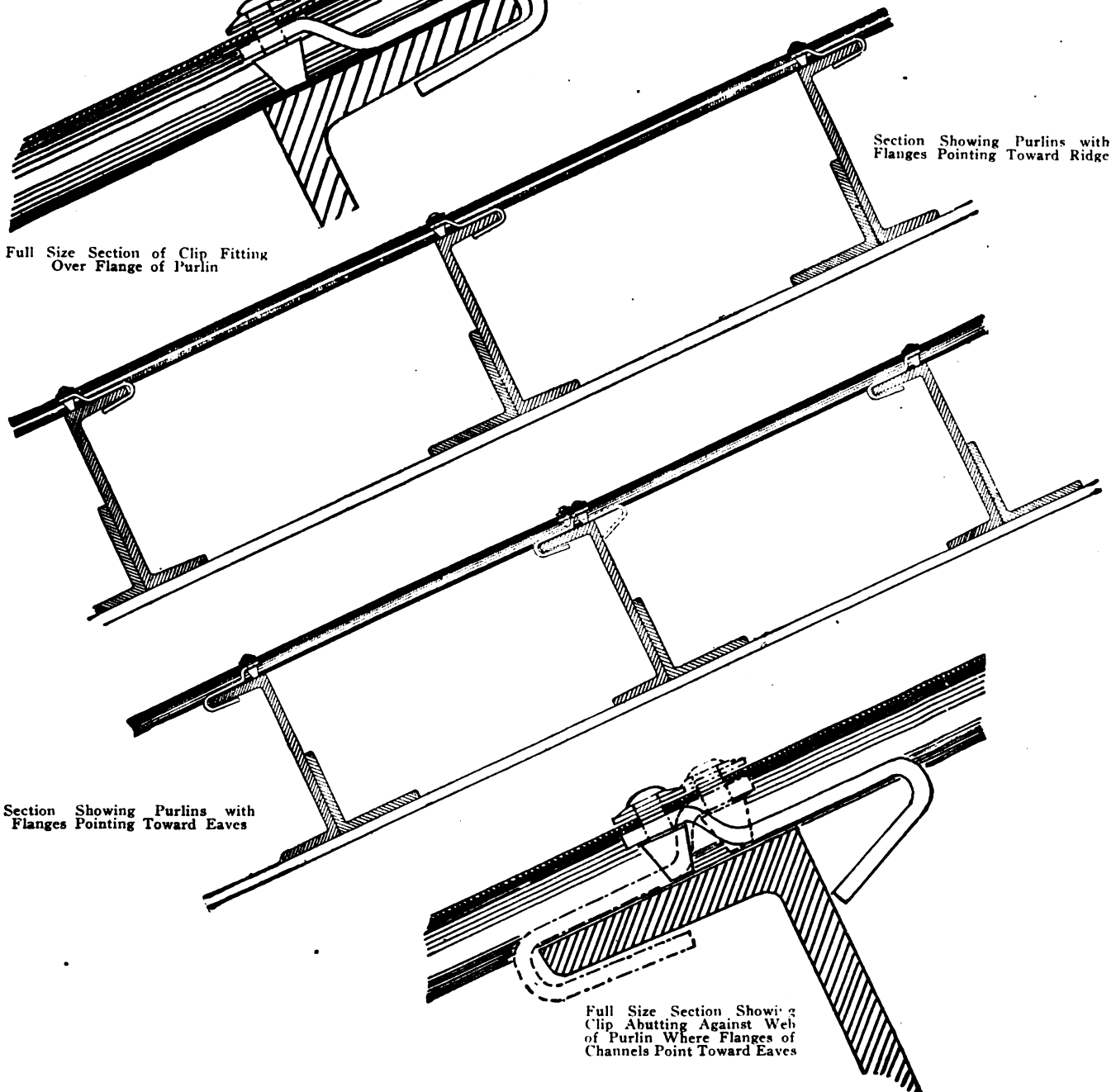
Write for prices and data.



PATTERSON CLIP
Full size



Full Size Section of Clip Fitting
Over Flange of Purlin



Section Showing Purlins with
Flanges Pointing Toward Ridge

Section Showing Purlins with
Flanges Pointing Toward Eaves

Full Size Section Showing
Clip Abutting Against Web
of Purlin Where Flanges of
Channels Point Toward Eaves

ILLUSTRATING VARIOUS METHODS OF FASTENING ROOFING TO PURLINS WITH PATTERSON CLIPS

E. N. BIEGLER MFG. CO.

Manufacturers of Roofing, Waterproofing, Technical Paints, Oils, Paving and Insulating Compounds

TELEPHONE:
HUMBOLDT 135

2734 North Rockwell Street
CHICAGO, ILL.

Products and Services.

ROOFINGS: BUILT-UP ASPHALT, BUILT-UP ASBESTOS, BUILT-UP TAR and GRAVEL (Barrett Specification), BUILT-UP PLASTIC; ASPHALT PREPARED ROOFING.

High grade WATERPROOFING MATERIALS for basements, subbasements, tunnels, reservoirs, subways, bridges, sidewalks, floors, cisterns, pits, silos and roofs.

TECHNICAL PAINTS for steel and metal; JAP-O-LENE PAINT OIL.

Also manufacturers of Acidproof and Alkaliproof Paints, Asphalt Paints; Insulating Compounds; Paving, Rock Mastic Floors, Asphalt Products and Metallic Floor Hardener; full line of Enamels; Insulating Varnish; Linoleum, Wood and Cement Floor Sealer and Sufacer. (Samples of these furnished gratis on request.)

Contracts for high class Roofing and Waterproofing (both Membraneous and Integral Methods) executed anywhere in the United States. Material furnished with specifications.

For Mas-Oleum (Mastic Linoleum) and Almada Cork Composition Floors, see page 225.

Roofing.

The roof for a building is one of the most important branches of construction. In the selection of the proper roofing, the construction of the building ought to be taken into consideration, and while the materials to be used are of importance, the installation of the work is equally important.

It has been the business of the E. N. BIEGLER MFG. Co. for over twenty years to install the proper roof, and by this experience it is able and pleased to recommend specifications according to work. The contracting department will furnish estimate on work in this line anywhere in the United States.

Built-up Tar and Gravel Roofing.

Barrett Specification 20-year Guaranty Bond roofs are executed by E. N. BIEGLER MFG. Co.

Built-up Asphalt Roofing.

Especially adapted for manufacturing plants, warehouses, etc., for either flat or steep surfaces. This roofing is built up at the building, usually consisting of three plies or more of asphalt saturated felt cemented together with hot asphalt and finished with hot asphalt, or if desired, gravel or slag embedded as a wearing surface or trowelled mastic finish.

Built-up Asbestos Roofing.

Installed the same as the built-up asphalt roofing. Gives the added feature of fire resistance, and is especially suitable on foundries or buildings subjected to flying sparks or extensive heat. Manufactured from rock minerals it gives greater durability.

Built-up Plastic Roofing.

Biegler's Ever-Tite plastic cement can be trowelled over any old or new roof surface. Put up in packages



ready for use. Also practical for repairing old felt, composition and metal roofs.

Biegler's Asphalt Prepared Roofing.

Put up in rolls containing 108 sq. ft. ready to lay. Practical for steep work only.

Biegler's Reinforced Membraneous Waterproof Construction.

Where there is considerable water pressure to contend with, this construction is recommended. To secure best results each job should be executed according to existing conditions, and, therefore, this company prefers having clients advise nature of work to be waterproofed, stating water pressure, etc. Recommendation and method of construction will then be submitted.

Duro-Carbo Paint.

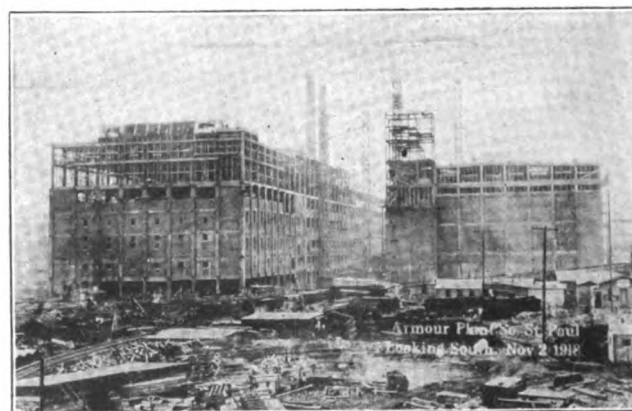
A durable, carbon metal preservative paint of high quality made with pure linseed oil and suitable dryers which prevent corrosion, and when properly applied protects all metals to which a metal surface is generally subjected. It should be used on all structural steel work, bridge and truss work, viaducts, fire escapes, metal lath, tanks, boilers, etc.

Jap-O-Lene Paint Oil.

Composed of China wood oil chemically treated, high grade gum, linseed oil, and reduced to consistency of a paint oil with volatile spirits (naphtha or turpentine). Jap-O-Lene can be used in any kind of paint material, either dry, ground in oil or japan, with or without addition of linseed oil. If linseed oil is to be used, raw oil in proportion suitable for the work in hand is recommended.

Co-operative Service.

Descriptive circulars on any of the products furnished on request.



NEW ARMOUR ABATTOIR, SOUTH ST. PAUL, MINN.

R. C. CLARK, Architect

BLOME-SINEK Co., General Contractors

Waterproofing, floors and roofing, amounting to 1,250,000 sq. ft., furnished and executed in the above plant by E. N. BIEGLER MFG. Co.

THE LEHON COMPANY

Roofings, Waterproof Papers, Compounds and Flooring Materials

TELEPHONE:
McKINLEY 700

West 44th Street and Oakley Avenue
CHICAGO, ILL.

Products.

Manufacturers of MULE-HIDE ASPHALT SHINGLES; MULE-HIDE ROLL ROOFINGS; MULE-HIDE WATERPROOF INSULATING PAPER; MULE-HIDE BUILT-UP ASPHALT ROOFING; SEAL-SKIN and BLACK-BEAR WATERPROOF BUILDING PAPERS.

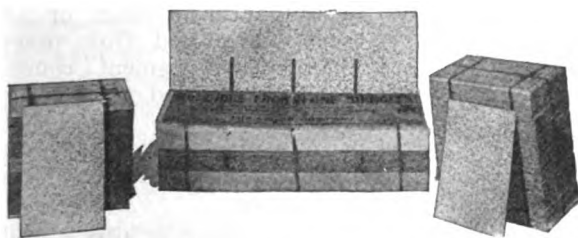
Also manufacturers of Mule-Hide Asphalt Felt; Mule-Hide Waterproofing Asphalt; Mule-Hide Waterproof Insulating Fabric; Mule-Hide House Lining; Mule-Hide Porch Deck Canvas; Concrete Waterproofing Membranes; Damp-Tite Waterproofing Compound; Asphalt Paints and Cements; Mule-Hide Mastic Flooring Materials; Expansion Joints for concrete pavements.

Asphalt Shingles.

Mule-Hide shingles may be had in three different styles in slate surfaces of unfading red or gray-green.

Mule-Hide Standard Weight Shingles—Size 8 by $12\frac{3}{4}$ in., should be laid 4 in. to the weather. They are furnished in either gray-green or red; 424 shingles to the square. Approximate weight 220 to 240 lbs.

Mule-Hide Four-unit Shingles (Four on the Strip)—Mule-Hide four-unit shingles are similar to what are commonly known as "slab" or "strip" shingles. They are furnished in red or gray-green; 112 strips to the square, sufficient to cover 1 square when laid 4 in. to the weather. Approximate weight 200 lbs. per square. Size 10 by 32 in.



MULE-HIDE INDIVIDUAL AND FOUR-UNIT SHINGLES

Mule-Hide Double Thick Shingles—Mule-Hide double thick shingles, size 8 by $12\frac{3}{4}$ in. They are furnished in red or gray-green; 340 shingles to the square, sufficient to cover 1 square when laid 5 in. to the weather. Approximate weight 245 to 260 lbs.

Roll Roofings (Smooth Surface).

Mule-Hide Roll Roofing—Made by a slow process that produces superior saturation with high melt point asphalt, which is less volatile and, therefore, remains elastic for long-time service.

Made 32 in. wide, in rolls containing 108 sq. ft. Special, extra large headed, thin shank galvanized, barbed roofing nails and cement included in each roll.

Made in two weights, heavy and extra heavy, approximately 50 to 60 lbs. to the square, respectively.

Mule-Hide Slate-Kote Roll Roofing—Surfaced with either red or gray-green crushed slate, 32 in. wide,



TRADE-MARK

put up in rolls containing 108 sq. ft., complete with nails and cement; in two weights: 90 lbs., also Mule-Hide Slate-Kote extra heavy, 115 lbs.

Insulating Paper.

A waterproof insulating paper used in the walls of refrigerators, coolers, butcher boxes, refrigerator cars, etc., and has both waterproof and insulating qualities, such as furnished to the leading refrigerator car lines and railroads operating in the United States.

Furnished in widths up to and including 112 in., in weights of 70, 80, 90, 110, 125, and 160 lbs. per 1000 sq. ft.

Built-up Asphalt Roofing.

Mule-Hide built-up asphalt roofing is the modern protection for permanent structures—modern because it is more efficient. Its base consists of Mule-Hide asphalt felt, thoroughly saturated with Mule-Hide waterproof asphalt. This same asphalt is used in mopping between the layers of felt. Specifications furnished on request.



APPLYING MULE-HIDE ASPHALT BUILT-UP ROOFING UPON THE KANSAS CITY TERMINAL
Roof surface of 160,000 sq. ft.

Waterproof Building Papers.

Seal-Skin and Black-Bear waterproof building papers are far superior to red rosin papers because they will not split or crack in any temperature. These waterproof papers are especially suitable for use in cold climates as they furnish an excellent insulation and effect a decided saving in fuel.

Seal-Skin Waterproof Building Paper—For lining and sheathing walls and floors of houses, refrigerators, cold storage plants, icehouses, etc.; for lining shipping cases, protecting pipes from frost, for use back of stucco work, covering new cement sidewalks, etc.

In rolls containing 500 sq. ft., weight from 40 to 45 lbs.; also in rolls containing 250 sq. ft., weight 20 to $22\frac{1}{2}$ lbs.; 36 in. wide.

Black-Bear Waterproof Building Paper—Desirable for lining and sheathing between walls or floors of houses, barns, poultry houses, refrigerators, etc.

In rolls containing 500 sq. ft., weight from 30 to 35 lbs.; in widths of 32 or 36 in.

THE NATIONAL ROOFING CO.

Manufacturers of Asphalt Roofing and Industrial Paints

FACTORIES AND GENERAL OFFICES

185 Fillmore Avenue
TONAWANDA, N. Y.

BRANCH OFFICES

PITTSBURGH, PA., 607 Publication Building

BALTIMORE, MD., 1048 West Baltimore Street

Products.

SECURITY WIDE-WELD ASPHALT ROOFING.
METAL PROTECTIVE PAINTS: NRC NEVER RUST for structural iron and steel; PROTEC STAC for smokestacks, boiler fronts, etc.; NATIONAL DOUBLE-X GRAPHITE PAINT for all metal surfaces.

NATROCO FACTORY WHITE.

HYDROLOX, an Integral Waterproofing;
NATIONAL BONDKOTE, a Dampproofing and Plaster Bond.

Security Wide-Weld Asphalt Roofing.

Security Wide-Weld asphalt roofing is an extra heavy built up mineral surfaced asphalt roofing, made in four surfacings and equipped with a patented 6-in. joint which can not leak, welding the entire roof into one piece and covering all nail heads with a full thickness of the roofing.

Security is built of two layers of asphalt saturated felt, two layers of pure mineral asphalt, and a layer of fine sea gravel, red or green crushed slate, or fine feldspar rock, thoroughly embedded into the extraordinarily heavy top layer of asphalt while hot. Not a particle of coal tar or coal tar pitch enters into the manufacture.

Laying Specifications—In cold weather heat the roll before unrolling. Always uproll roofing and lay it flat on roof deck for a time before applying, and stretch as much as possible to prevent wrinkles and buckling.

When Security is to be applied on concrete or tile roof decks, the roof deck should first be primed with National Asphalt Primer, after which a heavy layer of Natronite MC. asphalt is spread, into which, while hot, embed the Security Roofing. Adequate flashings must be built around chimneys and skylights to insure a satisfactory roof.

The patented joint, described below, is welded at 350° Fahr. by means of Natronite JC. Asphalt Cement, into which, while hot, the upper sheet is firmly pressed.

Specification sheets for engineers and architects mailed on request.

Metal Protective Paints.

NRC Never Rust—The base or pigment of this protective paint is magnetic oxide of iron and zinc chromate. The Atlantic City tests of the American Society for Testing Materials



TRADE-MARK

awarded these pigments the highest rating in their classes. The vehicle is prepared linseed oil treated to withstand the expansion and contraction of iron and steel.

NRC Never Rust is made in three colors: black, bronze green, and maroon. On smooth surfaces it will cover from 600 to 700 sq. ft. per gal., 1 coat.

Protec Stac—A high heat resisting black enamel for use on smokestacks, engines, boiler fronts, and other metal construction. It is made from a pure carbon base combined with a natural mineral asphalt of exceedingly high melting point.

National Double-X Graphite Paint—For the protection of all metal surfaces. It is chemically inert, thus avoiding all corrosive action on the iron or steel, and is unaffected by acids, alkalis, and gases. It is made only in natural graphite color, thus avoiding the introduction of pigments with inferior protective value. The covering capacity on ordinary metal surfaces is from 500 to 700 sq. ft. per gal.

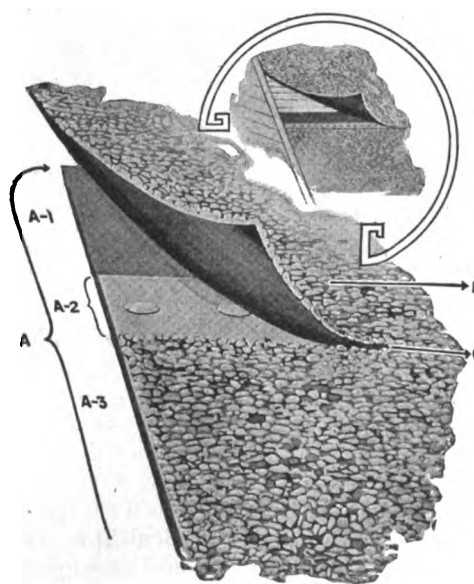
Natroco Factory White.

Natroco Factory White, the whitest of white oil paints, will not turn yellow even under the action of sulphurous fumes or other gases. Produced from non-poisonous zinc pigment combined with a pure linseed oil vehicle, subjected to a special process which not only gives it elasticity but also imparts a varnishlike hardness to the coating.

Waterproofings and Dampproofings.

Hydrolox—A concentrated liquid chemical solvent, which, for use as mixing water, is reduced to 1 part of Hydrolox to 14 parts of water. Used as waterproofing in two ways; either by mixing in the mass concrete or by the plaster coat system. Cement plaster waterproofed with Hydrolox will withstand static pressures up to 150 lbs.

National Bondkote—An asphalt dampproofing, which, when brushed or sprayed directly on concrete, brick, or stone will prevent seepage of moisture. Used as a bonding agent, it renders lath and furring unnecessary.



6-IN. CEMENT WELD (PATENTED)

- A—Lap construction of lower sheet of roofing.
- B—Upper sheet of roofing.
- A1—Bottom layer of saturated felt in lower sheet, 36 in. wide and extending 4 in. beyond the other layers.
- A2—Full thickness of 2 layers of saturated felt and 2 of heavy mineral asphalt, 32 in. wide, extending 2 in. beyond mineral surfacing. Covered with fine tissue paper to prevent sticking in roll. Nails are driven through full thickness of roofing as shown.
- A3—Mineral surfaced portion of sheet A, 30 in. wide and the full thickness of completed sheet of roofing.
- C—Completed joint appearance, showing continuous, one-piece, leakproof feature.

ESTATE OF J. G. HETZEL

CHAS. E. HETZEL, PROPRIETOR

Manufacturers of Roofing Cement and Paints

CABLE ADDRESS:

"HETZEL, NEWARK"

67 Maine Street
NEWARK, N. J.

Products.

HETZEL'S ELASTIC RUBBER ROOF CEMENT for all kinds of roofs, glass skylights, coping stones, etc.

HETZEL'S ASBESTOS PLASTIC COMPOUND for spreading over old roofs.

HETZEL'S "R. O. P." CEMENT COATING.

HETZEL'S PIPE JOINT COMPOUND.

HETZEL'S DAMP RESISTING PAINT for brick walls.

Also manufacturers of Hetzel's Asphalt Paints; Hetzel's Asbestos-Roof-Kote, a liquid asbestos roof paint; Hetzel's "Rub-on" Roofing Paint; Hetzel's Enamel Paints (black and green) for boiler fronts and steam pipes; and Hetzel's Acidproof Paint for metal work, ammonia tanks and gas tanks.



TRADE-MARK

Hetzel's Rubber Roof Cement.

Hetzel's rubber roof cement, which has been in general use throughout the United States and Europe for many years, is especially valuable for covering and repairing all holes, cracked joints, breaks, or leaks in roofs of all kinds. It is also used for pointing around chimneys, skylights, and dormer windows; for repairing coping stones, gutters, wood and stone work which require to be made watertight; and for laying and bedding slate and tile roofs.

Supplied in the following colors: brown, gray, black, green and red. It is also made to order to suit every purpose, and is the only slaters', tanners' and tile roofers' cement.

Hetzel's rubber roof cement is equally well adapted for use on slate, tin, asbestos, glass, wood and metal roofs; is permanent; does not run or loosen from joints or cracks, and is not affected by any extreme of temperature or climatic changes. It does not harden, but preserves its complete elasticity even when exposed to extreme heat, cold, dryness or humidity.

Hetzel's Asbestos Plastic Compound.

A specially prepared compound for spreading over old wood, tin, iron, or felt roofing; for repairing leaky chimneys; for waterproofing walls below and above grade, etc. Applied with a plasterer's trowel.

Hetzel's "R. O. P." Cement Coating.

A specially prepared material for stucco, brick and concrete surfaces.

Impervious to moisture, and positively unaffected by any of the alkalis in cement and brick materials.

As a cement floor coating, it dries hard and is proof against oil, grease or water.

Made in 8 different colors.

Pipe Joint Compound (Red, Gray and Black).

This compound adheres to metal, and is used for joints of gas, steam, water, and air pipes. It will not harden, and it prevents joints from rusting. It will make absolutely tight joints, which can be disconnected at any time, without injury to fittings.

Hetzel's Damp Resisting Paint.

A compound black paint for dampproofing foundations and walls above and below grade. When applied to inner side of exterior walls, forms a good damp-proof surface for direct application of plaster, rendering plaster stainproof, and saving cost of furring and lathing.

Specifications for the Use of Hetzel's Elastic Rubber Roof Cement.

All nailholes and joints between the slates shall be sealed with Hetzel's Elastic Rubber Roof Cement as manufactured by the ESTATE of J. G. HETZEL, Newark, N. J., in such quantities as to hold the slates in position should they break, or the nails rust away. (Fig. 1.)

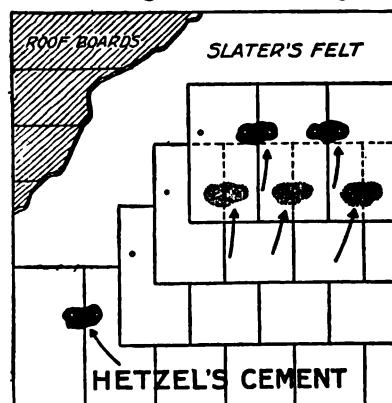


FIG. 1. For Slate Roofs

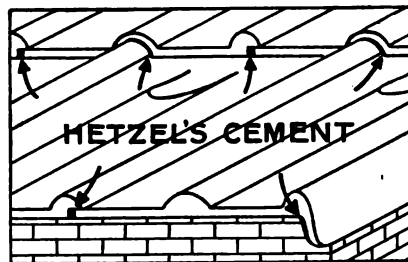


FIG. 2. For Spanish and Flat Tile Roofs

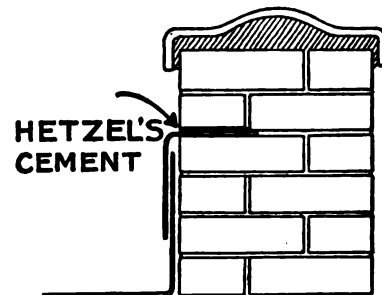


FIG. 3. For Pointing up Cap Flashings

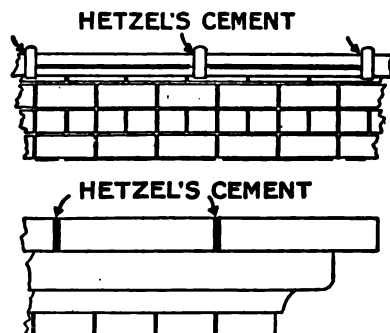


FIG. 4. For Tile and Stone Copings
APPLICATIONS OF HETZEL'S ELASTIC RUBBER ROOF CEMENT

The joints of all tiles shall be sealed with Hetzel's Elastic Rubber Roof Cement as manufactured by the ESTATE of J. G. HETZEL, Newark, N. J. To prevent leaking, the hip and ridge rolls shall be sealed in a like manner. (Fig. 2.)

All cap flashings shall be carefully pointed up with Hetzel's Elastic Rubber Roof Cement as manufactured by the ESTATE of J. G. HETZEL, Newark, N. J. (Fig. 3.)

The joints of all copings shall be set and sealed with Hetzel's Elastic Rubber Roof Cement as manufactured by the ESTATE of J. G. HETZEL, Newark, N. J. (Fig. 4.)

AMERICAN 3 WAY-LUXFER PRISM CO.

Manufacturers of Skylights

13th Street and 55th Court
CICERO, ILL.
(Suburb of Chicago)

139-41 Spring Street
NEW YORK, N. Y.

BRANCH OFFICES

DETROIT, MICH., 400 Penobscot Building
MINNEAPOLIS, MINN., 300 Builders Exchange

KANSAS CITY, MO., E. P. WILKINS, 604 Grand Avenue Temple Building
BOSTON, MASS., 453 Washington Street

WESTERN REPRESENTATIVES

CALIFORNIA: WATERHOUSE-WILCOX Co., 523 Market Street, San Francisco, Cal., and 331 East Fourth Street, Los Angeles, Cal.
WASHINGTON AND OREGON: D. E. FRYER & Co., Lumber Exchange Building, Seattle, Wash.; Spokane, Wash.; Tacoma, Wash., and Portland Ore.

Representatives in All Large Centers

Products.

SIMPLEX REINFORCED CONCRETE SKYLIGHT CONSTRUCTION.

STEELEAD SKYLIGHT CONSTRUCTION.

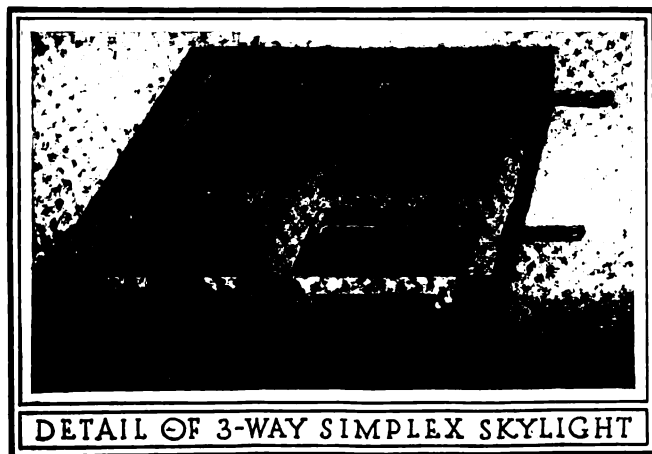
Also manufacturers of Paschall Interlocking Skylight Construction; Luxfer Skylight and Floor Light Construction.

Simplex Skylight Construction.

Services—Simplex skylights are made in pre-formed slabs or complete factory made slabs, and thus they can be installed by any experienced cement man. But, because of the care needed in making the finish waterproof, this company prefers to have its skilled men install, where the amount is great enough to be worth while.

Erection—The installation of Simplex skylights in the gable or "dog-house" construction is recommended; if flat, raised on copings. This allows for heat expansion and permits making joints permanently watertight.

The Ideal Skylight—Simplex skylights are of the double reinforced concrete construction that makes the ideal installation. All the faults of the ordinary types of skylights are eliminated in the Simplex construction. The Simplex skylight does not rust and needs no paint.



DETAIL OF 3-WAY SIMPLEX SKYLIGHT



190-FT. SIMPLEX SKYLIGHT OVER ENGINE ROOM OF REFRIGERATING PLANT—ARMOUR & CO., CHICAGO, ILL.

Adaptability—Because of its form of construction—factory made, preformed or completed slabs—Simplex skylight construction is adapted to any location. For floor lights, it is strong enough to carry traffic loads, having a tested strength of 700 lbs. per sq. ft. on a 6-ft. clear span (supported ends only). The underside is all cement soffits and glass surface, making any other finish unnecessary. Top is smooth and weather resisting. No metal is exposed, so no need of paint. Needs no protecting screen.

Advantages—

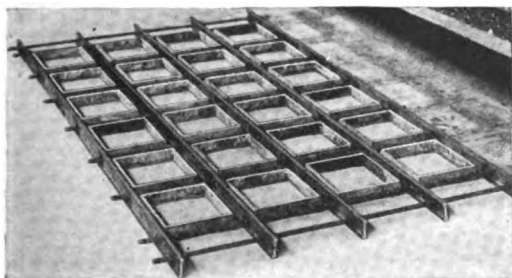
Great daylight area.	Weatherproof.
Great strength.	No rusting.
Everlasting.	Fire resisting.
No upkeep expense.	Burglarproof.

Construction—Built on the most approved scientific lines. Simplex is without a fault in any way.

STEEL REINFORCEMENT—A grid of steel is built. 1½-in. I-bars are punched every 7½ in.; through these holes are forced reinforcing rods, so that the I-bars are spaced on 7½-in. centers. Thus, a rigid grid of steel is made that is capable of carrying a big load.

EMBEDDED IN CONCRETE—This grid is then set in the moulds and a special mix of concrete, made of reground cement, packed around it until all metal but the tops of the bars is embedded in the concrete.

When set, this concrete and steel slab is ready to go to job or finishing room. The preformed slab is finished by putting the 6⅛-in. glasses in place in openings and finishing flush with concrete made of reground cement.



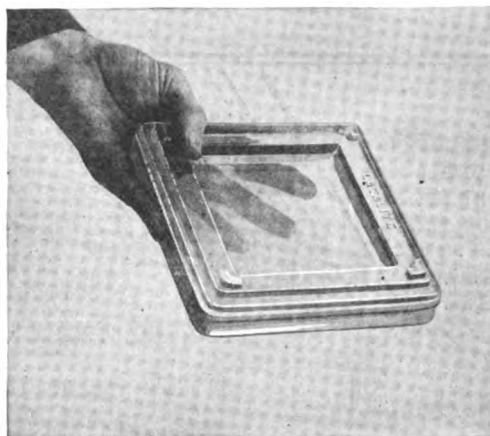
A GRID OF STEEL

MADE OF REGROUND CEMENT—To insure a homogeneous mass that would, in itself, be waterproof, to guard against "after-slaking" and setting of ordinary cements that cause internal expansion, with its consequent shaling and cracking of glass and disintegration of concrete, only reground cement of the same standard of fineness as used by the government in making concrete ships is used; that is, 95% is guaranteed to pass through a 200-mesh screen. Added to this, only perfect lenses of Lazalite glass.

LAZALITE GLASS—This famous glass—*Lazalite*—is made after a formula that insures toughness and long life. It contains no manganese, so will not turn purple or pink under action of the elements. Every piece is annealed, to make the surface weather and wear resisting.

Glasses are 6⅛ in. square and ⅝ in. thick and are made with replaceable construction. Each lens is guaranteed free from stresses and strains that will develop into faults, cracks and shaling in service.

POLARISCOPE TEST—The commercial polariscope is a combination of lenses and mirrors so arranged that light rays projected through an imperfect piece of glass are blocked or refracted. This causes cloudiness or a "rainbow." The makers of *Lazalite* glass test every piece under the polariscope and discard all but perfect



LAZALITE GLASS

lenses. This discard often runs as high as 50% of a lot of glass, thus, only perfect lenses are accepted and used in Simplex construction.

COATING THE EDGES OF THE GLASS—These perfect lenses have the edges of the glass coated with 3-Way Plastic Malleable Coating, to provide a cushion and make a watertight joint when temperature variations expand or contract the concrete.

FINISHING THE JOINTS—Joints between the Simplex slabs to be fitted with 3-way metal expansion joints and packed with Tyte-Lite. This makes them waterproof indefinitely.

Replacing—If a glass is broken by accident, simply clean the hole, set in a new lens, which is ⅛ in. smaller than the original; pack the surrounding space with neat cement or white lead, and the job is done. No chipping of the cement necessary.

Working Strength—Tests by the Robt. W. Hunt Company of Simplex slabs show slabs, supported ends only, have a carrying capacity of pounds per square foot as follows:

Clear Span		
8 ft.	6 ft.	4 ft.
400 lbs.	700 lbs.	1400 lbs.

Specifications—Skylights, where shown on plans, to be reinforced concrete type with no exposed metal, using 1½-in. channel flats with ⅜-in. reinforcing rods at right angles to channel flats. They shall have a tested carrying capacity of not less than 250 lbs. per sq. ft. on a 5-ft. clear span, supported on two ends only, figuring on a factor of safety of 4.

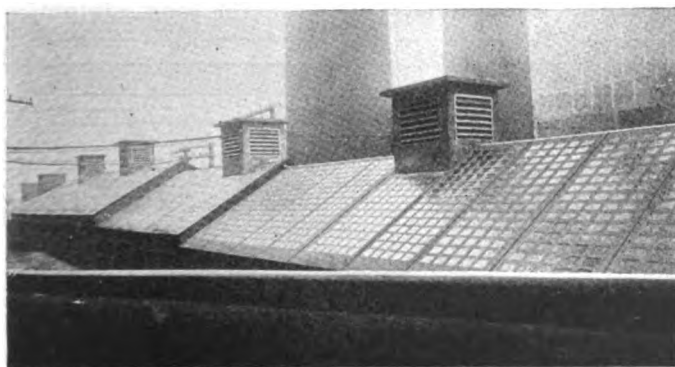
Glass to be *Lazalite* quality, as manufactured by the Jeannette Glass Company, guaranteed by the manufacturers to be free of manganese and without stresses and strains, each piece having been subjected to polariscope test.

Side walls to have a plastic malleable coating to form a cushion protection for expansion. Glass to be replaceable type, so as to permit of any replacement without defacing the surface of concrete. All glass to be 6⅛ in. square, spaced on not more than 7½-in. centers.

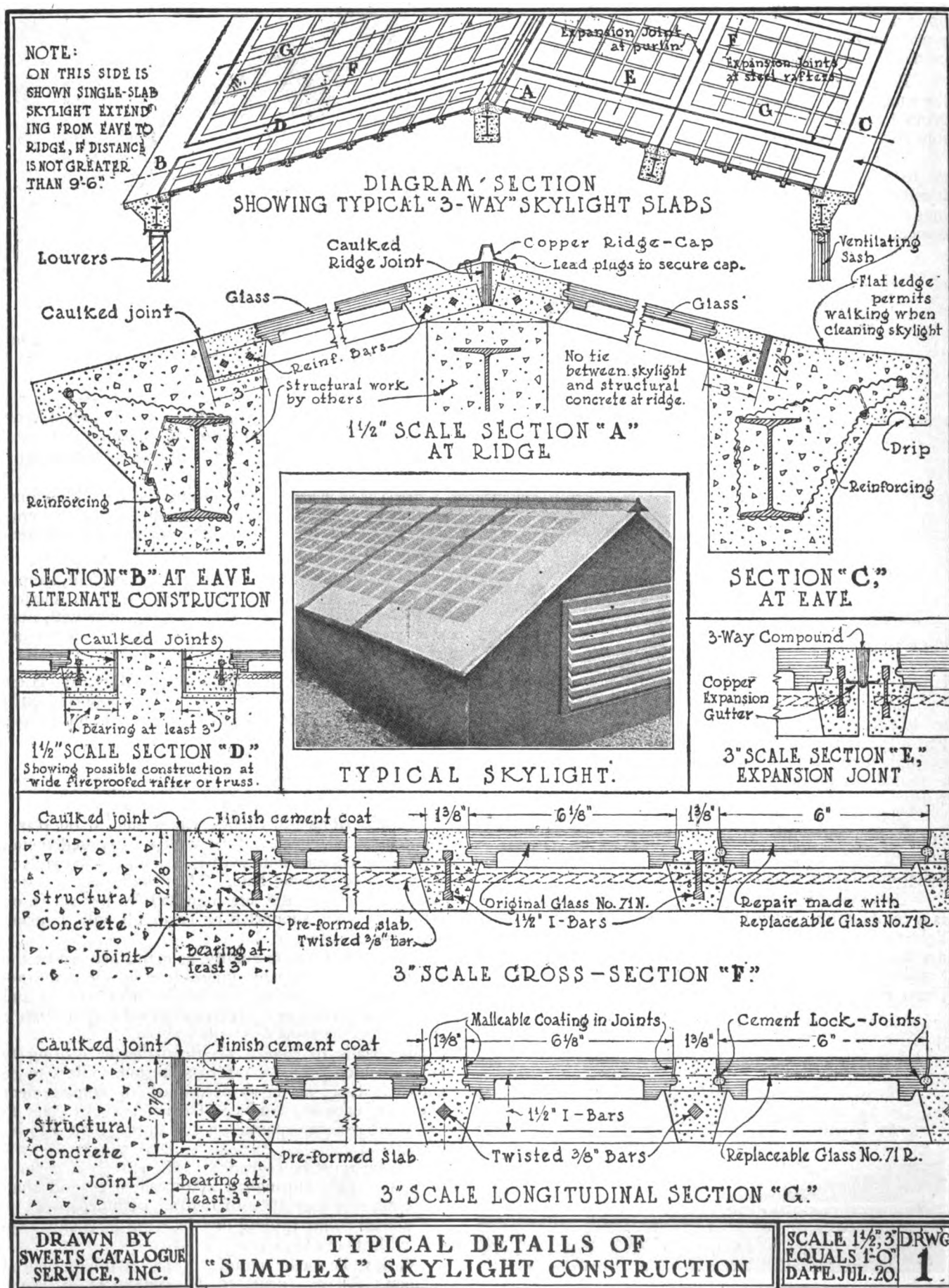
Cement must be reground to the extent of permitting 95% to pass through a 200-mesh sieve and shall contain not less than 10% of hydrate of lime.

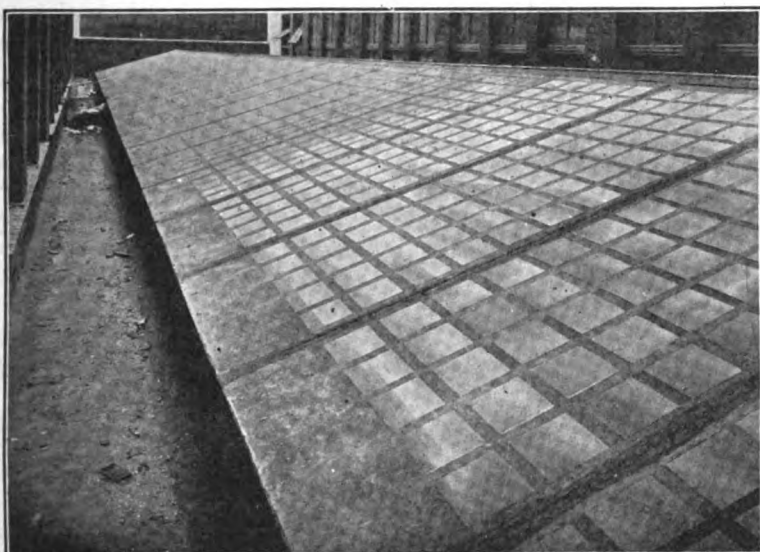
Calk all joints around and between prismatic skylights with Tyte-Lite.

Work to be set by manufacturers' own experienced workmen. All as furnished by AMERICAN 3 WAY-LUXFER PRISM Co. or other approved equal.

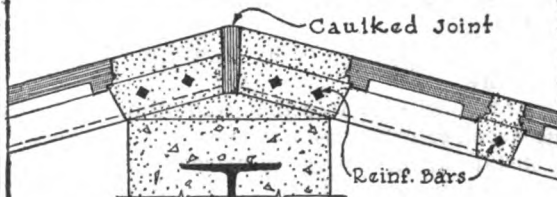


SIMPLEX SKYLIGHT OVER POWERHOUSE "STEPPED-UP" TO CONFORM TO ROOF PITCH

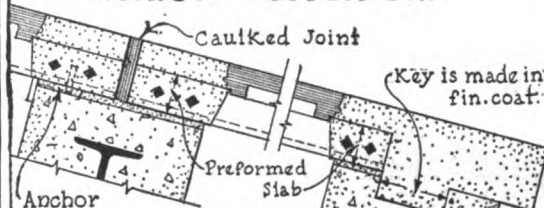




SIMPLEX SKYLIGHTS ON BORLAND BUILDING, CHICAGO, ILL.

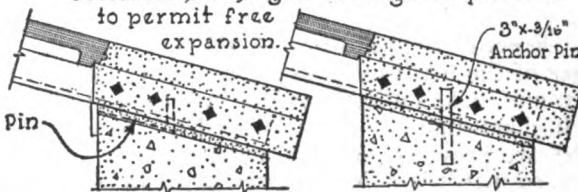


SECTION "A" THRU RIDGE WITHOUT COPPER CAP



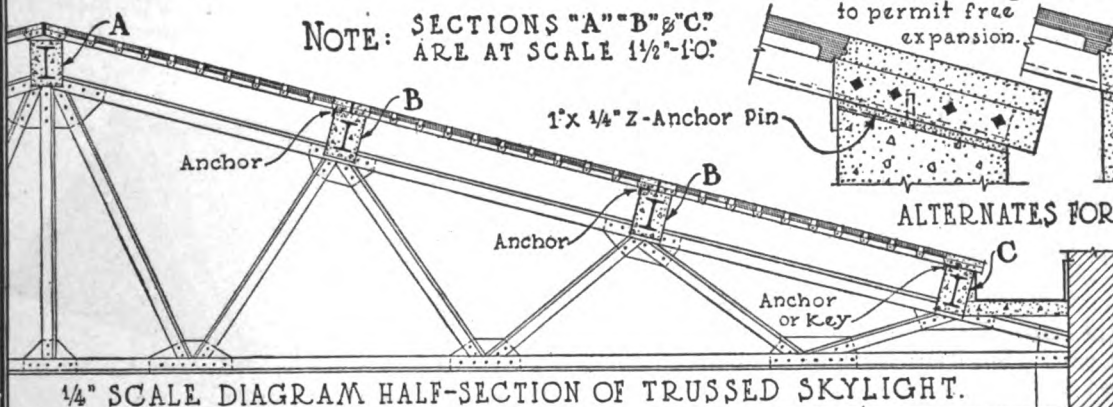
SECTIONS "B" & "C" THRU PURLIN AND EDGE OF SKYLIGHT

NOTE:—No tie or key between structural concrete & skylight at ridge or purlins to permit free expansion.

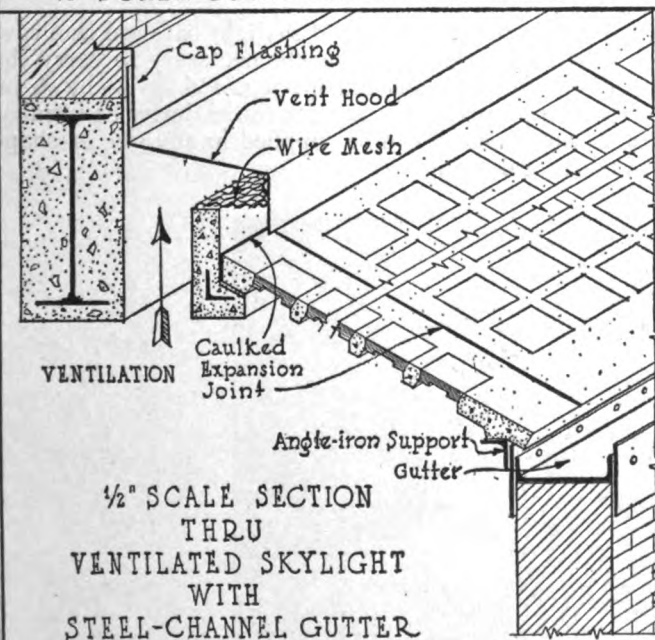


ALTERNATES FOR SECTION "C"

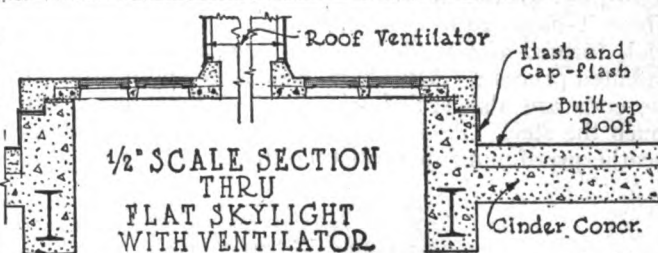
Anchor-pins for holding skylight slab in place, are set 2'-0" apart.



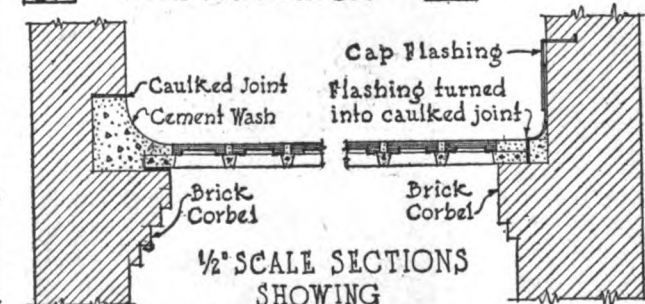
1/4" SCALE DIAGRAM HALF-SECTION OF TRUSSED SKYLIGHT.



1/2" SCALE SECTION THRU VENTILATED SKYLIGHT WITH STEEL-CHANNEL GUTTER



1/2" SCALE SECTION THRU FLAT SKYLIGHT WITH VENTILATOR



1/2" SCALE SECTIONS SHOWING METHODS OF FINISHING FLAT ROOF-LIGHTS AGAINST WALLS

DRAWN BY
SWEET'S CATALOGUE
SERVICE, INC.

DETAILS OF VARIOUS TYPES
"SIMPLEX" SKYLIGHT CONSTRUCTION

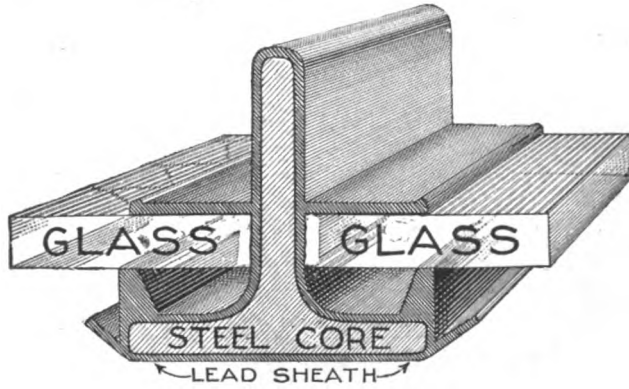
SCALE—1/4", 1/2" & 1 1/2"
EQUALS 1'-0"
DATE: JULY 20 2

Steelead Skylight Construction.

Services—Steelead offers the engineer and architect a skylight construction with three particularly striking advantages:

Everlastingness; no upkeep expense; great economy.

Steelead combines the strength of steel T-bars and the weatherproofness of pure lead. Steelead is easy to install, in fact any good mechanic can use it, but this company prefers to have it installed by its own skilled workmen where possible.



STEELEAD SKYLIGHT BAR AFTER GLAZING

Erection—Steelead is of the type that takes the place of the usual metal skylight bar of galvanized iron or wood. Glass is held in place by pure lead "wings" of such shape that no putty is needed. Screw holes are provided in the bottom of Steelead bars, so that it is only necessary to set bars in place over the substructure, screw them on, set glass in its seat, press the lead wings down on top and the work is done. Simple, fast and easy.

Steelead Skylight Bars—Puttyless, paintless, everlasting, strong. Steelead skylight bars are made of steel T-bars of various sizes according to the needs of the installation. These T-bars are incased in a seamless sheath of pure lead, formed and applied by this company's secret and patented process. After bars are cut to length ordered, the ends are also sealed with lead so that no air can touch the steel. As lead is non-corrosive, non-rusting, weatherproof and fume resisting, there is no reason why

this bar should not last as long as the building stands, without any attention.

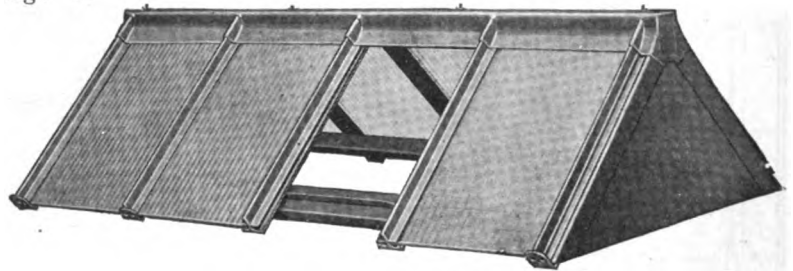
Steel bars covered with lead sheaths have been in successful use for 25 years in England and continental Europe. They have stood without any attention or repairs, and are as good today as when installed.

Advantages—Steelead overcomes all the faults of the ordinary types of metal skylight constructions that constantly need puttying and painting to keep them weathertight. Once in place, Steelead is practically everlasting, except in case of accident. Where the ordinary skylight doubles its installation cost every 4 years in upkeep Steelead's first cost is the only cost.

Because of the strength of the Steelead bar, longer spans can be used with fewer supports, thus increasing the daylighting value of the skylight, as well as reducing the cost of the substructure.

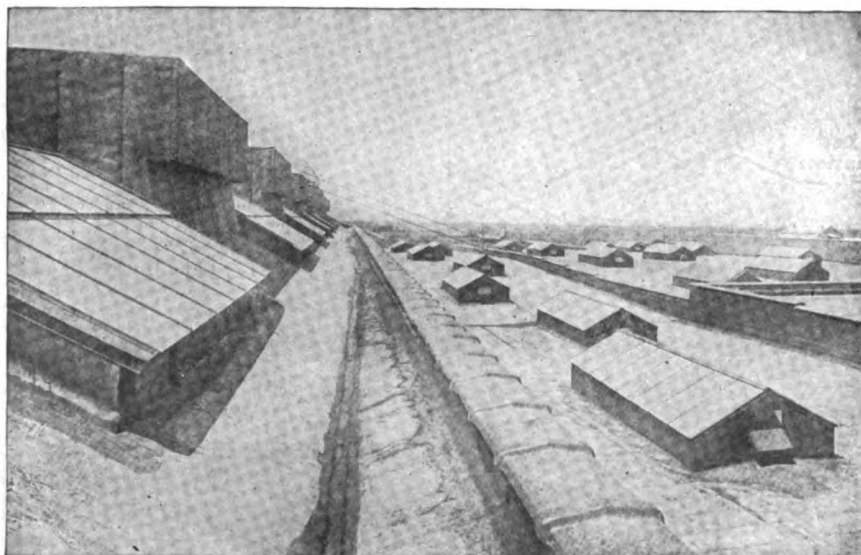
In replacing broken glass, the process is so simple and easy that it takes but a fraction of the time of any other construction.

Due to these points of advantage, Steelead is the ideal construction for standard skylights of all types, sawtooth roofs, marquees, studio lights, greenhouses and solariums. The form of the Steelead sheath is such that there can be no leakage or condensation drip, making it ideal for use without any glass-screen below. It is also dusttight.



TYPICAL STEELEAD SKYLIGHT

Construction—Steelead skylight bars are lead covered steel T-bars of the weight necessary to carry the load on different spans and spacing. $1\frac{1}{2}$ by $1\frac{1}{2}$ by $\frac{1}{8}$ -in. T-bars are the average size for the majority of installations, but Steelead can be supplied in any size or shape to meet local conditions.



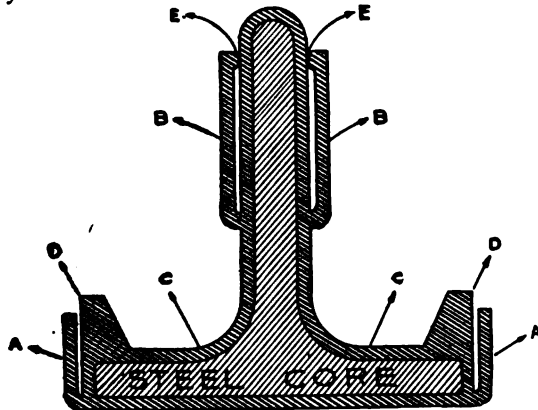
STEELEAD SKYLIGHT IN ROOF OF CERTAINTEED ROOFING CO.

The lead sheath on the steel is so formed that a broad flat surface of pure lead is provided as a seat for the glass. In making this, there is shaped a gutter to care for any leakage that might occur, thus there can be no dripping from outside leakage.

CONDENSATION GUTTER—On lower edge of the Steelead bar are formed 2 wings, one on each side. These are made integral with the lead sheath so that there is no joint. When bar is in place, these are spread open, forming miniature gutters to catch the condensation drip. Being lead, there is no chance for these to rust or corrode and they need no paint.

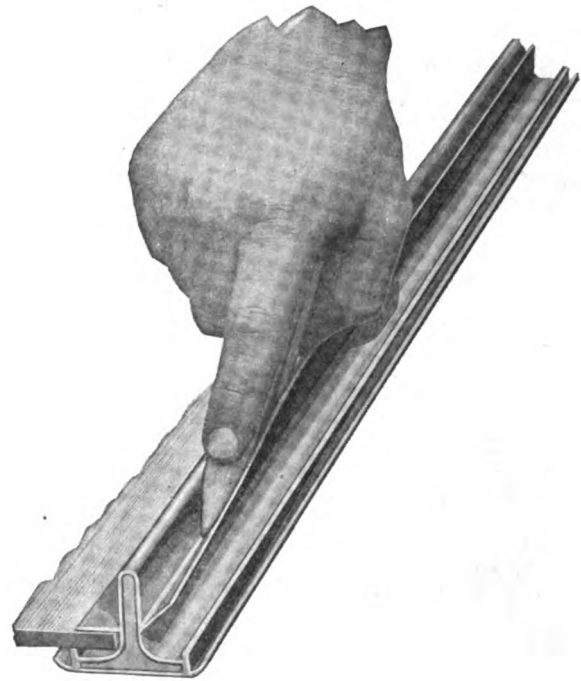
SETTING—From customer's blue prints of substructure, this company will drill and tap the Steelead bars on the lower side for machine screws, so that it is simple and easy to set the bars in place. They are also tapped for the screws to hold on the patented drain type glass stops.

GLAZING—Bars are shipped with glazing wings and condensation gutter folded up against the bar to prevent damage in transit. When the bar is set and screwed into place, glazing is very easy. With every job, this company supplies a specially formed wedge-shaped wooden tool to use in opening the condensation gutter and folding down the glazing wing, but a putty knife will do the work nearly as well.



STEELEAD SKYLIGHT BAR BEFORE GLAZING

When the Steelead bar is in place, the condensation gutter is opened by the simple process of inserting the wooden wedge between the wing and the bar at one end and pulling it evenly and steadily to the other end. After



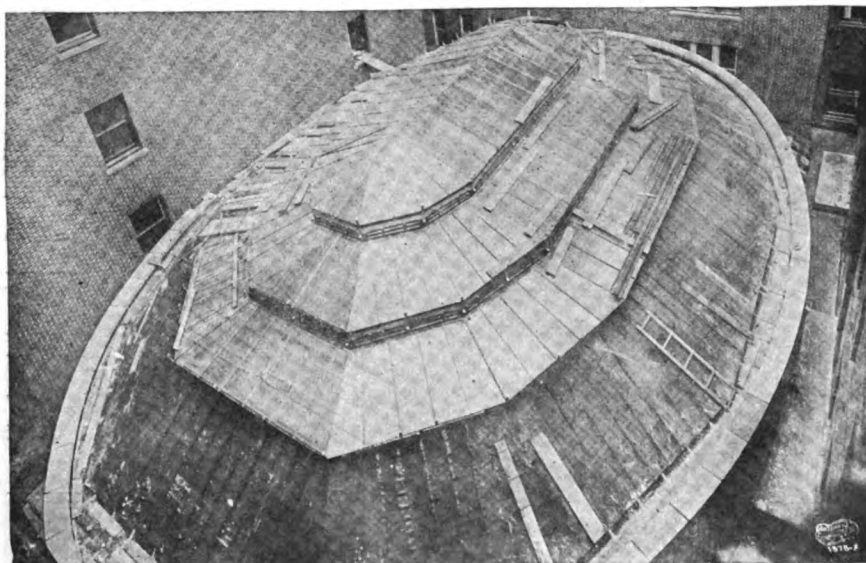
GLAZING WINGS BEING PRESSED DOWN ON SURFACE OF THE GLASS

this is done on both sides, the glass is set in place on the lead seat. The glazing wings, also made an integral part of the lead sheath of the bar, are then pressed down on the surface of the glass. Usually only 2 motions are necessary to have this so solidly set that the joint is weathertight.

Pure lead has the peculiar clinging quality with glass that is found in rubber, therefore when the glass is set on lead and held in place with lead, there is no chance for the glass to loosen or for the joint to leak. Glass breakage due to excessive vibration is practically eliminated because the glass is not held rigidly. In heavy manufacturing plants, this is a very desirable feature.

GLASS STOP—After the glass is in place, the patented glass stop is attached on the end of the bar. This has a special drainage opening to permit any water in the drip gutter to flow out.

When this is done, the entire job is finished, for no putty or paint is needed on Steelead.

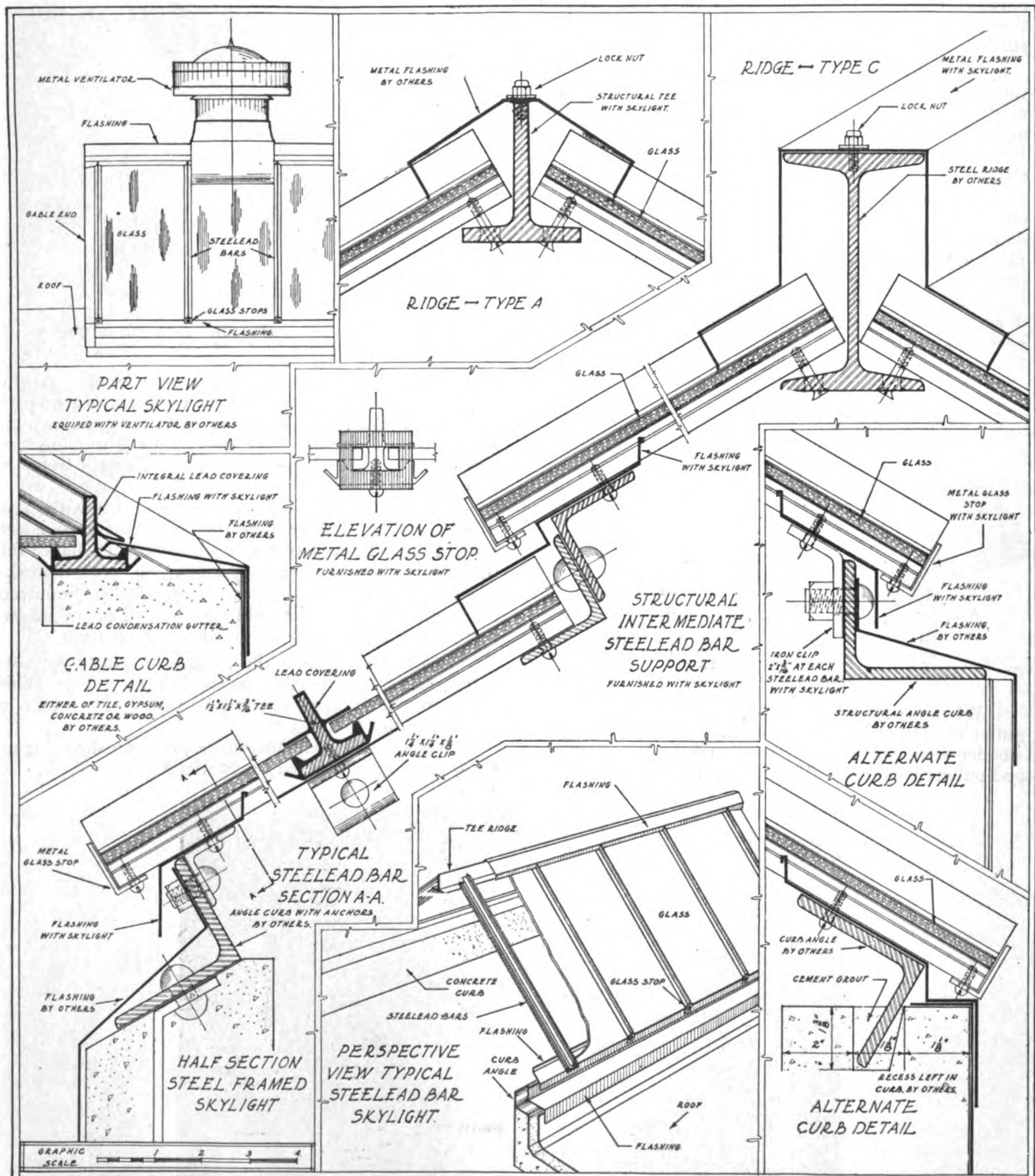


STEELEAD SKYLIGHT, ELLIPTICAL CONSTRUCTION

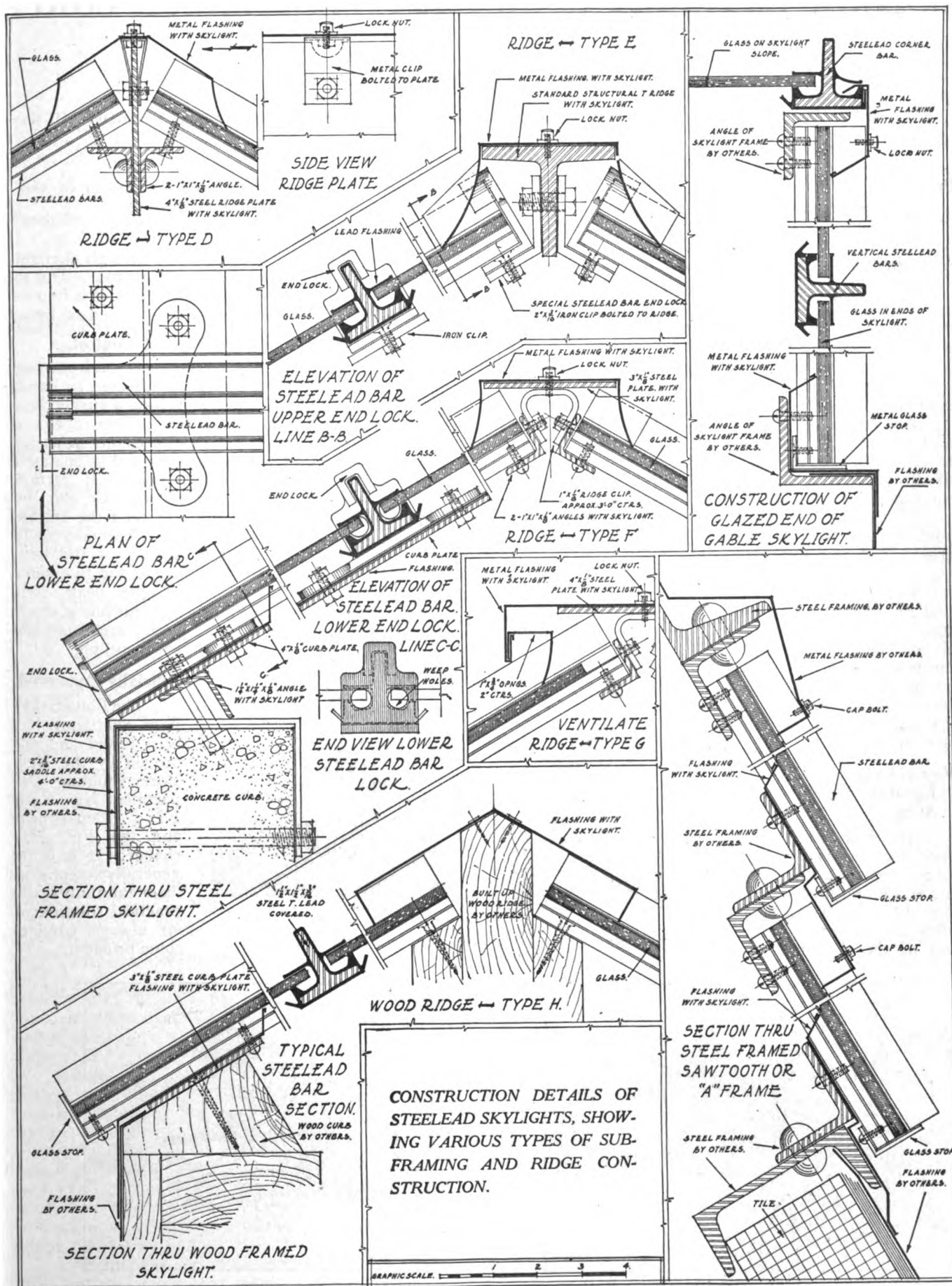
Specifications for Steelead Skylight Construction

—All skylights where shown in plans, shall be built of a lead covered steel T-bar, size to be determined by the manufacturer (depending on span and spacing), for holding and supporting glass. Steel T-bars to be completely incased in a seamless lead sheath. This lead sheath

to be so formed as to provide a gutter for leakage and condensation and lead seat for the glass, also flange of lead, made integral by the sheath and to be pressed down on the glass in glazing. This construction to be that known as Steelead skylight bar as manufactured by the AMERICAN 3 WAY-LUXFER PRISM Co., or other approved equal.



CONSTRUCTION DETAILS OF STEELEAD SKYLIGHTS



BOLOGH SKYLIGHT & GRAVITY VENTILATOR CORP.

494 Hudson Street
NEW YORK, N. Y.

SELLING AGENTS FOR MICHIGAN AND ILLINOIS: THE HOPKINS-LEFEVRE Co., 505 Equity Building, DETROIT, MICH.

Product.

BOLOGH SKYLIGHT and GRAVITY VENTILATOR
(Patents Pending).

A Skylight and Ventilator Combined.

The Bologh skylight and gravity ventilator is a new and entirely practical device; it is a *skylight plus a ventilator*, gravity operated and made of structural steel, sheet metal and glass.

The construction is such that it can be used as a lean-to ventilator and skylight or placed in any position desired.

No other steel but the curb is required. We furnish steel trusses made of structural angles and tees, covered with sheet metal, bolted and riveted. Scientifically figured as to carrying capacity. The Bologh eliminates the use of turrets and monitor sides.

One person can easily operate it. By releasing the holding chain or rope, the entire glazed surface opens by gravity and any degree of opening can be obtained at the will of the operator, up to *full* opening.

The Bologh skylight ventilator is adapted to industrial buildings, offices, theaters, schools and in all places where combined roof lighting and ventilation is required.

Ventilator Area Equal to Skylight Area.

The feature of special interest is the large free air opening and 100% effective ventilation that is afforded—the entire top of the skylight

(glazed surface) opens and allows an amount of ventilation equal to the skylight well opening.

Stormproof Construction.

Whether fully open or closed, the Bologh skylight ventilator is absolutely rainproof and snowproof. Due to the $52\frac{1}{2}^\circ$ of slope and the smooth surfaces, it is impossible for snow to remain on the top of the closed skylight.

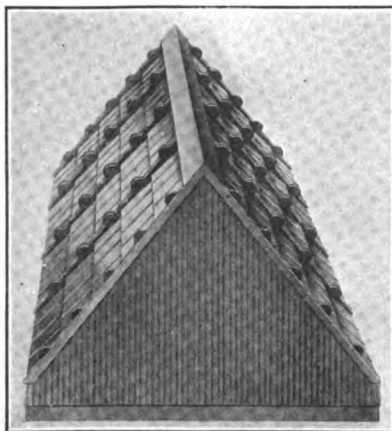
Automatically Opens Upon Release of Control.

The Bologh skylight ventilator is self-opening when the control is released, whether operated by hand, or effected as the result of fire by melting a fusible link in a chain control or burning the ropes when ropes are used to control the ventilator. These chains or ropes may drop from the ventilator to the floor and be operated at that point. This arrangement makes it certain that in the event of fire, the smoke will rise and the heat will either burn off the ropes or melt the fusible link in the chain so that the skylight will automatically open and the full area of the opening at the base will be effective, as the sash openings in the two sides

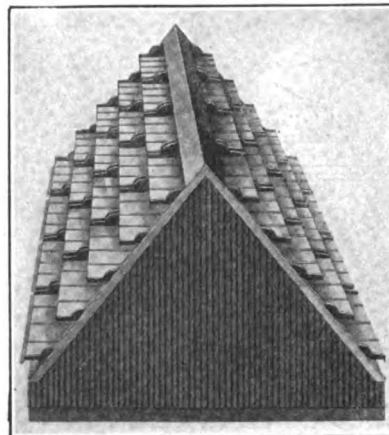
of the peak roof skylight has a much larger area than the base opening.

Officially Approved.

The Bologh skylight ventilator has been tested and approved by the New York Building Department, New York Fire Department and the Fire Exchange. It is being generally accepted as the one and only really practical solution of an always troublesome problem.

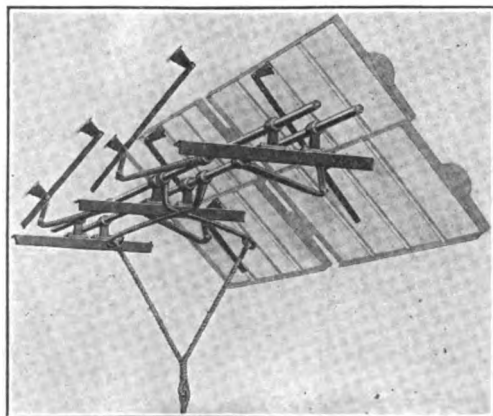


Closed

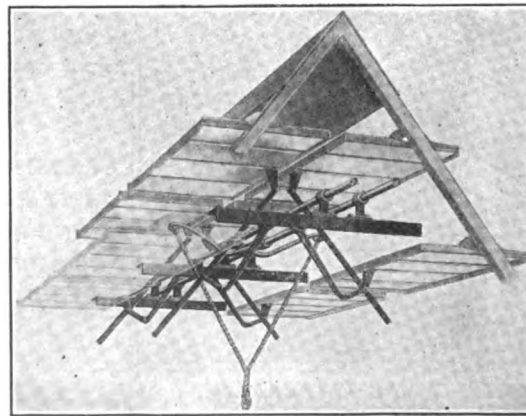


Open

EXTERIOR VIEWS OF THE BOLOGH SKYLIGHT VENTILATOR



Closed



Open

INTERIOR VIEWS OF THE BOLOGH SKYLIGHT VENTILATOR

NATIONAL VENTILATING COMPANY

Manufacturers of Puttyless Skylights

GENERAL OFFICE AND FACTORY

73-75 Tenth Street

LONG ISLAND CITY, N. Y.

TELEPHONE:

HUNTERS POINT, 5733-5734

Products.

MULTI-UNIT PUTTYLESS SKYLIGHTS.

Also manufacturers of Side Lights, Operating Sash, and National Ventilating Devices.

Adaptability.

Skylights for railway terminals, power stations, machinshops, factories, foundries, libraries, museums, art galleries, and all other buildings whereon permanent watertight skylights of large area are required.

Advantages and Distinctive Features.

Referring to illustration, the bar and upper lights are supported in a fixed manner by the purlin thereunder; while the lower bar, supporting the lower lights, is secured by the same purlin in a loose manner, permitting it to expand freely.

This construction, being repeated at each purlin, permits movement, all in same direction, due to expansion, contraction, or vibration (along the slope of the skylight) of the cap, glass and bar of each unit or tier of glass, independently of every other unit or tier.

Along the longitudinal line of the skylight the steel frame of the building and the entire length of the glass are each taken as separate units, and the difference, nearly 100%, in the expansion and contraction of these materials (glass and steel) is likewise thoroughly taken care of by the copper spreader clips shown in transverse section at supporting bar. These spreader clips are placed over each cap bolt, spaced about 12 in. along each skylight bar, and incidentally they serve also to better secure in place the copper bolts for holding the caps.

The cap is strong and yet resilient. Its upper half is of an inverted "U" shape, which provides strength and rigidity; while the lower half, especially at the lower extremities, is resilient, so as to conform thoroughly, when secured in position, to the surface of the glass.

All gutters and parts that are non-accessible, without removing the glass, are of non-corrosive material. The entire top of the bar is covered with 8-oz. copper, the same being applied while the last coat of bar-paint is still wet; and a flexible bearing for the glass is formed, which adjusts itself to any warps or irregularities of the glass along its bearing line.

The company is equipped to cover the bottom of the bar also. Both the top and bottom bar covers

are made by special dies and both fit the bar snugly.

No packing or filling substance of any kind is required, and no material is used other than glass and metal.

Installations.

The Pennsylvania Railroad Co. adopted this construction for its New York City passenger station, on which building 83,000 sq. ft. of skylight were installed, embracing every known variety of construction.

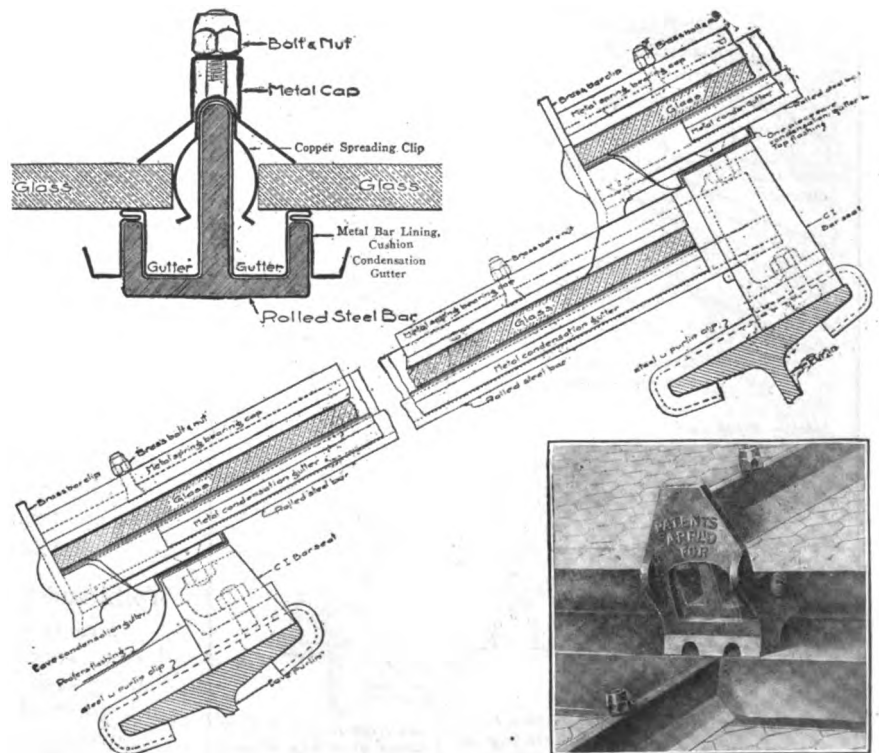
The Central Railroad of New Jersey also adopted this system for its new terminal at Jersey City, where 116,000 sq. ft. were installed.

The New York Central Railroad Co. has this construction on its Grand Central terminal at 42nd Street, and on powerhouses and passenger stations at various points.

Installations have been made on a number of large buildings in the United States Navy Yard at Washington, D. C., and Norfolk, Va.

A large number of industrial plants have also adopted this system as it has been found the most economical and satisfactory.

The Standard Arcade at 50 Broadway, New York, N. Y., has a curved roof skylight of this construction, which is a splendid example of its peculiar adaptability to any condition.



DETAILS OF MULTI-UNIT PUTTYLESS SKYLIGHTS

(Patents applied for)

Construction shown on the right side is repeated at each purlin between the eave and the ridge

THE G. DROUVÉ COMPANY

Manufacturers of Puttyless Skylights and Sash Operators

TELEPHONE:
BARNUM 540

50 Drouvé Street
BRIDGEPORT, CONN.

Western Union Code

AGENCIES IN ALL PRINCIPAL CITIES

Products.

'ANTI-PLUVIUS' FIREPROOF, PUTTYLESS SKYLIGHTS, trade-marked and patented.

"STRAIGHT PUSH" and "LOVELL" SASH OPERATORS, patented; WORM and GEAR SASH OPERATORS.

Also manufacturers of "Drouvé" Ship Skylight and Hatch Lifting Device.

Service.

A skilled estimating department will give every assistance in preparing specifications.

Detail drawings of different types and conditions will be forwarded on request, if engineers will indicate approximately their ideas.

Catalogues, prices, preliminary estimates or any co-operation will be gladly and promptly furnished.

"Anti-Pluvius" Puttyless Skylights.

Skylights are used in industrial buildings of all kinds; in sawtooth, flat or pitched roofs, and made in all types whether flat, single or double pitched, or hipped.

Advantages—A type that will satisfy the most exacting requirements of stiffness under wind and snow loads; of perfect watertightness, of freedom from condensation drip and of endurance against corrosion.

Strength of materials and of the structure are ideal; will support the weight of a man or men without danger to glass. Proper provision is made for easy

cleaning of glass. Frames are flexible and full allowances are made for contraction and expansion, vibration and wind pressures. Construction permits of easy removal of glass by any man about the place.

Skylight is adaptable to all types of roofs: wood, metal, brick, tile or concrete, galvanized iron or asbestos.

Can be put up by anybody, anywhere.

Lights of glass are independent, and do not come in contact with each other, nor do they touch the channels. Skylight frames are shipped with or without glass. No sweating of steel members from chill caused by cold glass.

Glass—Can be rough, hammered or ribbed, plain or wired, of any kind or thickness.

Painting—Steel channels or skylight frame have one shop coat of metal protective paint. Galvanized portions are unpainted unless requested.

Shipments—Shipped knocked down. Any person of ordinary intelligence can erect them (see assembling details).

The company will install these skylights anywhere, if desired.

Information Required for Estimating—State type of skylight required, give size or sizes and number wanted.

State trimmings desired. These cover outside exposed portions of skylight and include cap and flashings (not roofer's curb flashings) and may be of copper, or galvanized iron.

Specify kind of glass (see "Glass").

"Straight-Push" Sash Operator.

Designed to operate all types and makes of sash in monitors, skylights and sidewalls of buildings. Designed to withstand all manhandling and unexpected conditions.

Guide rolls mounted on brass pins to prevent rusting. All working parts have brass-to-iron connections. The sweep of levers is level.

Leverage force applied is uniform throughout length of line, insuring equal opening and closing of all sash.

Erection—Erecting crews are maintained by the company to handle any job, anywhere, or any workman can install from erection instructions.

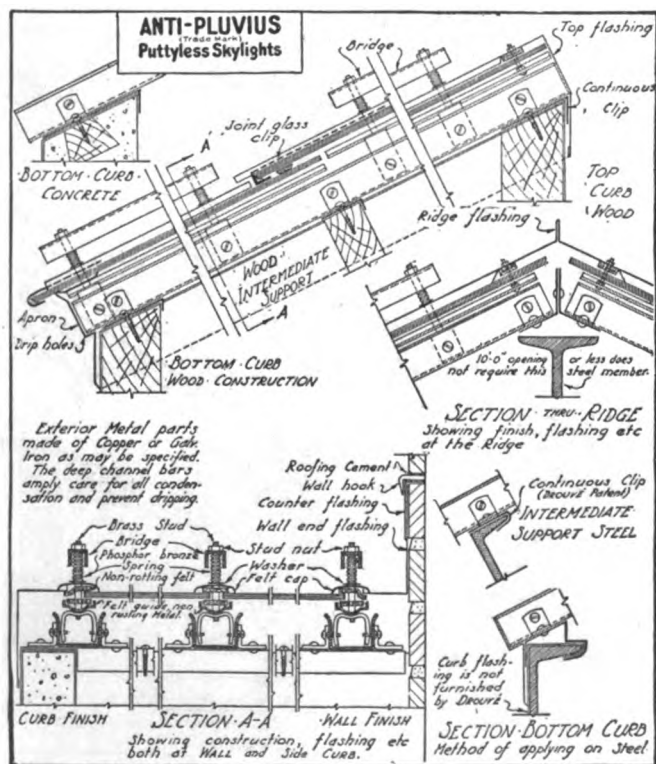
"Improved Lovell Dreadnought" Sash Operator.

This design, with its sweeping movement, gives large openings to heavy top hung sash. All parts made extra heavy, with phosphor bronze working joints.

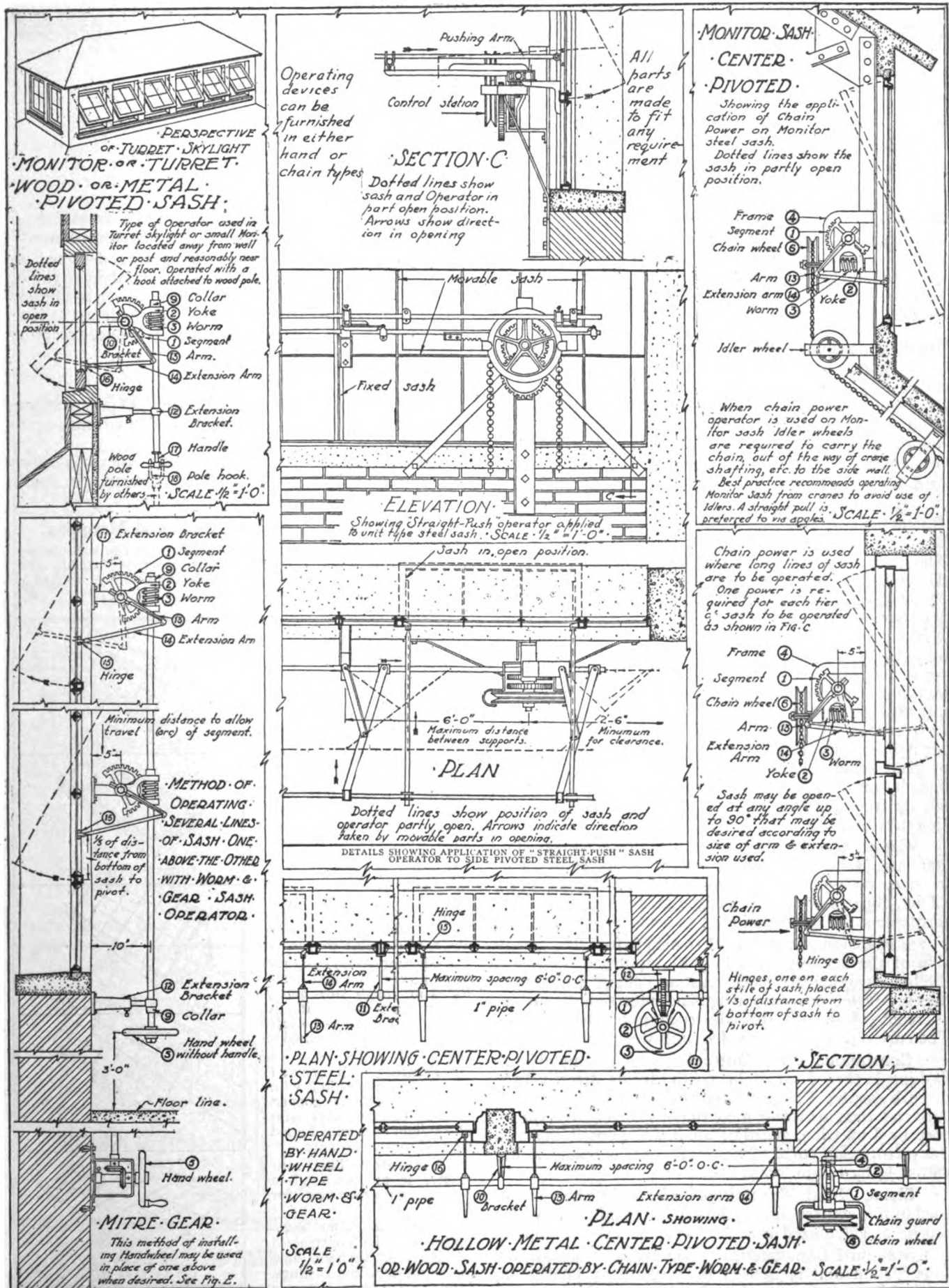
Worm and Gear Operators.

Practically all types of standard worm and gear devices supplied as desired for operating lines of ventilating sash in sidewalls, pitched roofs, sawtooth roofs and monitors, and for pivoted or hinged sash.

Details of standard worm and gear operating devices forwarded on application and, when sufficient information is given, recommendations will be made as to efficient and economical procedure.



DETAILS OF SINGLE OR DOUBLE PITCH TYPE GENERAL SKYLIGHT CONSTRUCTION
Scale 1 1/4 inch = 1 foot



DETAILS SHOWING APPLICATION OF WORM AND GEAR TYPE SASH OPERATORS

ESTABLISHED 33 YEARS

HUGH R. BURNS, PRES. JOHN A. MERCIER, VICE-PRES. CHAS. R. WOOLENSACK, SECY-TREAS. CHRIS. YAUCH, SUPT.

CAPITAL \$175,000.00

THE HOWIE COMPANY

INCORPORATED

Manufacturers of Skylights

5241 Wesson Ave.

DETROIT, MICH.

Products.**PEERLESS SKYLIGHTS.**

Also manufacturers of Fireproof Windows, Tin Clad and Kalamein Doors, approved by Underwriter's Laboratories, Inc.; Copper and Bronze Doors, Architectural Sheet Metal Work.

Peerless Skylight, Sawtooth and Marquise Constructions.

These are designed to provide a weatherproof and dustproof skylight construction and one that can be guaranteed against any and all possible glass breakage due to vibration; through expansion and contraction due to temperature changes, and from vibration of structure caused by machinery shafting fastened to roof trusses.

Bars, Cushion, Cap Strip and Condensation

Gutter—Supporting bars are of special rolled steel bars, $\frac{3}{4}$ by $1\frac{1}{4}$ -in. T-section with upturned flanges. The glass is laid directly on these flanges in small panes, 24 by 24-in. size, overlapping each other 2 in. with a $\frac{1}{4}$ by $\frac{3}{4}$ -in. Genasco Asphalt strip laid between, thus forming a cross condensation gutter. A special Genasco Asphalt strip is laid along edge of glass and against side of bar. A sheet metal spring bearing cap is provided for a covering of T-bar and packing strips. This cap is but 23 in. long and is provided with a heavy brass cotter pin through center of cap. Cotter pin engages a slot provided in bar in such manner as to insure a tight springlike fitting to glass and packing strips; each light of glass being held in place independent of every other light by means of this cap and cotter pin, and thus left wholly free to move whenever affected by either expansion or vibration.

Glass, Overlapping, Flexible Cross Joint—The standard $\frac{1}{4}$ -in. wire glass is used in lights 24 by 24 in. in size, necessitating the offsetting of T-bars every 22 in., thus providing a horizontal flexible cross joint throughout the construction.

Expansion Castings—Provision for the expansion of the bar is provided by the upturned flanges of the bar engaging the special casting flanges, which castings are fastened to curb, ridge and intermediate purlins, as required, to suit the construction of the building. The curb castings are provided with weep holes.

Continuous Curb Gutter—The sheet metal curb flashing is turned up $\frac{3}{4}$ in. on the inside directly back of curb casting; this necessitates the bar being offset at curb end, thus providing a continuous curb gutter $1\frac{1}{4}$ in. deep by 3 in. wide, guarding against the possibility of a leaky frozen-up curb. The metal ridge is bolted to bar with a $\frac{1}{4}$ by $1\frac{1}{4}$ -in. brass bolt.

Sheet Metal Trimmings—The only sheet metal used in this construction is the cap curb and ridge, which can be of galvanized iron, lead coated metal or copper.

Standard Construction—The above is a standard construction and is carried in stock, thus facilitating quick shipment upon receipt of order.

Cost and Maintenance—Peerless skylights cost

no more than ordinary skylights and last from 4 to 5 times as long without additional cost of maintenance.

Summary—The Peerless skylight is designed to meet all requirements and is the last word in skylight, marquise and sawtooth construction. It is absolutely proof against water, snow and dust; and will last as long as the building with no glass breakage possible, excepting by accident.

Details.

The following details illustrate the practical use of Peerless skylights, sawtooth and marquise construction.

Other details required to meet any other conditions evident in various building construction will be made and submitted for approval.

Specifications for Peerless Skylight and Marquise.

Intent—This specification together with the accompanying drawings and details is intended to provide for all labor and material required for the completion and erection of all skylights as shown or mentioned.

Work by Others—All steel framing, wood curbs, nailing strips, gutters and roof flashings, shall be provided for under another contract, unless otherwise specified.

Work Required—Provide and install all skylights as shown or indicated on drawings. All skylights shall be "Peerless" skylight construction as manufactured by THE HOWIE COMPANY, Detroit, Mich., complete as shown by their standard details, and adapted to the construction of the building.

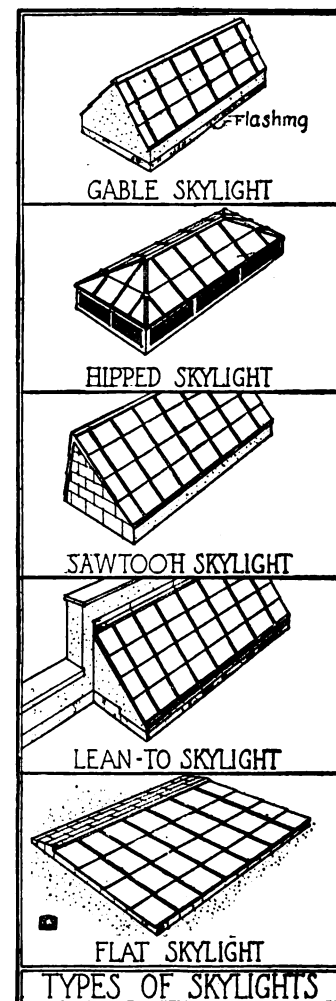
All sheet metal trimming shall be of No. 24-gauge galvanized iron or 16-oz. cold rolled copper.

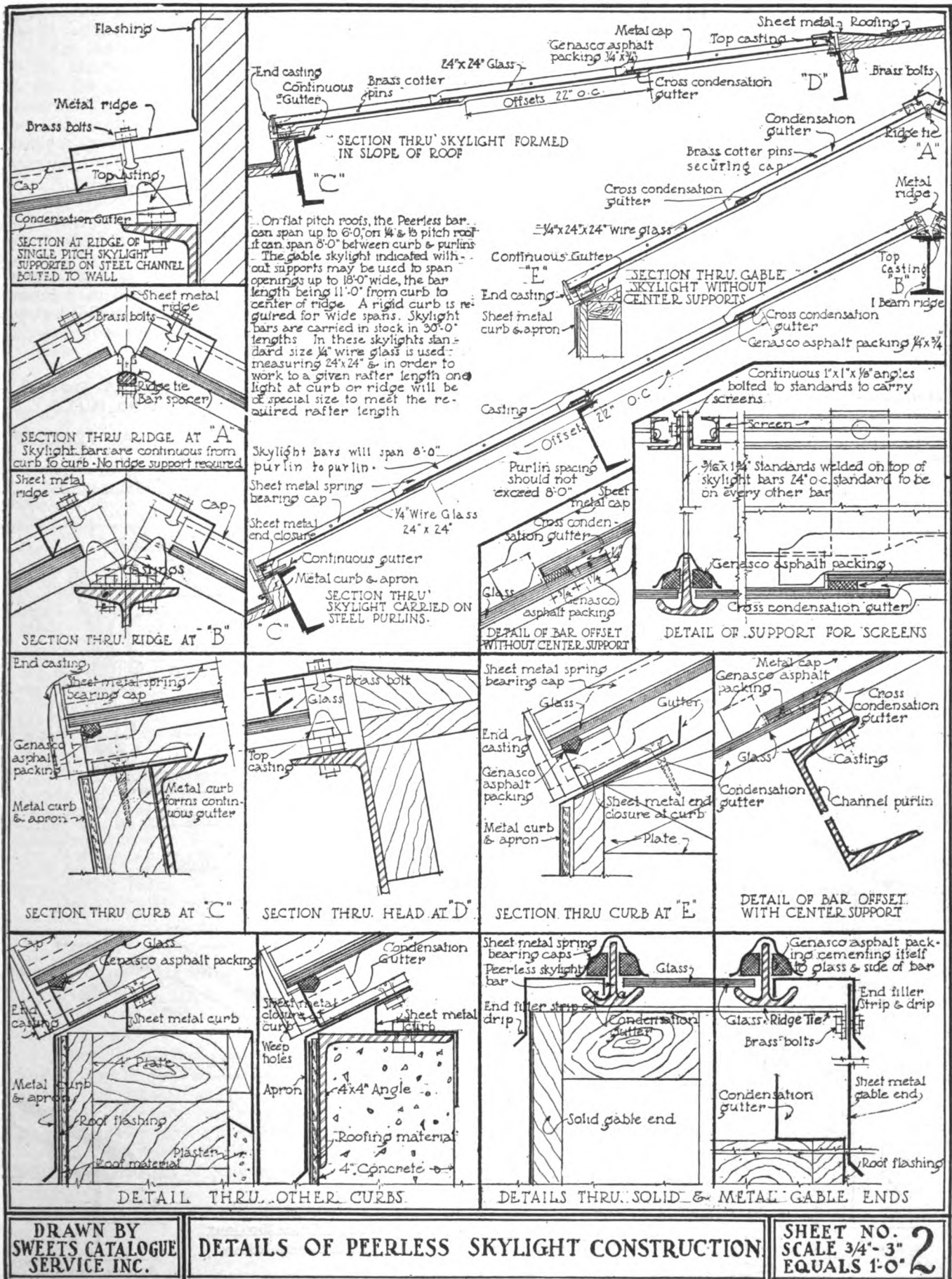
Glazing—All skylights to be glazed with best quality $\frac{1}{4}$ -in. rough wire glass, not to exceed 24 in. in width. All glass to be left whole and clean at completion of the work.

Painting—All metal work in connection with skylight, except copper, shall be painted; also paint all skylight bars with 1 good coat of approved paint.

Guarantee—This contractor is to furnish a written guarantee for 5 years.

Marquise—The marquise shall be constructed of Peerless skylight bars with necessary end castings, brass nut flashing, etc., in accordance with THE HOWIE COMPANY construction.





DRAWN BY
SWEETS CATALOGUE
SERVICE INC.

DETAILS OF PEERLESS SKYLIGHT CONSTRUCTION

SHEET NO.
SCALE 3/4" = 3"
EQUALS 1'-0" 2

A. H. JETER & COMPANY, INC.

Manufacturers of Puttyless Steel Skylights

GENERAL OFFICE AND WORKS

91-95 Webster Avenue

LONG ISLAND CITY, N. Y.

BRANCH OFFICE: BRIDGEPORT, CONN., WM. V. DEE, Vice-president and General Sales Manager

Products.

PUTTYLESS STEEL SKYLIGHTS.

CAST IRON ROOF DRAINS.

Also Sheet Metal Skylights, Turrets and Louvers;
Architectural Sheet Metal Work of every description;
Metal, Tile and Slate Roofing.

Services and Estimates.

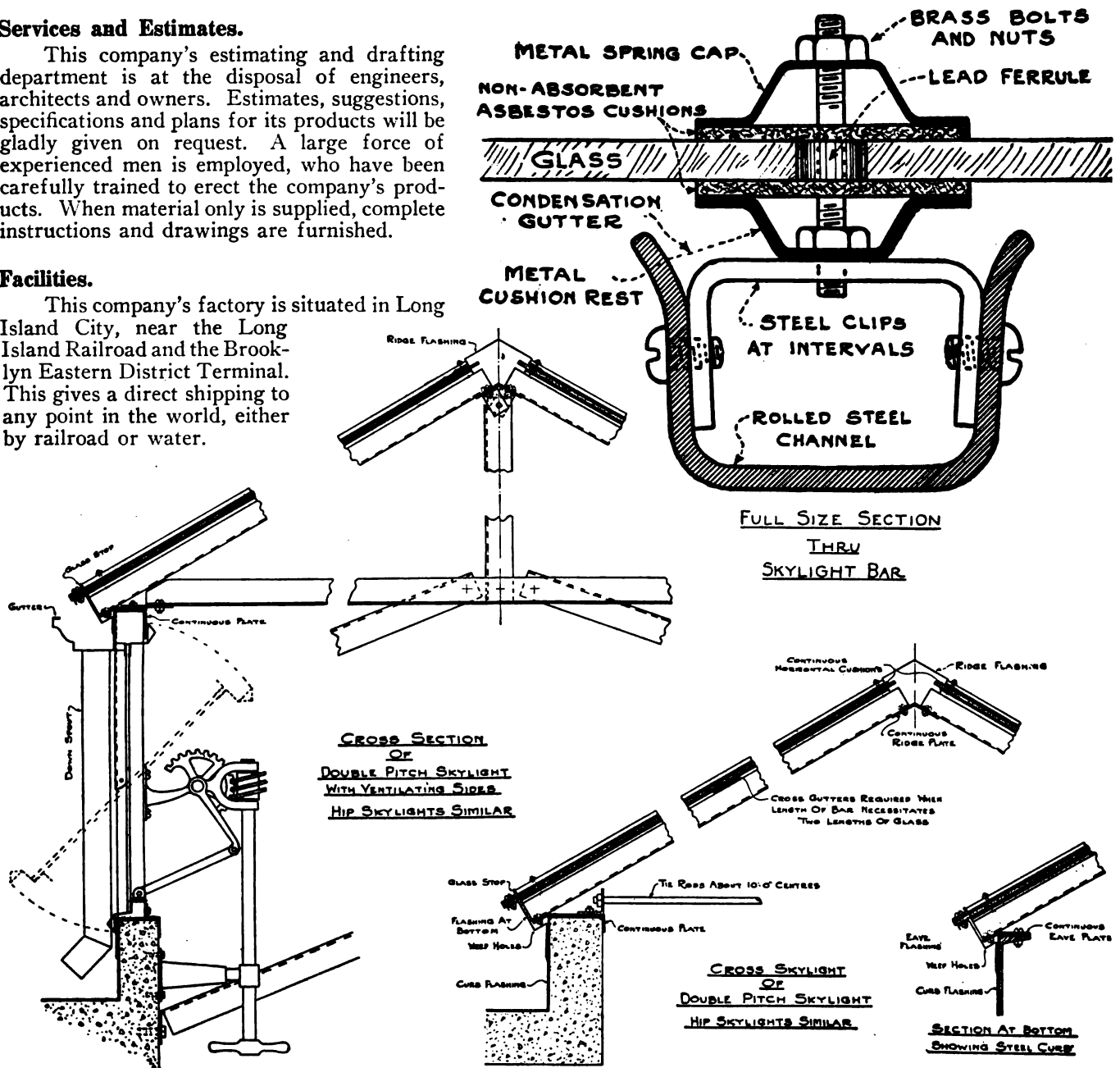
This company's estimating and drafting department is at the disposal of engineers, architects and owners. Estimates, suggestions, specifications and plans for its products will be gladly given on request. A large force of experienced men is employed, who have been carefully trained to erect the company's products. When material only is supplied, complete instructions and drawings are furnished.

Facilities.

This company's factory is situated in Long Island City, near the Long Island Railroad and the Brooklyn Eastern District Terminal. This gives a direct shipping to any point in the world, either by railroad or water.

Jeter's Puttyless Skylights.

Special Features—The sash bar of Jeter's patented puttyless steel skylight is composed of a lower channel, over which is placed a special moulded glass rest, secured to the bottom channel by means of wrought iron stirrups and tap bolts.



TYPICAL DETAILS OF JETER PUTTYLESS STEEL SKYLIGHTS
Scale: 1 in. = 1 ft.

The glass rest is held in position by a brass bolt, which is of sufficient length to engage and secure the metal cap that covers the edges of the glass.

On the special moulded glass rest, a cushion of heavy saturated asbestos is provided, running entirely across the glass rest. After the glass is laid in place, a saturated asbestos sealing strip is provided, which is securely held in place by the metal cap. This feature insures against any dust or moisture getting under the glass and in to the sash bars or gutters.

A special moulded section is used as a continuous bottom support for the glass. This section also contains a pocket, on which is placed a strip of saturated asbestos upon which the glass rests. Connections at intervals of about 20½ in. are provided in the continuous bottom members, which receive and secure the bars. This method of asbestos cushioning device makes the skylight waterproof and dustproof and, being of a soft indestructible material, reduces the cracking of the glass to a minimum.

Adaptability—Jeter's patented system of putty-less steel glazing is adaptable for use in railroad terminals, museums, schools, hospitals, factories, machine-shops, etc.

The very simplicity of construction enables any mechanic to readily erect this system.

Specifications—All skylights shall be of rolled steel, of a type to allow for free expansion and contraction and made tight without use of paint, cement or putty.

Sash bar shall be composed of a special U-channel 2 in. wide and 1½ in. deep, made of high carbon steel ½ in. in thickness.

A special moulded glass rest made of No. 16 gage steel shall be provided. This glass rest shall be formed in the shape of a trough and shall be supported on wrought iron stirrups which will be tap-bolted through the walls of the special U-bar.

A heavy non-absorbent asbestos cushion shall be placed over the glass rest. Cushion and glass rest shall be securely fastened to the wrought iron stirrup by means of brass or copper machine screw.

A special continuous moulded member shall be provided at eaves of skylights. Between this member and the glass shall be placed a non-absorbent asbestos cushion and same drawn up tight under glass by means of bolts at bar centers.

After glass is set in place, provide a metal spring cap 1¾ in. out to out of flanges. This cap shall be underlined with a sealing strip of non-absorbent asbestos material, held in position by being punched and strung over the cap bolts. Edges of sealing strip shall not protrude beyond edges of cap. Securely fasten cap by means of a brass nut.

All skylights to be glazed with ¼-in. ribbed wire glass.

All caps, combing and trim shall be of (specify copper, zinc, or galvanized iron).

After fabrication and before assembling the sash bars, all parts shall be thoroughly coated with an application of bitumastic solution (or specify hot galvanizing).

Jeter's Improved Cast Iron Roof Drains.

These drains are decidedly superior to the troublesome old style drains and are offered at about the same cost as the latter.

They are adapted for use with interior leaders on slag, gravel or promenade tile roofs, with either concrete or wood construction.

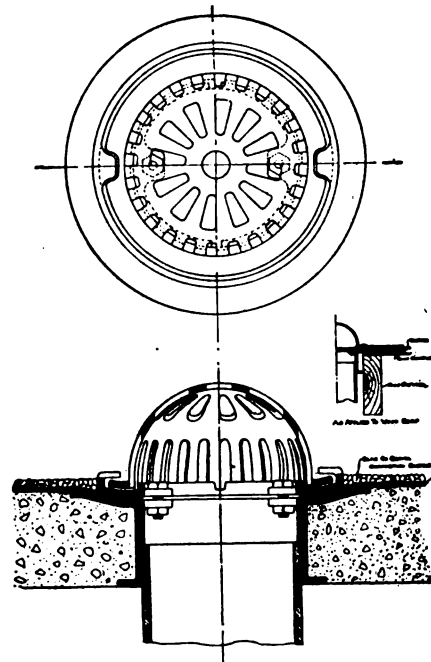
They are substantially constructed of cast iron, insuring service for the life of the building.

No extra metal flashing is required, as the roof material is flashed directly to the drain and clamped

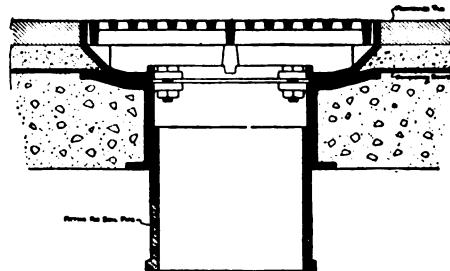
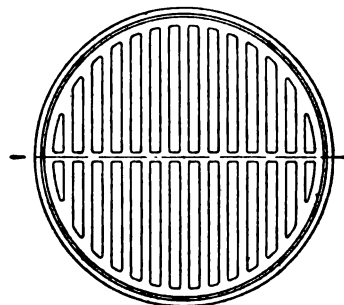
down in place by flashing rim, which also forms gravel or tile stop.

Being incorporated in concrete roof slab or fastened to wood construction eliminates any chance of shrinkage or separation between roofing material and drain, and proof against leakage is assured.

Their simplicity, few parts, ease of installation, durability and economy make them ideal drains.



For Slag or Gravel Roofs



For Promenade Tile Roofs

DETAILS OF JETER'S CAST IRON ROOF DRAINS
(One-eighth full size)

ESTABLISHED 1873

E. VAN NOORDEN & COMPANY

Skylights and Ventilators

TELEPHONE:
ROXBURY 3040, 3041, 3042

100 Magazine Street, near Massachusetts Avenue
BOSTON, MASS.

Products.

Manufacturers of "ANCHOR-BAR," ROLLED STEEL, PUTTYLESS SKYLIGHTS; GALVANIZED STEEL OR COPPER VENTILATORS.

Also manufacturers of Sheet Steel and Copper Skylights of every type, Sheet Steel or Copper Windows, Kalamain Doors.

Rolled Steel, Puttyless Skylights, "Anchor-Bar" Type (Patent No. 931638).

The opportunity of suggesting framework for any type of glazed roof is solicited, and saving in steel framework is assured.

The Van Noorden rolled steel puttyless skylight is designed for large skylight areas. Fewer purlins or steel supports are required than for any other skylight.

The structural parts of rolled steel and trim of sheet metal (generally copper) form an unsurpassed combination for strength and weather protection.

Bar—A tee and angle combination. Angle member serves as condensation gutter. Glass rests loosely on cushion of pure wool felt.

Curb—Continuous steel reinforcement at the base. The thrust of skylight bars is directly against this member, which must hold while the curb holds.

Features—The combination of steel frame of bars, base and ridge form a self-supporting steel structure upon which the glass is loosely embedded after which the exposed sheet metal portions (generally copper) are applied. Caps secured with brass bolts.

Expansion and Contraction—Amplly provided for. Sheet metal parts are independent of rolled steel parts. Glass sets loosely on the cushion of wool felt.

Accessibility for Repainting—Rolled steel members are readily accessible; sheet metal portions (preferably of copper), are impervious to weather conditions.



TRADE-MARK

Adaptability—Wherever overhead light is desired. Inquiries should state over all length of outside of curb, bar length, pitch of skylight (5 in. to the foot, or more) and distance between intermediate purlins.

"Anchor Truss Bar" (Patent No. 1140909)—Used where bar length is more than 11 ft., unless intermediate

purlins are provided. Truss bars are self-supporting for a bar length up to 17 ft. The saving effected in the steel frame support is far greater than the excess cost of truss bar construction. Details on application.

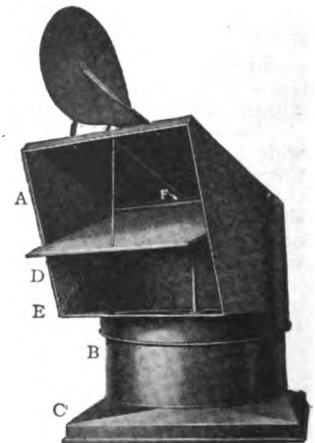
"Storm King" Rotary Ventilator.

Consists of a stationary barrel surmounted by a sensitive ball bearing, flare shaped head that is always in correct position to the wind.

Insures free exhaust.

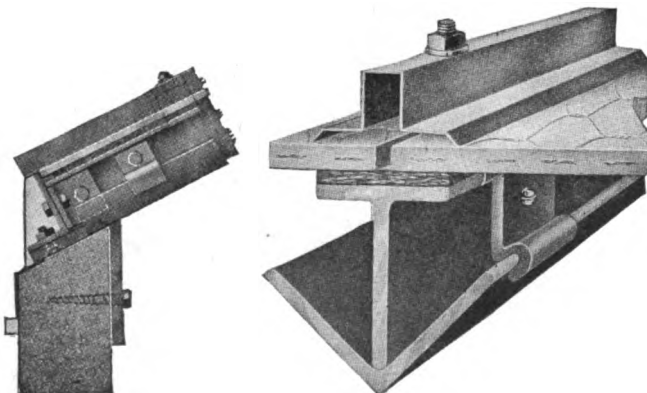
Hinged damper, weatherstripped at top, permits full capacity when open and completely seals mouth of ventilator and prevents back action of snow, etc., when closed. Gutters provided at sides of damper.

The damper is operated by a chain, through tubular spindle, which can not foul braces or supports.



"STORM KING" ROTARY BALL BEARING VENTILATOR

A—revolving head; B—fixed barrel; C—base; D—gravity damper (half open); E—side gutter insuring tightness of damper; F—weatherstrip



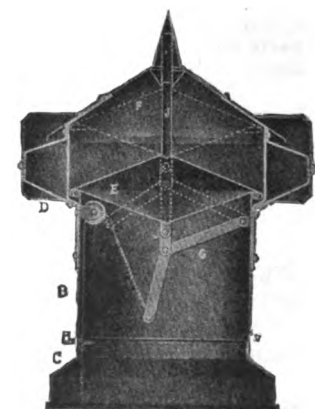
SECTION THROUGH CURB "ANCHOR-BAR" SKYLIGHT

SECTION OF BAR IN "ANCHOR-BAR" SKYLIGHT
About one-half full size

"Simplex" Ventilator with "Suretite" Damper.

Consists of a stationary barrel and head with sliding damper.

When closed, the damper completely seals the top of shaft insuring absolute weather-tightness. Damper is of double cone form. With damper open, lower cone accelerates up-draft in shaft and prevents back-draft. With damper closed, upper cone sheds filtration of fine snow. Damper can be locked in various positions.



"SIMPLEX" VENTILATOR WITH "SURETITE" SLIDING DAMPER

A—head; B—barrel; C—base; D—weather shield; E—"Suretite" gravity sliding damper (closed); F—damper (open); G—operating arm; H—chain lock (locking damper in open position); J—telescopic damper guide; K—gutter (for condensation)

J. C. KERNCHEN, PRESIDENT

AREX COMPANY

Industrial Ventilating Engineers

TELEPHONE:
FRANKLIN 5453, 5454

1598 Conway Building
CHICAGO, ILL.

BRANCH OFFICES IN ALL PRINCIPAL CITIES

Product.

AREX ORIGINAL SIPHONAGE ROOF VENTILATOR.

Also manufacturers of Arin Antidraft Window Ventilators.

Arex Siphonage Roof Ventilator.

The Arex ventilator assures, by natural means, constant, positive, uniform ventilation for any kind of building—mills, factories, foundries, warehouses, power plants, train sheds, etc. Foul air, warm air, fumes, gases, vapors, steam and smoke are quickly and completely removed.

Description—Passing wind plays upon the siphons so as to accelerate the outflow of foul air from interior of building, but it permits none of the outside wind to enter the ventilator. Every opening an outlet.

Of galvanized iron, ingot or Toncan metal, cold rolled copper or any other special metal in any size or gage. Brass bolts connecting the frustum to the siphons permit installation in two halves and facilitate painting inside and outside after installation.

Advantages—Down-drafts impossible; constant, positive ventilation assured; 300% greater air exhaust obtained; half the number of ventilators required. No cost for maintenance or operation; every joint securely riveted; no solder used; no movable parts; the whole is one strong, solid piece. Approved by leading and most prominent architects and engineers in the country; also by government officials.

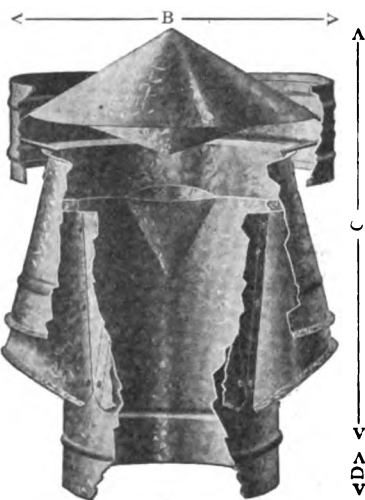
How to Specify—Simply multiply cubical contents of room by number of air changes required per hour. The capacity table will tell exactly the size and number of Arex to use.

Shipments—Prompt shipments from large stock.

Co-operative Service.

Installations shown below are standard; special bases and pipe connections to order. Submit sketch.

The Arex Engineering Department gladly offers expert advice on any ventilating problem without obligation.



SECTIONAL VIEW OF AREX VENTILATOR
Showing siphonage system and extraordinary outlet for escape of air

DATA, AREX VENTILATORS

Principal dimensions, in.				Area, sq. in.	Exhaust per hour, cu. ft.	Gage of metal	Price f.o.b. Chicago	Principal dimensions, in.				Area, sq. in.	Exhaust per hour, cu. ft.	Gage of metal	Price f.o.b. Chicago
A	B	C	D					A	B	C	D				
6	9	12	1 1/4	28	9,425	26	\$10.00	30	45	60	4 3/4	707	235,619	20	\$72.00
7	10 1/2	14	1 1/2	38	12,828	26	11.00	36	54	72	5	1,018	339,293	20	99.00
8	12	16	1 3/4	50	16,755	26	12.00	42	63	84	5 1/4	1,385	461,813	20	147.00
9	13 1/2	18	2	64	21,206	26	13.00	48	72	96	5 1/2	1,810	603,187	20	198.00
10	15	20	2 1/4	79	26,180	24	14.00	54	81	108	5 3/4	2,290	763,407	18	280.00
12	18	24	2 1/2	113	37,699	24	16.00	60	90	120	6	2,827	942,477	18	395.00
14	21	28	2 3/4	154	51,313	24	18.00	66	99	132	6 1/4	3,421	1,140,397	16	540.00
16	24	32	3	201	67,021	24	22.00	72	108	144	6 1/2	4,072	1,357,167	16	698.00
18	27	36	3 1/4	254	84,823	24	26.00	84	126	168	6 3/4	5,342	1,847,256	14	1,125.00
20	30	40	3 1/2	314	104,720	22	32.00	96	144	192	7	7,238	2,412,743	14	1,610.00
22	33	44	3 3/4	380	126,711	22	38.00	108	162	216	7 1/4	9,161	3,053,626	12	2,185.00
24	36	48	4	452	140,796	22	44.00	120	180	240	7 1/2	11,310	3,769,900	12	2,930.00
26	39	52	4 1/4	531	176,976	22	52.00	132	198	264	7 3/4	13,685	4,561,621	10	3,690.00
28	42	56	4 1/2	616	205,251	22	61.00	144	216	288	8	16,286	5,428,667	10	4,575.00

Above prices are for galvanized Arex ventilators.

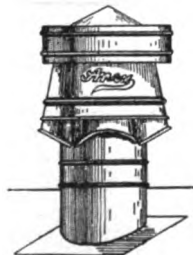
Prices for American ingot iron or Toncan metal, add 10%.

Prices for cold rolled sheet copper Arex ventilators on application.

These prices do not include bases, condensation arresters, or dampers.



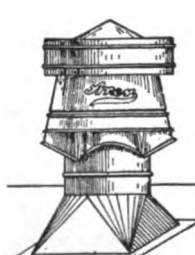
AREX ORIGINAL SIPHONAGE VENTILATOR (PATENTED)



No. 3
Round Base for Slant
Roof



No. 5
Round Base for Gable
Roof



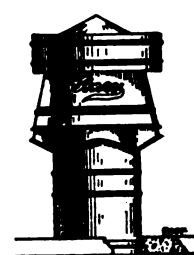
No. 8
Square to Round Base
for Slant Roof



No. 9
Square to Round Base
for Gable Roof



No. 12
Square to Round Base
with Shoulder for
Gable Roof



No. 13
Round Base for Flat
Concrete Roof with
Angle Iron Ring
at Bottom

TYPICAL STANDARD INSTALLATIONS OF AREX ORIGINAL SIPHONAGE VENTILATORS

ACME VENTILATOR CORPORATION

399 Atlantic Avenue
BOSTON, MASS.

Products.

ACME AUTOMATIC ROTARY VENTILATOR (United States Patent No. 1202842; Dominion of Canada Patent No. 189715).

AIROUT AUTOMATIC BALL BEARING VENTILATOR. (Patent applied for.)

Acme Automatic Rotary Ventilator.

ADVANTAGES—No corrosion; no squeaks; no oil used; no down-drafts; absolutely weatherproof.

DESCRIPTION—Made of galvanized steel, Toncan iron, and copper. Painted standard or acidproof. Most simple, stable, and durable automatic rotary ventilator known to be in use.

CONSTRUCTION—*Point*—Ventilator revolves on case-hardened steel point against cast iron center, a method considered practical and satisfactory as the result of more than ten years' experience.

Air Congestors—Cause greater suction by actual scientific tests than any other known ventilator on the market.

gestors. Larger sizes are bound with $\frac{1}{8}$ -in. wire to increase the strength and stability.

Sail—Made of heavy gauge material and braced to add to its stability.

Bases—Can be furnished when required. In such cases, detailed specifications should accompany order. When questions as to position and construction are involved, the engineering department is ready to assist with an expert service based upon more than twenty years' experience in solving ventilator problems.

OPERATION—Cone is always kept pointed to the wind which passes through large outer openings of the air congestors (one on either side of cone), the constant pressure forcing the air through the smaller inside openings at higher velocity, thus the slightest movement of air outside automatically creates a strong and constant suction that draws air within the building upward through the ventilator pipe and out the exhaust opening. The outer rim of the storm guard—extending beyond and being separated from rim of the cone by space shown in Plate B—serves both as protection against weather and to increase suction power.

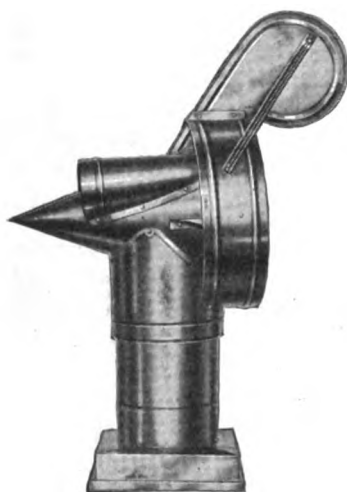


Plate A



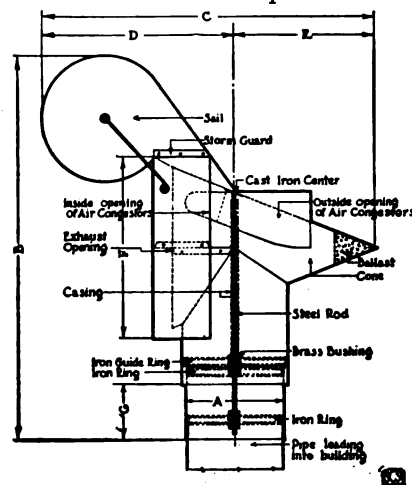
Plate B

VIEW OF ACME VENTILATOR
Showing exhaust opening, storm guard, etc.

Ballast—Causes equal pressure on sides of rod so that ventilator rotates to the slightest breeze.

Brass Bushing and Rod Protector—The friction part of the rod passing through the iron ring is protected by a brass bushing. Rod between point and bushing is protected by metal casing, making friction part proof again dust and dirt.

Storm Guard—Adds stability, makes ventilator weatherproof, and increases pulling force of air con-



DETAIL OF ACME AUTOMATIC ROTARY VENTILATOR

Size, in.	Dimensions, in.						
	A	B	C	D	E	F	G
4	4	16	13 1/4	7 1/4	6	7 1/4	3 1/4
6	6	24	20 1/2	11 1/4	8 1/4	11 1/4	5
8	8	32	27 1/2	15 1/4	11 1/4	15	6 1/4
10	10	40	34 1/4	19 1/4	14 1/4	18 1/4	8 1/4
12	12	48	41 1/4	23 1/4	17 1/4	22 1/4	10
14	14	56	48	27 1/4	20 1/4	26 1/4	11 1/4
16	16	64	55	31 1/4	23 1/4	30	13
18	18	72	61 1/4	35 1/4	26 1/4	33 1/4	15
20	20	80	68 1/4	39 1/4	29 1/4	37 1/4	17 1/4
22	22	88	75 1/4	43 1/4	32 1/4	41 1/4	18 1/4
24	24	96	82 1/4	47 1/4	35 1/4	45	20
30	30	120	103	59	44	56 1/4	25



GEO. H. LINCOLN CO. BUILDING, SOUTH BOSTON, MASS.



CARTER'S INK CO. BUILDING, CAMBRIDGE, MASS.



MERRIMAC MANUFACTURING CO., LOWELL, MASS.

SPECIFICATIONS—Should read as follows:

Acme automatic rotary ventilator, in. diameter, to exhaust cu. ft. per hour with a wind velocity of $6\frac{1}{2}$ miles per hour.

NOTE—Insert number of cubic feet according to size and as given in table below:

DATA, ACME AUTOMATIC ROTARY VENTILATORS

Size, in.	Cap., cu.ft. per hour	Galvanized Iron Ventilators			Copper Ventilators		
		Gauge of metal	Weight, lbs.	Price	Weight of metal, oz.	Weight, lbs.	Price
4	5600	26	5	\$12.00	16	5½	\$18.25
6	12169	26	10	16.00	16	11	25.40
8	22418	26	16½	20.00	16	18	32.50
10	35028	26	29½	24.00	16	32	39.70
12	50441	26	40	29.00	16	44	47.75
14	68656	26	58	36.00	16 and 18	63	62.30
16	89673	26	73	45.00	16 and 18	80	75.00
18	113493	24	109	60.00	18	120	99.40
20	140115	22 and 24	140	72.00	18	154	115.75
22	175143	22	175	88.00	20	192	143.00
24	201765	22	217	112.00	20	238	172.00
30	314464	20	450	280.00	22	490	394.00

NOTE—The above exhaust capacities should be compared with other ventilators. These tests were made with actual outdoor working conditions, and are not the result of laboratory tests. Velocity of wind at time of tests, $6\frac{1}{2}$ miles per hour. Temperature inside, 68° ; outside, 50° . With higher temperature inside building and lower temperature outside, capacities would be greatly increased.

USES—*Exhausts*—Smoke, steam, gases, and fumes.

Drafts—For chimney to create suction and overcome down-draft.

Industrial and Public Buildings, Theaters, etc.—For lifting foul air, heavy gases, fumes, and smoke. The use of Acme ventilators greatly increases efficiency of labor.

COMPETITIVE TESTS—All representations made by this corporation are based on actual facts. An Acme ventilator will be placed in competitive tests with any known ventilator and a sample will be sent for trial, also an engineer to demonstrate.

Actual tests show the Acme with a 35% higher efficiency than any other known ventilator.

Consult the Engineering Department for any information and suggestions.

PARTIAL LIST OF USERS OF THIS COMPANY'S VENTILATORS:

Revere Sugar Refinery, East Cambridge, Mass.; Canadian Woollens, Limited, Peterboro, Canada; General Electric Company, West Lynn, Mass.; Massachusetts Institute of Technology, Cambridge, Mass.; Amoskeag Mfg. Co., Manchester, N. H.; Broadway Iron Foundry Co., Cambridge, Mass.; W. H. McElwain & Co., Merrimac, N. H.; Winchester Laundry, Winchester and Lowell, Mass.; Boston Woven Hose and Rubber Co., Cambridge, Mass.; Home Bleach and Dye Works, Pawtucket, R. I.; Assabet Mills, Maynard, Mass.; National Shawmut Bank, Boston, Mass.; Merrimac Paper Co., Lawrence, Mass.; Merrimac Chemical Co., South Wilmington, Mass.; Parkhill Mfg. Co., Fitchburg, Mass.; Austin Co., Cleveland, Ohio; Great Northern Paper Co., Millinocket, Me.; Manhattan Print Works, New York, N. Y.; A. C. Lawrence Leather Co., Peabody, Mass.; Lever Bros. Soap Co., Cambridge, Mass.; Comique Theater, Lynn, Mass.; Perfection Cooler Co., Michigan City, Ind.; Queen Dyeing Co., Providence, R. I.; Wanskuck Co., (Steer Mill), Providence, R. I.; U. S. Navy Yards, Charlestown, Mass. and Portsmouth, N. H.

Airout Automatic Ball Bearing Ventilator.

ADVANTAGES—Patented, ball bearing race; dust-proof and weatherproof attachments.

MATERIAL—Rust resisting galvanized iron and copper construction. Ventilator revolves on patented ball bearing attachment with metal casing to protect all parts from dirt and condensation, making it absolutely dust-proof.

BALL BEARING—Patented ball bearing attachment fastened to revolving head of ventilator and fitted over end of machined, cold rolled steel rod, insuring free and easy rotation.

STEEL ROD—Steel rod machined on top to receive ball bearing attachment, guided through ring on bottom of revolving part of ventilator, extended down and through ring fastened to stationary part of ventilator, secured and held permanent by locknuts.

BRASS BUSHING AND ROD PROTECTION—Friction part of rod passing through iron ring is protected by brass bushing, and rod between bearing and bushing is protected by metal casing, making rod and bearing proof against dust, condensation, and corrosion.

BALLAST—Counterweights placed on back of ventilator to insure proper balance, so that head will rotate to slightest breeze.

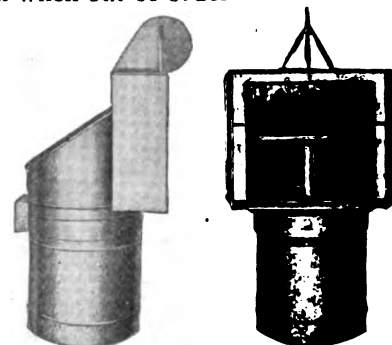
DAMPER—Damper is of the butterfly type, weighted and placed in main pipe of ventilator, eliminating pulleys and chains, which when out of order interfere with the mechanical operation.

STORM GUARD—Adds stability and greatly increases pulling force.

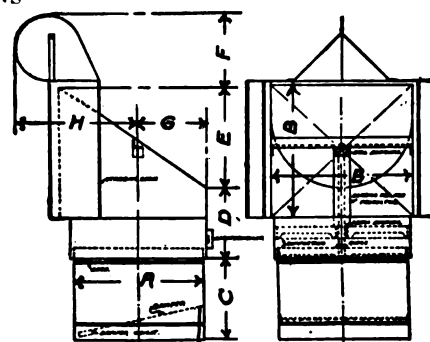
SAIL—Made of heavy gauge material and braced to add to its stability, keeping ventilator in proper position in relation to wind.

SPECIFICATIONS should read as follows:

Airout automatic ventilator, in. diameter, to exhaust cu. ft. per minute with a wind velocity of 5 miles per hour; all ventilators to be equipped with storm guard, ball bearings, rod and bearing protector, and butterfly damper in barrel of ventilator.



AIROUT VENTILATOR



DETAILS OF AIROUT VENTILATOR

DIMENSIONS OF AIROUT VENTILATORS

Size	Dimensions, in.								Gauge of metal	Oz. copper	Net, wgt., lbs.	Cu. ft. per min.
	A	B	C	D	E	F	G	H				
8	8	8½	5	4½	6½	4½	4½	7	24	18	12	160
10	10	10½	6½	5½	8	5½	5½	8½	24	18	15	250
12	12	12½	7½	6½	9½	7	6½	10½	24	18	25	350
14	14	14½	8½	7½	11	8½	7½	12½	24	18	38	460
16	16	16½	10	8½	12½	9½	8½	14	24	18	50	625
18	18	18½	11½	9½	14½	10½	9½	15½	24	18	56	825
20	20	20½	12½	10½	15½	11½	10½	17½	24	18	62	1000
24	24	25	15	13	19	14	12½	21	24	18	105	1375
30	30	31	18½	16½	23½	17½	15½	26	22	20	150	2100
36	36	37½	22½	19½	28½	21	18½	31½	22	24	200	3200
42	42	43½	26½	22½	33½	24½	22	37	20	26	280	4250
48	48	50	30	26	38	28	25	42	20	26	475	5550
54	54	56½	34	29	42½	31½	28	47	20	28	650	6850
60	60	62½	37½	32½	47½	35	31	52½	20	28	750	8575

THE AMERICAN VENTILATING COMPANY

Martin Building, N. S.
PITTSBURGH, PA.

CABLE ADDRESS:
"AMVECO"

BRANCH OFFICES IN NEW YORK, SAN FRANCISCO,
AND ALL PRINCIPAL CITIES

CODES USED:
Western Union
and Lieber

Product.

AMERICAN-LARSON SUCTION VENTILATOR.

Most Economical.

The American-Larson ventilator is surprisingly inexpensive; costs no more than any other and less than some. Because of its tremendous exhaust, half the number of proportionately smaller sizes are required for desired results. Thus considerable savings are effected by eliminating unnecessary ventilators, by minimizing the number of holes in the roof, and by reducing transportation and installation costs. The first cost of the American-Larson is the only cost.

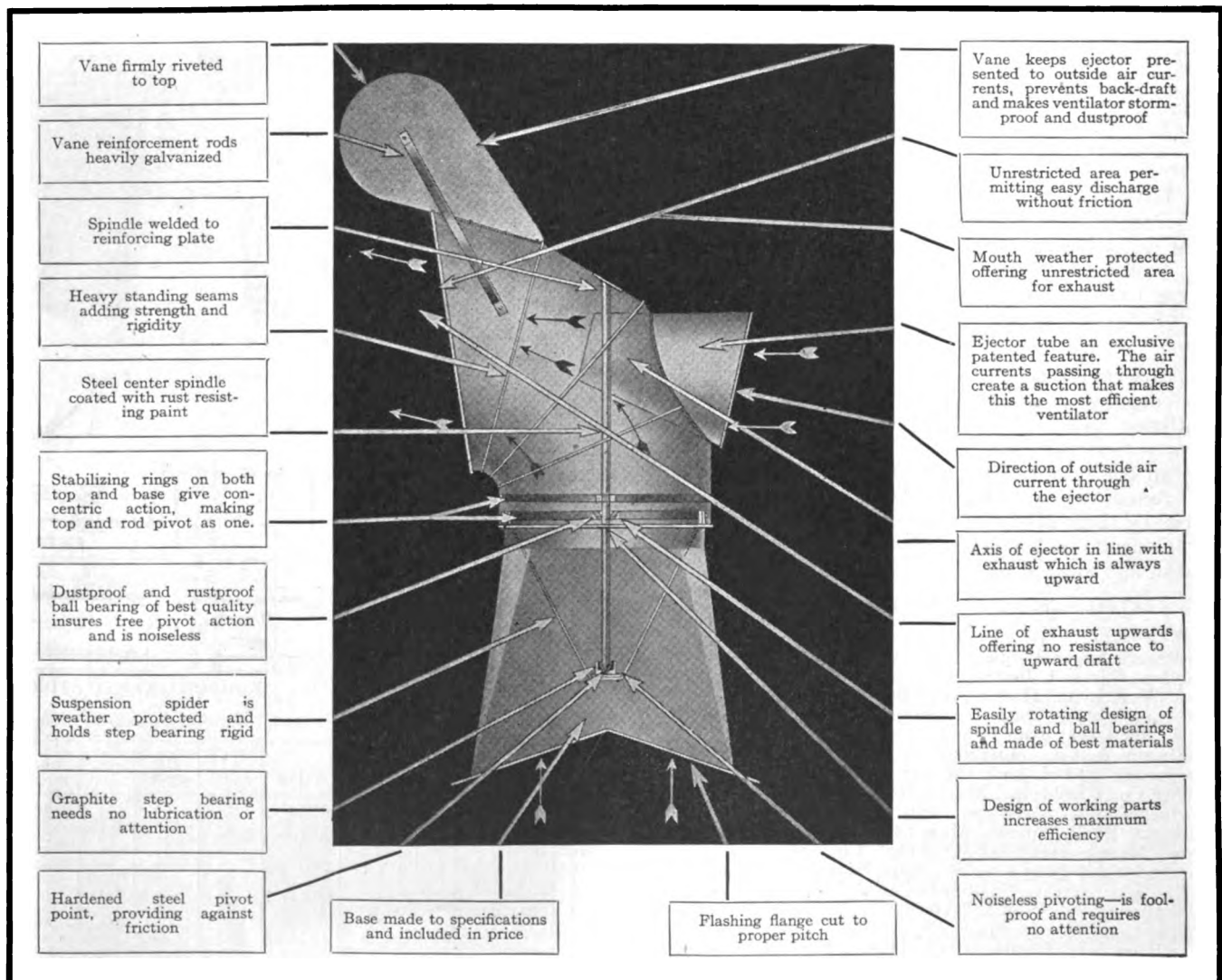
Scientific Design.

It is the first ventilator designed on the siphon principle that applies that principle in a logical way, insuring maximum efficiency under all conditions. The American-Larson Suction Ventilator consists of a piv-

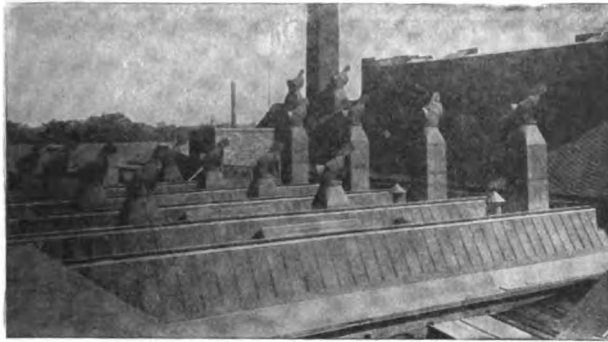
oted elbow cowl having its mouth inclined in a slightly upward direction. Inserted in the back of this cowl is a cone-shaped tube with its axis parallel to the line of discharge. The vane keeps the suction tube in alignment with the slightest change in the direction of the air currents. The air currents rushing through the cone-shaped tube into the larger space of the cowl by this siphon action induce an up-draft in the neck of the ventilator.

First Class Construction.

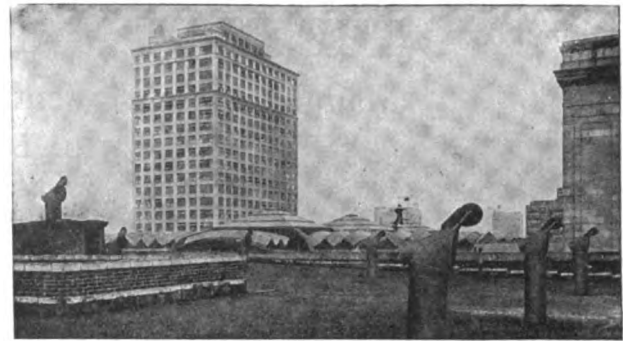
The American-Larson is union made, of the best materials, by the highest paid sheet metal workers in the United States. The graphic cut on this page gives a full description. There are no shutters or louvers to break off; no meaningless fancy trimmings to impede the ventilating action; nothing to rattle or wear out; nothing to get out of order. It outlasts any other ventilator.



AMERICAN-LARSON SUCTION VENTILATOR



A BATTERY OF AMERICAN-LARSON AT ERIE MALLEABLE IRON WORKS, ERIE, PA.



AMERICAN-LARSON VENTILATORS ON PENNSYLVANIA R. R. STATION, NEW YORK, N. Y.

Superior Points.

In seven years use by the largest corporations in the United States and Canada, the American-Larson Suction Ventilator has proved 'self to be the most efficient of its type. It gives constant, positive, and uniform ventilation whenever all other means and devices fail.

First: It is the most efficient, harnessing the breeze to induce an up-draft.

Second: It will exhaust more air for less money.

Third: It will remove heavy fumes and steam heretofore requiring power ventilation.

Fourth: It is stormproof and dustproof, and requires no attention.

Fifth: It pivots freely when it comes to you, and keeps on doing so for its full life.

Sixth: It will not back-draft even under the most unfavorable conditions.

Seventh: Its first cost is the only one.

Adaptability.

The American-Larson is the ideal ventilator for mills, factories, foundries, warehouses, schools, theaters, power plants, train sheds, barns, railway cars, ships, etc.; for completely and quickly removing foul air, warm air, fumes, gases, vapors, steam, smoke. Install it on flat roofs, slant roofs, sawtooth roofs; on skylights, monitors, etc.; everywhere pure air benefits living beings; everywhere vitiated air contaminates perishable products; everywhere a rapid change of air or temperature is required.

Guaranteed Capacities.

Base your specifications on the reliable, accurate official figures below. Made with inspected anemometers. Approved by the United States Government.

Following are the guaranteed capacities of American-Larson suction ventilators, the breeze velocity being 5 miles per hour:

SIZE	CU. FT. PER HR.
8-in.	11,550
10-in.	17,820
12-in.	24,800
14-in.	34,980
16-in.	46,200
18-in.	58,410
20-in.	71,940
24-in.	103,620
30-in.	161,700
36-in.	232,890
40-in.	287,760
48-in.	412,500
54-in.	524,700
60-in.	646,800
66-in.	782,100

Ventilating Service.

The installation of ventilators and ventilating systems has its peculiar angles and its individual problems which should have the attention of trained minds. We therefore place at your service our corps of ventilating engineers. We solicit an opportunity to serve as ventilating counselors, and welcome actual tests against any ventilator in existence, under your supervision.

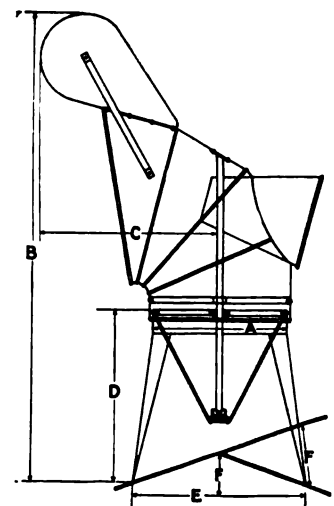
DIMENSIONS IN INCHES, GAUGES, WEIGHTS, PRICES AND CODE WORDS
(All ventilator prices include base)

A in.	B in.	C in.	D in.	E in.	Iron gauge	List price, damper	List price, ventilator	Net weight, lbs.	Crated weight, lbs.	Code word
8	27 1/2	10 1/2	10 1/2	10 1/2	24	\$1.50	\$18.00	12	26	Amen
10	34 1/2	13 1/2	12 1/2	12 1/2	24	2.15	22.00	18	35	Amable
12	41 1/2	16	13 1/2	13 1/2	24	2.90	30.00	26	46	Amend
14	48 1/2	18 1/2	17 1/2	17 1/2	24	3.30	35.00	32	57	Amity
16	55 1/2	21 1/2	20 1/2	20 1/2	24	3.80	40.00	39	70	Amid
18	62 1/2	24	21 1/2	21 1/2	24	4.30	45.00	49	85	Amis
20	69 1/2	26 1/2	25 1/2	25 1/2	22	4.80	50.00	68	115	Amerce
24	83 1/2	32	30 1/2	30 1/2	22	5.80	60.00	92	145	Amulet
30	104 1/2	40	38 1/2	38 1/2	20	7.15	75.00	146	206	Amuse
36	125 1/2	48	46 1/2	46 1/2	20	9.30	110.00	225	325	Amour
40	139 1/2	53 1/2	51 1/2	51 1/2	20	11.50	140.00	282	412	Amaze
48	167 1/2	64	61 1/2	61 1/2	20	17.00	170.00	390	560	Amass
54	187 1/2	72	63 1/2	63 1/2	18	20.00	220.00	620	820	Amazon
60	208 1/2	80	76 1/2	76 1/2	18	25.00	300.00	790	1025	Amain
66	229 1/2	88	84 1/2	84 1/2	18	35.00	375.00	930	1215	Ammonia

Code: Ship at once by freight. Amethyst
Ship at once by express. Amplify
Price, f. o. b. Pittsburgh. Amount

Price, f. o. b. destination. Ambrosia
How soon can you ship? Amateur

For "A," "B," "C," "D," and "E," see dimension drawing. In ordering, only dimension "A" is required.



THE BURT MANUFACTURING CO.

Manufacturers of Ventilators and Exhaust Heads

601 High Street
AKRON, OHIO

Products.

"BURT" VENTILATORS: Double Damper, Fan, Sliding Cone Damper, and Ball Bearing Revolving; "BURT" EXHAUST HEADS.

For Oil Filters, see pages 1080-82.

"Burt" Ventilators.

By means of "Burt" ventilators, impure air, hot air, smoke, steam and gas are taken out of buildings automatically and without any operating expense. The "Burt" glass-top ventilator constitutes both a skylight and a ventilator.

Whether ventilator is closed or open, the air shaft remains always unobstructed. Manufactured in any size required. Regular patterns are built throughout of galvanized iron, of suitable weight for each size. May be made with a metal top instead of a glass top, when required, either type of which may be mounted on top of a skylight or on the ridge of a roof.

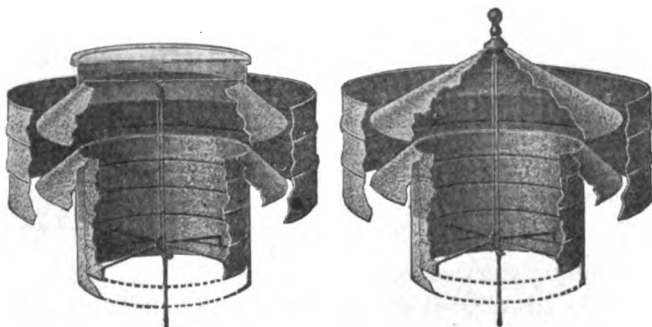


FIG. 1A. "BURT" GLASS-TOP VENTILATOR
Sectional view

FIG. 2A. "BURT" METAL-TOP VENTILATOR
Sectional view

"BURT" DOUBLE DAMPER VENTILATOR (Patented)—Designed especially for weave sheds. It is being adopted by two-thirds of the new textile mills now being erected in the Eastern States.

When condensation is very severe, lower damper acts as a drip pan and collects moisture, and later this evaporates. Lower drip pan is placed below bottom damper as a safety device. In case lower damper should overflow, this collects all surplus water. The condensation trough in the air shaft collects a great deal of moisture and passes this to outside of ventilator.



FIG. 3F. "BURT" DOUBLE DAMPER VENTILATOR
Open

"BURT" FAN VENTILATOR—This ventilator will remove quickly and at a slight expense excessive fumes and odors in blacksmith shops, foundries, rubber factories, laundries, etc. Adapted for the most difficult conditions and will be found much more economical than the average blower system and just as effective.

Fan, operated either by pulley or by motor, at a speed of 350 to 400 revolutions per minute (requiring from $\frac{1}{4}$ to $\frac{1}{2}$ h.p.) will remove 10 times more air in a given length of time than the average stationary ventilator. Fully equipped with ball bearings.

In case of fire, the fusible links will break, causing damper to drop and shut off draft. Manufactured in 8 sizes; namely, 30, 36, 40, 48, 54, 60, 66, and 72 in.

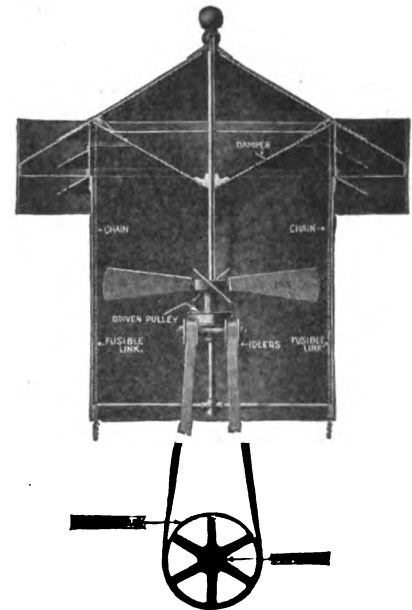


FIG. 4D. "BURT" FAN VENTILATOR
Sectional view

"BURT" SLIDING CONE DAMPER VENTILATOR—A strictly high grade cone damper, which automatically closes in case of fire. The raising and lowering device (patent applied for) is simple in construction, positive in action, and guaranteed not to stick or bind (Fig. 5B). Made with metal tops, and with or without fusible links.

"BURT" BALL BEARING REVOLVING VENTILATOR—Fully equipped with high grade ball bearings and guaranteed not to stick or bind. Owing to its peculiar construction, all the air currents are allowed to pass directly through the ventilator. (Fig. 6R.) Every ventilator is fully erected and tested before shipment.



FIG. 5B. "BURT" SLIDING CONE DAMPER VENTILATOR
Showing cone damper open

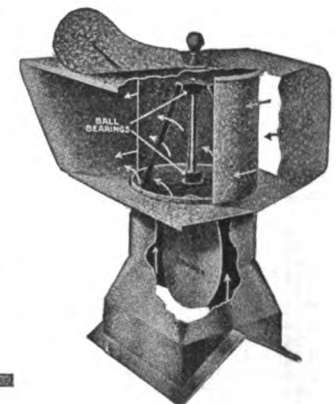


FIG. 6R. "BURT" BALL BEARING REVOLVING VENTILATOR
Sectional view

DIRECTIONS FOR ORDERING—In ordering bases always furnish sketch showing pitch of roof, and location of ventilators whether on ridge or slope, and round or square.

Ventilator bases are charged for extra, for which figures will be quoted on receipt of specifications. All bases equipped with dampers without extra charge.

Prices on ventilators made of copper, Toncan, American ingot iron, or any other material desired will be furnished on application.

DATA, "BURT" VENTILATORS

Diameters, in.	Neck	Outer rim or band	Gage of iron	Height without base, in.		Length air shaft from bottom of wind-shield, in.	Net weight without crating, lbs.		Area of diameter in sq. in.	Price
				Glass top	Metal top		Metal top	Glass top		
12	22	22	22	14	17	4 1/4	17	20	113.10	\$8.00
14	24	22	22	15	17 1/2	4 1/4	20	24	153.94	12.00
16	26	22	22	15 1/2	19	5	24	30	201.06	15.00
18	29	20	20	16	21	5 1/2	28	34	254.47	19.00
20	32	20	20	18	23	5 1/2	33	42	314.16	23.00
24	38	20	22	22	26	6	45	56	452.39	27.00
30	46	18	24	30	30	6	90	105	706.85	38.00
36	54	18	27	36	36	8	130	155	1017.88	57.00
40	64	18	33	40	40	10	175	200	1256.00	75.00
42	68	18	34	42	42	10	190	225	1386.00	81.00
48	78	18	36	46	46	11	300	320	1809.00	90.00
54	86	18	40	51	51	14	350	400	2390.00	105.00
60	94	16	43	54	54	12 1/2	430	480	2827.00	120.00
66	102	16	46	55	55	15 1/2	500	550	3456.00	135.00
72	110	16	51	66	66	15 1/2	560	610	4071.00	150.00

Prices f. o. b. Akron, Ohio, and include sliding sleeve damper. Ventilator bases are charged for extra, for which prices will be quoted on receipt of specifications. Operating rope or chain not furnished.

GUARANTEE—This company expressly agrees to replace, free of charge, any of its ventilators which shall at any time be found to have been defective in workmanship or material.

CO-OPERATIVE SERVICE—The engineering department of this organization will gladly and expeditiously co-operate with engineers, architects, contractors and others, in the selection of proper types and sizes of ventilators, to suit particular conditions and requirements. Blue prints of all types will be furnished on application.

REFERENCES—A few prominent users are here given:

COMPANY	No. ORDERS
U. S. Steel Corporation	417
U. S. Government	111
Standard Oil Co.	161
American Beet Sugar Co.	23
Stone & Webster Engineering Corporation	49
American Steel & Wire Co.: Cleveland, Ohio, 116;	
Waukegan, Ill., 71; Joliet, Ill., 31; De Kalb, Ill.,	28
Goodyear Tire & Rubber Co., Akron, Ohio	17
Firestone Tire & Rubber Co., Akron, Ohio	26
Canadian Pacific Railroad Co., Montreal, Can.	389
Sheffield Farms-Slawson-Decker Co.	42

"Burt" Exhaust Head.

Attached to the exhaust pipe, this device prevents oil and wet steam from escaping, to drench and disfigure the building and rot the roof. Prevents condensed steam from falling on sidewalks, which in winter forms ice under foot. After cylinder oil has been removed, the water employed in steam system may be repeatedly used.

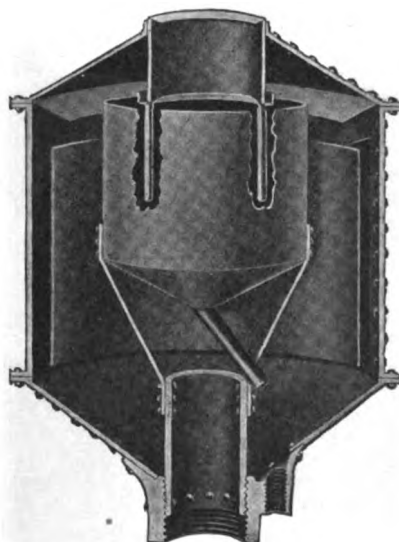


FIG. 7A. "BURT" EXHAUST HEAD
Sectional view

CONSTRUCTION—The "Burt" exhaust head is constructed with perpendicular sides, giving a large inside area, and providing abundant room for the expansion of the steam. With plenty of room for expansion, there is no back pressure; and as the area of the steam chamber is not lessened by useless stuffing, it is virtually increased. There are no baffle plates, no diaphragm nor scrap metal. This means the avoidance of friction, and increases the life of the apparatus.

The "Burt" exhaust head is equipped with malleable iron bases and drips (galvanized). Seams and attachments are watertight; the head can not overload or blow up if proper size is ordered.

DATA, "BURT" EXHAUST HEADS

Size of exhaust pipe, in.	Height, in.	Diam., in.	Size of drip, in.	Net weight, lbs.	Shipping weight, lbs.	Price
1 or 1 1/4	16	10	1	18	30	\$12.00
2 or 2 1/4	18	12	1	25	40	15.00
3 or 3 1/4	20	14	1	35	55	18.00
4 or 4 1/4	27	16	1 1/4	50	70	24.00
5	29	18	1 1/4	70	100	30.00
6	31	20	1 1/4	90	130	36.00
7	36	22	1 1/4	100	150	45.00
8	39	24	1 1/2	125	180	54.00
9	43	26	2	168	225	63.00
10	46	30	2	168	225	75.00
11	46	30	2	190	260	80.00
12	48	32	2	213	300	90.00
13	51	34	2	248	340	105.00
14	56	36	2	280	375	120.00
15	59	39	2	315	435	145.00
16	62	42	2	350	500	160.00
17	69	45	4	425	575	170.00
18	76	48	4	500	650	190.00
19	79	50	4	600	825	210.00
20	82	52	4	700	1000	225.00

Net f. o. b. Akron, Ohio

STANDARD EXHAUST HEADS—Designed for the utilization of centrifugal force for separating water and oil from exhaust steam. Due to the cone shape of the head, the incoming steam is given a whirling motion at the top of the head, and the water and oil strike the sides, flow down the drip outlet at the bottom, and thus do not come in contact with the incoming steam.



FIG. 8F. STANDARD EXHAUST HEAD
Sectional view

LARGE EXHAUST HEADS—Where an exhaust head is used in connection with a rolling mill engine or hoisting engine, or where the exhaust is extremely severe, the individual conditions require special treatment. Large exhaust heads furnished any size desired and manufactured from any weight of iron specified. Quotations will be forwarded on receipt of information as to the horsepower of the engine and whether or not same is overloaded and the exhaust is severe.

REFERENCES—Among recent equipment of special exhaust heads have been the following:

Jones & Laughlin Steel Co., Pittsburgh, Pa., 30-in., No. 10 gage
Salem Iron Co., Leetonia, Ohio, 37 1/2-in., No. 10 gage
U. S. Steel Corporation, Pittsburgh, Pa., 42-in., No. 10 gage
Tennessee Coal & Iron Co., Birmingham, Ala., 24-in., No. 14 gage
Iroquois Iron Co., Chicago, Ill., 16-in., No. 10 gage
Anaconda Copper Mining Co., Butte, Mont., 24-in., No. 14 gage
Illinois Steel Co., 30-in., No. 10 gage

GLOBE VENTILATOR COMPANY

205 River Street
TROY, N. Y.

Products.

Sole manufacturer of "GLOBE" DOME TOP SUCTION VENTILATORS; "GLOBE" CHIMNEY CAPS and "GLOBE" VENTILATED RIDGING.

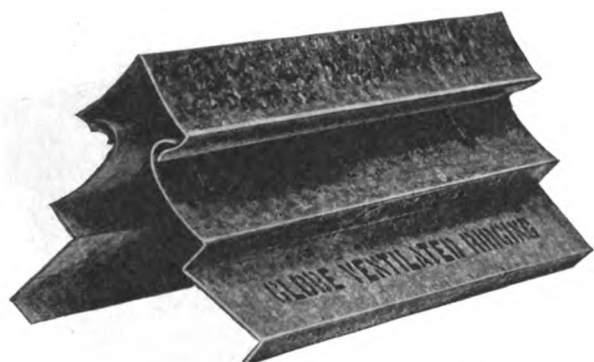
Also Barn Birdproof Ventilators; Special "Globe" Car Ventilators and "Globe" Lamp Jacks.

Uses.

"Globe" Ventilators—Especially adapted for removing excessive heat and foul air from churches, schoolhouses and public buildings; for exhausting steam, smoke and gases from mills, foundries and factories; and for expelling impure air, moisture and odors from barns and stables—in fact, they meet every requirement of ventilators.

Chimney Caps—Prevent downward currents in chimneys and increase drafts in sluggish flues.

"Globe" Ventilated Ridging—For use on buildings where it is not desired to break the skyline by placing ventilators.



"GLOBE" VENTILATED RIDGING

Description of "Globe" Ventilators.

The "Globe" ventilator is made in all materials, of the proper gages to give lasting service; it is strongly braced with extra heavy steel bands, and is riveted, making an exceptionally strong ventilator, which is efficient under all conditions.

Glass top ventilators possess all the qualities of the metal top ventilators, and are designed to secure the greatest degree of ventilation and the largest area of light.



GLASS TOP "GLOBE" VENTILATOR



"GLOBE" VENTILATOR, WITH REGULATION SQUARE BASE



Sectional View



Regular View

DOME TOP "GLOBE" VENTILATOR.

Anemometer Readings.

Below is given a test made on the "Globe" 24-in. ventilator with 6-in. outlet, under the low wind velocity of less than 5 miles an hour.

RENSSELAER POLYTECHNIC INSTITUTE
Department of Mechanical Engineering
Troy, N. Y.

No. of reading	Velocity of wind in miles per hour	Velocity of air in the ventilator in feet per minute	Temperature difference
1	4.41	468	38°
2	4.65	457	38°
3	4.36	462	38°
4	3.74	447	37°

(Signed) ARTHUR M. GREENE, JR., M. E.

PRICES, DIMENSIONS, AREA SQUARE INCHES AND GAGES OF MATERIALS

Size, in.	Gage of iron	Weight of copper, oz.	Extreme outside diameter, in.	Total height, in.	Area, sq. in.	Price list*
6	24	18	11 1/4	9	28	\$3.40
8	24	18	14	11	51	4.65
10	24	18	17	12	79	5.75
12	24	18	18 3/4	13	113	6.75
14	22	18	25	18	154	13.00
16	22	18	27 1/2	19	201	20.00
18	20	18	32	21	255	27.00
20	20	20	36 1/2	23	314	33.00
22	20	20	38	25	380	36.00
24	20	20	43 1/2	29	453	40.00
26	20	20	44	31	531	50.00
28	20	24	50	33	616	56.00
30	20	24	50 1/2	35	707	65.00
32	20	24	54	38	804	80.00
36	18	24	68	50	1018	120.00
40	18	24	74	57	1257	180.00
48	18	28	84	64	1810	240.00
54	18	28	92	67	2290	300.00
60	18	28	99	70	2828	360.00

*Subject to liberal discounts.

PAUL R. JORDAN & CO.

Manufacturers of the "Aero" Line of Ventilators

TELEPHONES:

AUTO 25-301
BELL-MAIN 535

HOME OFFICE AND FACTORY
INDIANAPOLIS, IND.

PACIFIC COAST REPRESENTATIVE
LOS ANGELES, CAL., W. H. STEEL, 600 Metropolitan Building—Telephones, 60871; Broadway 502

CANADIAN REPRESENTATIVE
MONTREAL, QUE., J. E. MCCARTHY, 617 New Birks Building

Products.

AEROPLANE ROTARY VENTILATORS;
AEROBOOST COMMON FOCUS VENTILATORS;
AEROPULL STORM BAND VENTILATORS; AERO-AUTOMATIC BASES.

Also manufacturers of Aero-automatic Fresh Air Intakes; Wall Boxes; Ventilating Systems Complete; Automatic Regulating Bases; Siphonage, Roof Barn, Toilet, Schoolhouse, Car, Dampened, Glass Top, and Revolving Ventilators.

The "Aero" Line.

There are three types of successful roof ventilators—the rotary, ejector or siphonage, and storm band. The "Aero" line presents the highest development in each type. It does not exploit any fantastic ideas, but harnesses each proved principle of air movement to take fullest advantage of that principle.

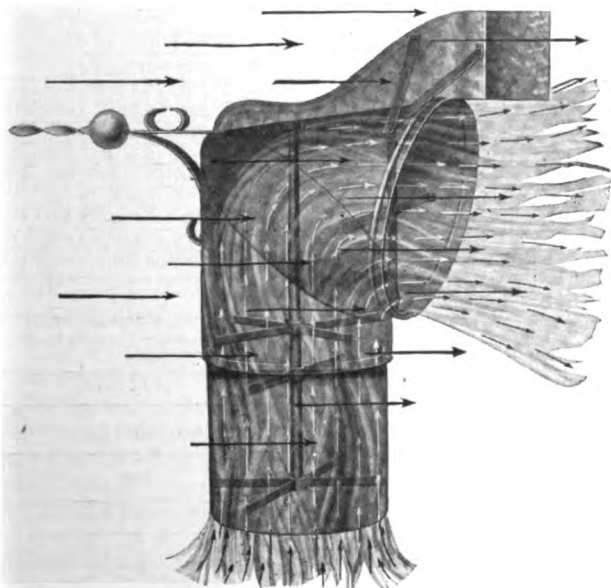
Aeroplane Rotary Ventilators.

A *top balanced* rotary ventilator, free swinging, perfectly balanced with a weight, well braced with steel flats set edgewise, reinforced with riveted steel segments, seamed and riveted throughout.

The *main bearing* at the top is of a special bronze on steel one-ball type, which is non-corrosive, is practically frictionless and has no setting tendency. Absolutely reliable under all conditions and requires no attention. It never sticks.

In operation it swings around, responding to wind direction, always keeping the mouth away from the wind. The wind blowing past the mouth creates a vacuum there, exerting a tremendous sucking action.

Four *special shaped planes* keep the mouth exactly away from the wind and from this accurate adjustment Aeroplane ventilators get their remarkable efficiency. Sensitive to the lowest air movement.

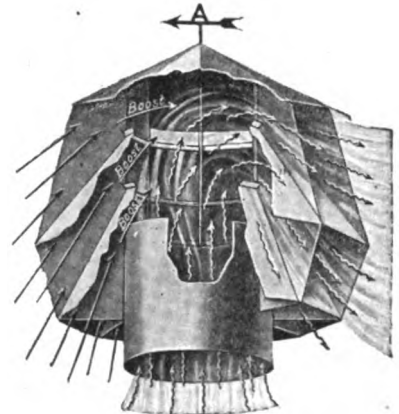


AEROPLANE ROTARY VENTILATOR

The "Aero" Line**Aeroboost Common Focus Ventilators.**

A highly efficient stationary ventilator Triple siphonage, or triple ejector type.

The three strata of ejector tubes are so focused as to give a boosting action to the exhausting foul air at every point in the same direction that it is moving, boosting it without causing eddies or whirls to impede its rapid flow.

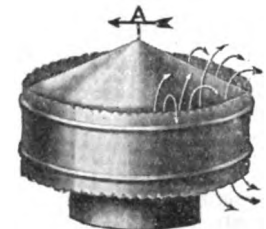


AEROBOOST COMMON FOCUS VENTILATOR

Aeropull Storm Band Ventilators.

A stationary type, well designed and well put up.

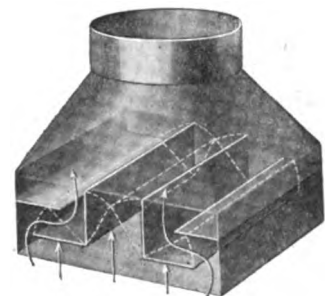
Its unequalled free exhaust area and generous dimensions eliminate the choking down tendency of poorly designed storm band ventilators.



AEROPULL STORM BAND VENTILATOR

Aero-automatic Bases.

A base that can be used with any ventilator, giving automatic regulation to the flow of air out the flue. Is noiseless; needs no oiling or attention of any kind. Is well made and durable. Keeps heat from being sucked out of building when ventilation conditions are too favorable.



AERO-AUTOMATIC BASE

SIZES OF AEROPLANE ROTARY VENTILATORS REQUIRED FOR VARIOUS CONDITIONS

Size of ventilator throat, in.	Flue Installation		Roof installation open, cu. ft. per min.
	Pan job, cu. ft. per min.	Gravity job, cu. ft. per min.	
12	565	354	393
14	769	482	536
16	1004	629	699
18	1272	796	884
20	1571	983	1092
24	2260	1415	1572
30	3531	2206	2451
36	5085	3183	3537
42	6921	4328	4809
48	9040	5659	6288
54	11441	7158	7953
60	14125	8843	9825
66	11091	10700	11888
84	27685	17331	19257

KERNCHEN COMPANY

Ventilating Engineers

111 West Washington Street

CHICAGO, ILL.

NEW YORK OFFICE: 1265 Broadway—Telephone, Pennsylvania 2711

AGENCIES IN ALL PRINCIPAL CITIES

Products.

"K-S-V's" (KERNCHEN SIPHONAGE VENTILATORS), with or without dampers.

Fuse Link Dampers for same when desired.

"K-S-V" (Kernchen Siphonage Ventilator).

For any type of building or enclosure, railway and street cars; chimneys, defective drafts, etc.

"K-S-V" (Kernchen Siphonage Ventilator) does the work of three others. Save this cost.

The correct siphon is the most powerful pulling force known to gravity science. It not only exhausts, it terrifically pulls.

The siphons harness the most delicate air currents, compressing and compelling them to co-act in mightily increasing the upward movement of air through the ventilator, and consequently increasing the pull.

Construction—Simplicity of construction and absence of any mechanism whatever are extra features of the K-S-V (Kernchen Siphonage Ventilator). It has over 200% free area or outlet. Nothing choking or hindering. Friction at minimum, exhaust at maximum.

The eduction pipe is of cylindrical form throughout. The upper end of the pipe is provided with several V-shaped slits or openings, each opening covered with a siphon, tapered inwardly toward the top and rising above the level of the pipe. A jacket of conical shape envelops these siphons, whereby other siphons are formed, greatly increasing the terrific pulling power of the ventilator. In addition, two hoods are put over the jacket near its mouth, augmenting considerably the pulling force and preventing rain, hail, sleet or snow from going through, thus being absolutely stormproof. There is no band of iron around the two top hoods interfering with the exhaust or outlet area. (See illustration of ventilator.)

The ventilator is in one piece and stationary—no mechanism, nothing revolving or rotating—always silently doing its work. Nothing to wear out. No cost for maintenance. A rotary ventilator requires a certain amount of wind energy to swing it around before it gets ready to ventilate. The "K-S-V" uses this same wind energy to ventilate.



The damper is equally as simple as the ventilator and is made in one piece. It has no sliding sleeves or mechanism.

Caution—Beware of imitations and infringements. Protect yourself by specifying as follows: "K-S-V's (Kernchen Siphonage Ventilators), manufactured by KERNCHEN COMPANY, McCormick Building, Chicago, Ill.," and see that KERNCHEN COMPANY brass tags are on ventilators.

Official Tests.

Note in the following two indisputable official tests (which are signed by eminent authorities) the absolute proof of capacity and terrific pulling power. Compare the Case School of Applied Science Official Test (which was made on the roof of a building) with the Armour Institute Official Test (which was conducted in a laboratory), for scientific corroboration and verification of each other, and of our statements regarding the actual powerful pull of "K-S-V's."

We challenge all to furnish such signed, Institutes of Technology Official Tests.

Ventilation of Industrial Buildings.

Pivoted sash, sawtooth or monitor roofs, with hinged or pivoted windows, do not ventilate and are useful for light only. Wind pressure, direction, and angle govern window ventilation and produce contrary results. Instead of providing ventilation, they have generally an exactly opposite effect, for the outside air, entering a building through such openings, blows down or back

OFFICIAL TEST OF "K-S-V's" (KERNCHEN SIPHONAGE VENTILATORS) CONDUCTED BY
ARMOUR INSTITUTE OF TECHNOLOGY, CHICAGO
SHOWING EXHAUST UNDER DIFFERENT WIND VELOCITIES, AND WHICH SCIENTIFICALLY PROVES THE TERRIFIC PULLING
POWER AND 100% TO 300% MORE EFFICIENCY THAN THAT OF OTHER VENTILATORS

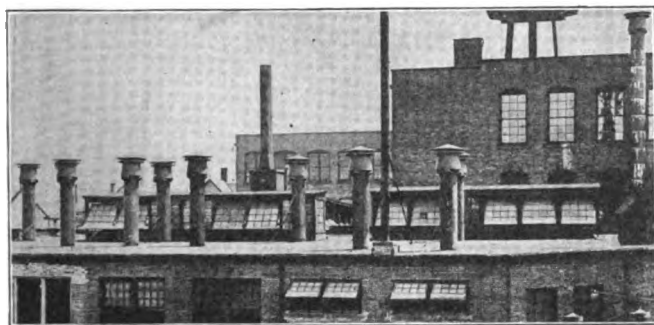
Wind velocity, miles per hour	Air pulled through ventilator, lineal ft. per min.	Size of ventilator, in.	Cubic feet air pulled through ventilator									
			12	14	16	18	20	24	30	36	40	48
5	460	Per min.	364.0	492.2	644.0	814.2	1,003	1,444	2,250	3,247	4,000	5,776
		Per hr.	21,840	29,532	38,640	48,852	60,180	86,640	135,000	194,820	240,000	346,560
		Per min.	525.0	717.0	938.0	1,186	1,460	2,103	3,280	4,730	5,830	8,412
10	670	Per hr.	31,500	43,020	56,280	71,160	87,600	126,180	196,800	283,800	349,800	504,720
		Per min.	754.0	1,027	1,344	1,699	2,100	3,014	4,700	6,777	8,350	12,056
		Per hr.	45,240	61,620	80,640	101,940	126,000	180,840	282,000	406,620	501,000	723,360
15	960	Per min.	957.0	1,305	1,708	2,159	2,660	3,830	5,980	8,613	10,640	15,320
		Per hr.	57,420	78,300	102,480	129,540	159,600	229,800	358,800	516,780	638,400	919,200
		Per min.	1,161	1,584	2,072	2,619	3,230	4,647	7,250	10,448	12,870	18,588
20	1,220	Per hr.	69,660	95,040	124,320	157,140	193,800	278,820	435,000	626,880	772,200	1,115,280
25	1,480	Per min.										
		Per hr.										

(Signed) G. F. GEBHARDT, A. H. ANDERSON, Mechanical Engineers, Armour Institute of Technology

CASE SCHOOL OF APPLIED SCIENCE—TEST NOV. 6, 1913 ON ROOF OF LEADER BUILDING, CLEVELAND, OHIO		ARMOUR INSTITUTE OF TECHNOLOGY—TEST APRIL 17, 1911 IN LABORATORY	
15 inches	Diameter of ventilator	15 inches	
5.32 miles per hour, or 63 $\frac{3}{4}$ % stronger than Armour's	Velocity of outside wind	5 miles per hour	
497	{ Velocity of air pulled through ventilator } per min., lineal ft.	460	
610	Exhaust of ventilator per min., cubic ft.	564	
Outside temperature, 67° Fahr.		Inside temperature, 85.8° Fahr.	

(Signed) F. H. Vose,
Head of Mech. Eng. Dept.,
Case School of Applied Science.

(Signed) G. F. GEBHARDT,
A. H. ANDERSON,
Mech. Engrs., Armour Institute of Technology.



"K-S-V's" INSTALLED ON THIS MONITOR OR LANTERN ROOF WITH PIVOTED SASH

the foul air, smoke, fumes, etc., which, instead, should be pulled out.

Louvers also have proved to be nothing but complete intakes, driving the foul air, fumes, steam, smoke, etc., down to the floor.

Greater Results with Less Cost.

"K-S-V's" (Kernchen Siphonage ventilators) are far cheaper than other makes since less than half the number or size are required to exhaust the same amount of air. Even then the inferior types, with their larger number or greater size, will not give results equal to the "K-S-V's" (Kernchen Siphonage Ventilators) when the outside air currents are low.

This saving in the number or size of ventilators involves an added saving in installation.

And so, while the initial cost of the "K-S-V" (Kernchen Siphonage Ventilator) may be higher than some others from a diameter standpoint, this is much more than offset by its surpassing exhaust.

SIZES, GAGES, WEIGHTS AND PRICES OF VENTILATORS

Diam., in.	Area of vent., sq. in.	GALVANIZED				INGOT IRON, TONCAN, KEY-STONE OR EQUIVALENT				COPPER			
		Gage	Weight, complete	Price without damper	Price of damper	Gage	Weight, complete	Price without damper	Price of damper	Oz. of copper	Weight, complete	Price without damper	Price of damper
6	28	26	5 1/4	\$10.67	\$2.55	26	5 1/4	\$11.74	\$2.81	12	8 3/4	\$23.48	\$5.62
8	50	26	10	12.98	3.14	26	10	14.28	3.45	12	14	28.56	6.90
10	78	24	17	17.16	3.89	24	17	18.88	4.28	14	30	37.67	8.56
12	113	24	24	18.04	4.67	24	24	19.84	5.15	14	32 3/4	39.68	10.30
14	154	24	35	21.56	5.35	24	35	23.72	5.89	16	48	47.44	11.78
16	201	24	48	25.08	5.92	24	48	27.59	6.51	16	62	55.18	13.02
18	255	24	60	28.60	6.46	24	60	31.46	7.11	16	74	62.92	14.22
20	314	22	71 1/2	36.08	7.51	22	71 1/2	39.69	8.26	16	109	79.38	16.52
22	380	22	93	42.68	8.15	22	93	46.95	8.96	16	137	95.90	17.92
24	453	22	113	47.96	9.17	22	113	52.76	10.09	16	153	109.52	20.18
26	521	22	126	60.72	10.35	22	126	66.79	11.39	18	210	142.58	22.78
28	615	22	157	68.64	10.58	22	157	75.50	11.64	18	235	161.00	23.28
30	707	20	184	74.36	12.82	20	184	81.80	14.10	20	247	176.60	28.20
36	1018	20	227	101.20	14.90	20	227	111.32	16.39	20	269	282.64	32.78
42	1385	20	400	154.00	18.07	20	400	169.40	19.88	20	440	463.80	39.76
48	1810	20	700	228.80	22.42	20	700	251.68	24.66	24	770	603.38	49.32
54	2290	18	830	290.40	26.77	18	830	319.44	29.45	32	913	718.88	58.90
60	2827	18	1015	429.00	32.04	18	1015	471.90	35.24	36	1116	963.80	70.48
66	3421	16	1642	572.00	37.85	16	1642	629.20	41.64	36	1806	1258.40	83.28
72	4072	16	1955	729.00	43.35	16	1955	834.90	47.69	40	2150	1669.80	95.38
84	5542	14	3180	1237.50	59.15	14	3180	1361.25	65.07	42	3498	2722.50	130.14

Above sizes are kept in stock and prices are f.o.b. our five factories: east, central, north and west. Prices on other and larger sizes, and other metals, supplied on application. When ordering, specify if damper is desired.

Special Ventilation Service.

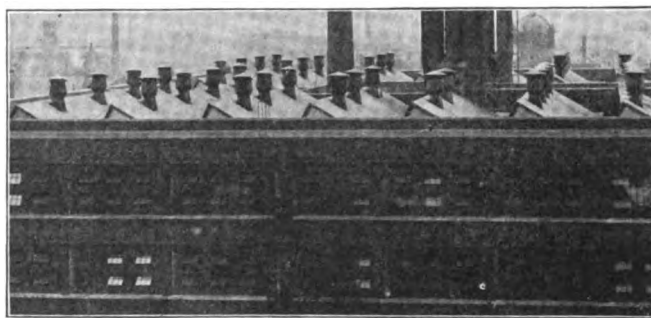
The KERNCHEN COMPANY specializes in ventilation and its engineers are always available, gratis.

Particular attention given to difficult or unusual problems involving great heat as well as temperatures below the freezing point; steam conditions; elimination of condensation, moisture, fumes, gases or smudge, foul or vitiated air, in every type of building or room.

Booklet—"It Pulls."

A postal will bring our latest illustrated booklet,

SWEET'S CATALOGUE



52 "K-S-V's" INSTALLED ON THIS SAWTOOTH ROOF WITH PIVOTED SASH

entitled "It Pulls," containing complete information concerning the "K-S-V's" (Kernchen Siphonage Ventilators).

Testimonials.

The following letters, selected from many received from industrial houses of national and international reputation, convey a limited idea of the way that we and our "K-S-V's" (Kernchen Siphonage Ventilators) are completely curing vexing and costly conditions of foul air, steam, smudge, condensation, moisture, gas, smoke, fumes, dust, etc., giving absolute satisfaction, in many cases after large fans and other types of ventilators have failed to give adequate relief:

American Car and Foundry Co., Chicago—"The Kernchen Siphonage Ventilator has proved very satisfactory. It is installed above our blacksmith shop and it pulls the bad air out."

Packard Motor Car Co., Detroit—"Kernchen Siphonage Ventilators are handling the ventilating of the third floor of our Heat Treat Department and our Truck Blacksmith Shop very well indeed."

New York, Chicago & St. Louis Railroad Co. ("Nickel Plate"), Cleveland, Ohio—"The ventilators are working very satisfactorily."

General Railway Signal Company, Rochester, N. Y.—"The operation of this ventilator is entirely satisfactory and we are considering the use of several more in the near future."

Henry Disston & Sons, Philadelphia, Pa.—"The Ventilators have been installed and are giving satisfaction."

The Thompson & Norris Co., Brookville, Ind.—"During the months previous to the extreme cold weather, the Kernchen Ventilators absolutely prevented any dripping and condensation in our Machine and Store Room where we were formerly bothered very much, although we had four 36 in. fans and two ordinary ventilators."

"It was such a positive pleasure to go into this room after your ventilators were installed and find the floor and ceiling dry, whereas both used to be covered with moisture, that we wondered if such would be the case when the extreme cold weather set in. The extreme cold weather has been encountered and we have found your ventilators to be just as effective, and our Machine and Store Room has been kept absolutely free from steam, condensation and dripping."

Frazer Paint Co., Detroit—"The summer of 1916 will pass into weather history on account of the long, torrid spell in the Middle West. Factories and furnaces were forced to suspend operations on account of the heat or materially curtail productions."

"Detroit was no exception as a sufferer from the heat and our factory of metal sash construction became so hot that the men could not stand it and we were confronted with a shutdown at the time of the greatest rush of business in our experience."

"But instead, we installed K-S-V's (Kernchen Siphonage Ventilators) according to the layout proposed by your man, and they saved the day for us."

"Not only did they cause a refreshing current of air by withdrawing the hot, bad air, but they reduced the temperature of the working rooms several degrees. We did not shut down, but, instead, had an output beyond the usual."

"When our factory was built in 1915, we had intended to install K-S-V's, but the architect provided others and the contract had been let before we noticed it and we did not insist. Under stress, they proved entirely inadequate."

"We regard the K-S-V in a class by itself."

KAIN & AUNGER COMPANY

Manufacturers of Rotary Ventilators

1364-1368 East 34th Street
CLEVELAND, OHIO

Product.

SI-FO VENTILATOR.

Description.

The Si-Fo ventilator is of the rotary type, with the siphonic feature perfected and embodied in the design and construction which gives it *power to eject more air than any other ventilator made.* (Note official test.)

It is constructed in a neat and durable manner, of sufficiently strong material and bracing to withstand long and continuous operation. It is made of rust resisting galvanized sheet metal or cold rolled copper. The revolving part of the ventilator is supported by a phosphor bronze bearing resting on a steel shaft. It is practically noiseless in operation and is guaranteed to operate at all times and under all conditions.

Operation.

As the wind strikes the cylindrical cone it is deflected outwardly to the larger or front end of the funnel. As the funnel tapers around the inner chamber, the outlet is contracted, which causes the air to leave at a greater velocity than that at which it entered. This produces siphonic action at the open end of the inner chamber and naturally exhausts air from the vertical chamber.

To further increase the velocity of the air for obtaining greater siphonic action, a plurality of openings is provided in the walls of the inner chamber. These openings are covered by inclined pockets having open front ends and closed rear ends.

As the air enters these pockets it is directed through the openings into the inner chamber near the open end, and this produces increased velocity of the air at the

discharge end of the inner chamber. The openings are made tapering and larger toward the discharge end to deliver a greater volume of air nearer the open end and thereby create siphonic action. The cylindrical form of this ventilator precludes the possibility of dead air pockets, which exist in the square or rectangular design of ventilators.

Results of Test.

This test was conducted by F. H. Vose, Professor of Mechanical Engineering, Case School of Applied Science, Cleveland, Ohio.

The Si-Fo ventilator used was 12-in. in diameter. Readings were taken of the wind velocity over the roof, and of the air velocity through the ventilator—readings being taken continuously for one hour. During this time the

Average wind velocity was 4.28 miles per hour

Maximum wind velocity was 5.6 miles per hour

Minimum wind velocity was 2.24 miles per hour

Air discharged by ventilator averaged 465 cu. ft. per min.

Diameter of ventilator pipe at point of measurement was 12 in.

Area of pipe at point of measurement being .7854 sq. ft.

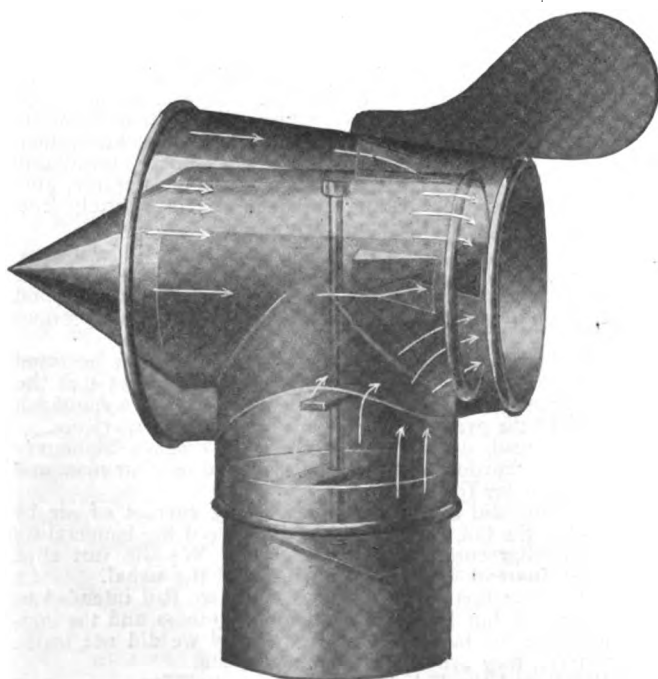
Average velocity of air through ventilator at point of measurement was 592.5 ft. per min.

Distance from roof to lowest point of exhaust opening was 5 ft. 10 in.

At the same wind velocity, the Si-Fo ventilator has a greater velocity through the ventilator and moves more cubic feet of air per minute per square inch of area opening, than any other ventilator on the market.

PRICES, AND CUBIC FEET PER MINUTE BASED ON WIND VELOCITY OF 5 MILES PER HOUR

Diameter, in.	Weight, lbs.	Cu. ft. per minute capacity	Price, galvanized ingot iron	Price, copper
8	18	240	\$26.00	\$41.00
10	24	375	29.00	49.00
12	32	540	33.00	62.00
14	40	745	41.00	77.00
16	52	975	47.00	95.00
18	68	1230	59.00	116.00
20	96	1530	69.00	156.00
24	160	2200	87.00	241.00
30	205	3400	131.00	330.00
36	280	4950	177.00	447.00
42	395	6720	243.00	612.00
48	560	8750	329.00	870.00



SI-FO VENTILATOR

Testimonial.

CLEVELAND, OHIO, November 13, 1918.

GENTLEMEN:

Last June you installed on our foundry five of your 16-in. Si-Fo ventilators, and on our furnace room two of your 18-in., and after almost five months continual use of same, we are pleased to advise you that the Si-Fo is without question the most efficient ventilator we have ever had installed, and we believe the most scientifically constructed ventilator on the market today.

The two 18-in. Si-Fo ventilators on our furnace room keep the room clear from all fumes and smoke at all times regardless of the kind of metal we are melting, while the five 16-in. on the foundry draw all the smoke and fumes out as fast as they rise from the metal we are pouring.

We take great pleasure in recommending the Si-Fo ventilator to any one contemplating installing ventilators.

Very truly yours,

THE AETNA BRASS MANUFACTURING CO.
Chas. Miles, President.

(Signed)

MILWAUKEE CORRUGATING CO.

Manufacturers of Roof Ventilators

MILWAUKEE, WIS.

BRANCH OFFICE AND FACTORY AT KANSAS CITY, MO.
SALES OFFICE, 929 Lumber Exchange, MINNEAPOLIS, MINN.

Products.

"ALPINA" REVOLVING SIPHON VENTILATORS; "NU-AIR" and "MILWAUKEE" STATIONARY VENTILATORS.

"Alpina" Revolving Siphon Ventilators.

The "Alpina" revolving siphon ventilator consists of stationary stem surmounted by a revolving cowl with ornamental vane at top. Upward passage of foul air through stem is accelerated by suction created by outer air current passing upward around mouth of stem. This outer air current enters ventilator between two aprons or fins, lower one of which is attached to stem and upper one to revolving cowl. The principle of construction provides for entire capacity of stem being used for ejecting foul air, cowl being three-fifths larger than stem. The larger diameter of revolving cowl not only increases capacity for removing foul air, but also permits broader intake for outer air which increases both volume and velocity of outer air passing upward around outlet of stem. This creates a more powerful suction and helps produce increased capacity for ejecting foul air. These two features are distinct advances in ventilator construction.



TRADE-MARK

Vane is sufficiently large and so designed that the cowl is revolved by lightest air currents, *with outlet always away from the wind*. The revolving part turns on a perpendicular shaft, which has a ball race bearing of non-rusting metal; greased, easy turning and noiseless. Bearing is entirely incased. Two deflectors on opposite sides between fins, turn with cowl, directing air currents inward and upward.

A 1/4-in. galvanized iron rod is turned under edge of galvanized sheet steel around mouth of outlet.

Whole structure is solidly braced with heavy bar iron. Metal ribs and corrugations add further strength. Braces are galvanized after being formed.

DATA, "ALPINA" VENTILATORS

Size of stock, in.	Approximate shipping weight, lbs.	List price	Size of stock, in.	Approximate shipping weight, lbs.	List price
12	50	\$17.00	20	140	\$40.00
15	60	30.00	24	175	48.00
16	75	32.00	30	325	60.00
18	80	36.00	36	450	90.00

Galvanized sheet steel, sheet copper or "Copperoid metal." Made to order when desired in 42-in. and 48-in. sizes.

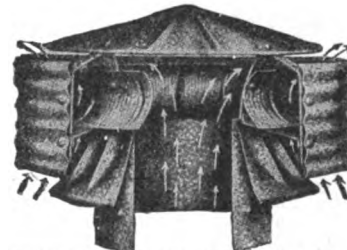
"Nu-Air" Ventilators (Patented.)

Have greater exhaust capacity than any other stationary ventilator. Made of galvanized steel with steel top, and also with 1/4-in. wired glass top.

The air currents rush from below between weatherband and curved deflector, drawing the warm, impure air up and out through shaft of the vent.



"NU-AIR" VENTILATOR, STEEL TOP



INTERIOR VIEW NU-AIR VENTILATOR SHOWING COURSE OF AIR CURRENTS

"Milwaukee" Ventilator.

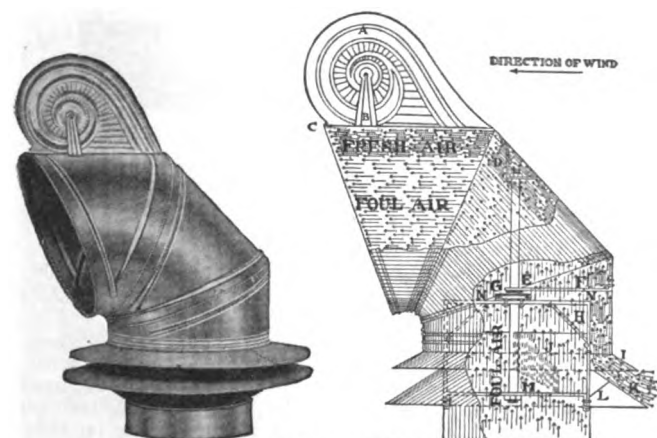
The "Milwaukee" ventilator is very simple and efficient. Provided with damper, which is opened and closed by pulling on a chain. Weight of damper keeps it open unless intentionally closed by means of chain.



"MILWAUKEE" VENTILATOR

Co-operative Service.

The Engineering Department and a completely equipped drafting room are at your service and problems of installation will be cheerfully solved.



"ALPINA" REVOLVING SIPHON VENTILATOR
(Patented Oct. 21, 1913)

A—Weather vane of galvanized iron, so designed and constructed as to make the ventilator responsive to the slightest breeze, assuring the proper facing of the ventilator and preventing down-draft.

B—Brace of galvanized iron at either side of vane, which holds the vane rigidly in place.

C—1/4-in. galvanized rod, turned under edge of iron around mouth of the exhaust.

D—Brace of heavy bar iron, riveted at back of ventilator, which holds the perpendicular shaft rigidly and securely in place.

E—Reinforced seamless steel tube, which holds ventilator in place as it revolves upon its bearings.

F—Brace of bar iron, riveted to ventilator and upper section of ball race, assuring stability and free swing of upper section of ventilator.

G—Brass ball race bearing, non-rustable, entirely incased and securely attached to brace N.

H—Braces of bar iron reaching across the corners of brace N. These braces give great rigidity and strength.

I—Conical flange forming top member and carrying deflector fin J.

J—Deflector which regulates the direction of the air currents at either side of the ventilator. Revolves with ventilator.

K—Conical flange forming base member (from which aspiration starts).

L—Inverted apron which holds under member in proper position; insures rigidity and maintains an accurately circular shape.

M—Brace of bar iron on which the perpendicular shaft rests at bottom. This brace is also securely fastened to brace N.

N—Brace of bar iron to which lower section of ball race bearing is fastened.

THE OHIO BODY AND BLOWER COMPANY

Rotary Ball Bearing Ventilators

CLEVELAND, OHIO

For Branch Offices, see page 1030

Products.

ROTARY BALL BEARING VENTILATORS.

For Steam Specialties and Feed Water Heaters, see pages 1030-32.

Swartwout Rotary Ball Bearing Ventilators.

"A hole in the roof is not ventilation." The Swartwout actively compels the flow of air. Because of large ball bearing and ample vane, the Swartwout always faces *away* from the wind. The free power of the breeze as it passes the mouth of the ventilator creates an active and continual suction which pulls out a steady flow of used air from below.

Responding to every change in wind direction, the entire area of the mouth is always efficient. The flow of air, regulated by chain operated dampers, takes only one right angle turn.

The Swartwout ventilator is built of special rust resisting, galvanized metal (*or copper on specification*), of ample gauge, over a frame-work of sturdy angle iron, galvanized after forming on template and punching. It is

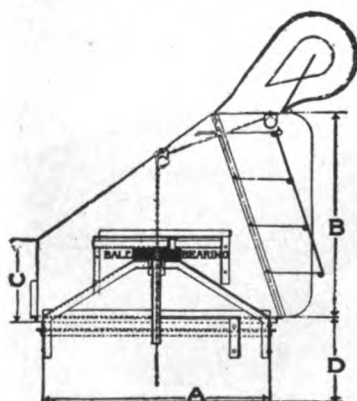


TRADE-MARK
Registered in
U. S. Pat. Off.

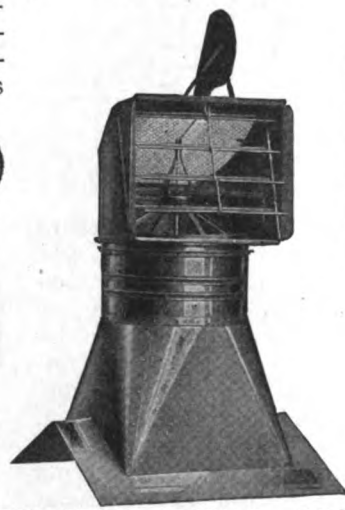
suspended on a skeleton of steel channels and angle iron and revolves on large size non-corrosive, frictionless bronze bearing and hard composition balls, placed centrally in a dustproof housing.

Skylight Type—When specified, a full size wired glass top may be substituted for the sloping metal top, affording a combination ventilator and self-cleaning skylight. Accurate directions for mounting are supplied on each ventilator.

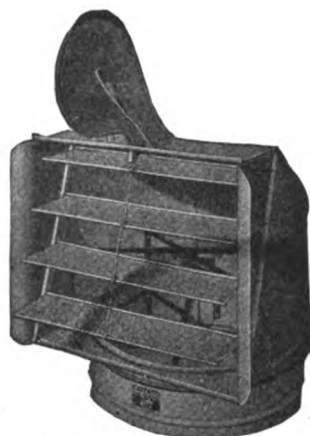
Note the illustrations show that no position of ventilator or damper can obstruct the passage of light into the room below. One view also illustrates the type of base recommended and shows both ventilator and base as built in copper, which is furnished when specified.



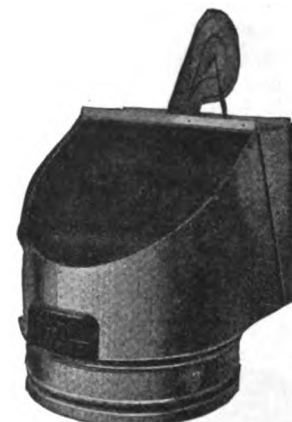
Section
SWARTWOUT ROTARY BALL
BEARING VENTILATOR



SWARTWOUT ROTARY BALL
BEARING SKYLIGHT TYPE
VENTILATOR WITH BASE



FRONT VIEW SHOWING
LOUVERS OPEN



BACK VIEW GLASS TOP SKY-
LIGHT TYPE

Air Requirements—In large buildings, the number of cubic feet of air required for each person in an hour is as follows:

In workshops and barracks, 3000; office rooms, 1800; schools, 2400; hospitals, 3600; churches, theaters, 2000; dining rooms, 1800; toilet and bathrooms, 2400.

Specifications—All ventilators to be of the rotary ball bearing type, glass top [metal top] of galvanized [copper] rust resisting metal, all interior members of angle iron, galvanized after forming and punching. The ventilators to turn sensitively on accurately machined bronze bearings, employing bell metal balls, and counterweighted on outside. The ventilators to be equipped with outside louver dampers to throw accumulated dirt outside of building, louvers to be operated from within by rustproof chains over brass pulleys. Gauge of metal* to be THE OHIO BODY AND BLOWER COMPANY, Cleveland, Ohio, standard, as furnished in Swartwout rotary ball bearing ventilators at regular prices. Top of collar and bottom of hood to be stiffened with galvanized angle iron rings.

* (If desired, give standard gauge for each size, as shown in preceding column.)

Any or All of Following Features Mailed Free—

VENTILATION DATA CARD—A quick reference for the drafting room and specification man, printed on heavy card 8½ by 11 in. Contains requirement tables, complete base and ventilator specifications, anemometer test figures, capacity tables, etc. Fits letter size file.

"THE GOSPEL OF FRESH AIR"—A 24-page handbook giving facts on the fresh air needs of every industry, together with capacity tables and specifications.

"THE GUIDE TO FRESH AIR"—Concise, definite information with facts and prices.

DATA, SWARTWOUT ROTARY BALL BEARING VENTILATOR

A in.	B in.	C in.	D in.	Gauge iron	Weight copper, oz.	Net weight, lbs.	Crated weight, lbs.	*Capacity cu. ft. air per min.	Price	Code word
10	9½	4	5	24	18	15	25	190	\$25.00	Sulcicolle
12	11	4½	5	24	18	20	30	275	25.00	Sulciforme
14	12½	5½	5½	24	18	30	40	370	40.00	Sulcipenne
16	14½	6	5½	24	18	40	50	490	50.00	Suleiman
18	16½	6½	6½	24	18	45	65	650	65.00	Sulfacide
20	18½	7½	6½	24	18	50	70	800	75.00	Sulfatable
24	22	9	6½	24	18	85	115	1100	85.00	Sulfatado
30	27½	11½	9½	22	20	120	165	1700	100.00	Sulfatage
36	33	13½	11	22	24	160	215	2550	150.00	Sulfatamos
42	38½	15½	11½	20	26	225	325	3400	210.00	Sulfataria
48	44	18½	11½	20	26	320	430	4450	240.00	Sulfataron
54	49½	20½	13½	20	28	525	650	5500	350.00	Sulfateur
60	55	22½	15½	20	28	610	735	6850	400.00	Sulfatique
66	60½	24½	16½	20	28	700	825	8250	450.00	Sulfato
72	66	27	16½	20	28	810	960	9850	500.00	Sulfazote

Discounts on request.

Ship by fast freight.....Inceptor
Ship by express.....Incepting
Quote lowest price f.o.b. factory.....Goorkha
Quote lowest price cost and freight.....Goorder
Quote price f. a. s. New York City.....Gooseberry
How soon can you ship.....Incarnat

Collars two gauges heavier than top. All ventilators are supplied with chain through ventilator with swivel at end. Additional chain furnished at nominal cost. In ordering, only dimension A is required.

*Figures shown here taken from actual anemometer readings of a ventilator in service under actual conditions (not a laboratory test). The wind velocity was 5 miles per hour, or about one-half average wind velocity of United States, as shown by official government reports. Conditions of test were: Temperature, outside, 30°; inside, 60°. Average wind velocity, 440 ft. per minute, or 5 miles per hour.

SWEET'S CATALOGUE

ROYAL VENTILATOR COMPANY

412 Locust Street
PHILADELPHIA, PA.

Products.

Manufacturers of "ROYAL" VENTILATORS of Galvanized Steel, Pure Iron, Copper, etc.

Glass Top Ventilators; Rectangular and Square Ventilators with fire retarding dampers; Smoke Jack and Combination Ventilators; Insectproof and Bird-proof Ventilators.

Double Cone Ventilators.

The double cone is designed to withdraw smoke, fumes, and impure air without any resistance being offered to the outward flow. The lower cone is placed directly in the center of ascending air, which, upon striking it, is deflected directly upward and outward. There are no obstructions. Only an upward draft is obtained. The "Royal" ventilates continuously, regardless of wind or temperature conditions. The tapered frustums force outside air currents over top and down sides, providing a constant strong upward draft.

Construction.

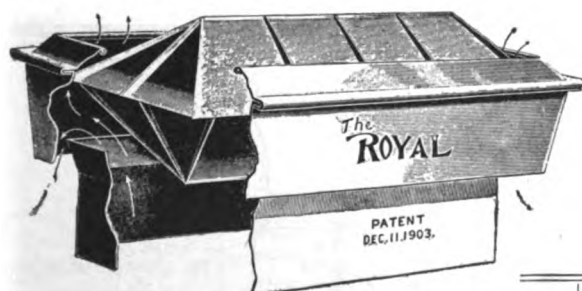
If the construction of the "Royal" ventilator is examined critically, the "Royal" will be specified.

The double cone has two thicknesses of metal, doubling the life of the ventilator. Every known mechanical improvement is embodied in the "Royal"; all sections are built with lapped seams, giving three thicknesses of metal at joints; all edges are wired for rigidity and weather resistance; all bracing is accomplished with galvanized iron stays, so arranged as not to impede passage of air. Absolutely weatherproof.

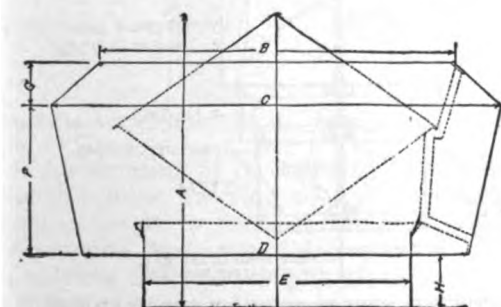
The "Royal" is especially adapted for foundries and chemical plants.

Specification.

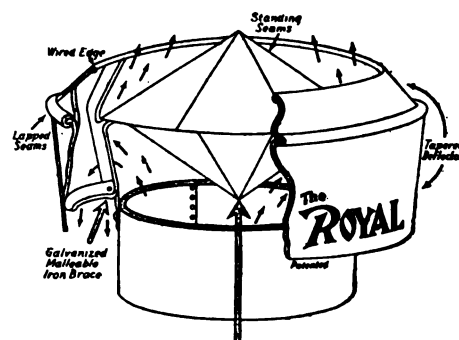
"Furnish and erect Royal Double Cone (Glass Top) Ventilators, manufactured by ROYAL VENTILATOR COMPANY, Philadelphia, Pa."



RECTANGULAR "ROYAL" VENTILATOR
Metal or glass top. Made to any size



SECTIONAL DRAWING "ROYAL" DOUBLE
CONE VENTILATOR
Send for catalogue and model

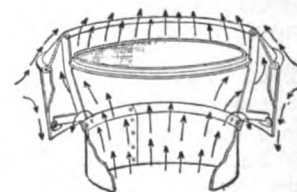


The Inverted Cone.
The reason the Royal exhausts more air per
minute - also why it offers least re-
sistance to natural or forced
draft.

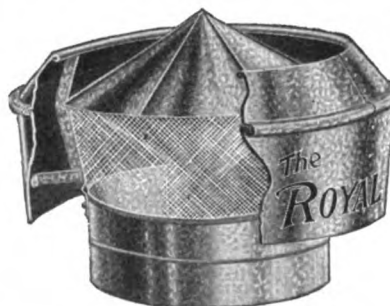
DOUBLE CONE VENTILATOR, ILLUSTRATING THE "ROYAL"
PRINCIPLE—100% EFFICIENT



BASES MADE TO FIT ANY
TYPE OF ROOF



"ROYAL" GLASS TOP
VENTILATOR
Gives more light and ventilation



INSECTPROOF VENTILATOR
For hospitals, barns, powder mills, etc.



"ROYAL" VENTILATOR
With fire damper

DATA WITH REFERENCE TO SECTIONAL DRAWING

Size, in.	A	B	C	D	E	F	G	H	Area, sq. in.	Gage of iron	Ounces of copper	List price	Cu. ft. exhaust per minute, wind 7 miles
10	12	13	16	14	10	5	2	3	78	24	16	\$5.75	141
12	13	15	19	16	12	6	2	3	113	24	16	6.75	159
16	17	20	26	23	16	8	3	3	201	24	16	20.00	388
18	18	23	29	26	18	8	3	3	255	24	16	27.00	490
20	21	25	31	28	20	10	4	5	314	24	16	33.00	606
22	24	26	34	32	22	11	4	5	380	24	16	36.00	729
24	24	30	39	34	24	11	5	5	453	22	16	40.00	874
26	24	33	42	36	26	13	4	3	527	22	16	50.00	1005
28	26	35	45	40	28	13	5	3	615	20	16	56.00	1186
30	26	35	45	41	30	14	5	4	707	20	18	65.00	1364
32	25	37	47	44	32	14	5	4	804	20	18	80.00	1551
34	28	40	50	48	34	15	5	4	908	20	18	100.00	1765
36	28	44	56	51	36	15	6	4	1017	20	18	120.00	1961
40	34	47	61	55	40	16	7	5	1257	18 and 20	18	180.00	2424
42	32	52	68	63	42	17	7	3	1386	18 and 20	18	190.00	2673
44	35	54	70	64	44	18	7	5	1620	18 and 20	18	200.00	3124
48	39	59	75	70	48	19	8	4	1809	18 and 20	20	240.00	3489
54	42	68	84	77	54	22	9	4	2390	18 and 20	20	300.00	5414
60	47	76	94	82	60	23	8	8	2807	18	24	360.00	6665
66	52	81	103	94	66	26	9	6	3504	18	24	420.00	7851
72	50	86	108	98	72	26	10	6	4071	18	24	480.00	10682

F. O. SCHOEDINGER

Manufacturer of Rotary Suction Ventilators

COLUMBUS, OHIO

Products.

SCHOEDINGER'S ROTARY SUCTION BALL BEARING VENTILATORS.

Also manufacturers of "Columbus" Stationary Ventilators, Puttyless Skylights, Underwriters' Tin Clad Fire Doors.

Sole manufacturer of Schoedinger's Universal Lock Joint Metal Ceilings and Kinnear and Gager's Quad Lock Metal Ceilings.

Description.

Schoedinger's rotary suction ventilator is rigidly constructed from galvanized steel, Armco iron or copper, supported by an adequate framework of rust resisting steel and malleable iron. It is equipped with high grade, high speed hardened steel ball bearings, which are immersed in heavy acid resisting lubricant, fully weather-proofed and easily accessible.

Official Test.

Official test of Schoedinger's rotary suction ventilators made at the Mechanical Engineering Laboratories of The Ohio State University:

Wind velocity miles per hour.....		5	10	15			
Velocity of air through ventilator. ft. per min....		538	632	726			
Cubic feet of air discharged					Gauge metal	Crated weight, lbs.	
Size of Ventilator	10"	per min. per hour	294 17,640	345 20,700	397 23,820	26	60
	12"	per min. per hour	423 25,380	497 29,820	571 34,260	26	70
	14"	per min. per hour	575 34,200	674 40,440	774 46,440	26	85
	16"	per min. per hour	752 45,120	880 52,800	1,013 60,780	26	100
	18"	per min. per hour	950 57,000	1,117 67,020	1,283 76,980	24	125
	20"	per min. per hour	1,173 70,380	1,380 85,800	1,585 95,100	24	155
	24"	per min. per hour	1,690 101,400	1,985 119,100	2,280 136,800	24	200
	30"	per min. per hour	2,640 158,400	3,100 186,000	3,570 214,200	22	280
	36"	per min. per hour	3,810 228,600	4,470 268,200	5,130 309,800	22	360
	42"	per min. per hour	5,170 310,200	6,080 364,800	6,990 419,400	20	430
	48"	per min. per hour	6,750 405,000	7,920 475,200	9,120 547,200	20	640
	54"	per min. per hour	8,550 513,000	10,030 601,800	11,550 693,000	20	710
	60"	per min. per hour	10,570 634,200	12,400 744,000	14,270 856,200	20	900
	66"	per min. per hour	12,800 768,000	15,000 900,000	17,280 1,036,800	20	1100
	72"	per min. per hour	15,230 913,800	17,880 1,072,800	20,550 1,233,000	20	1300

[Signed] F. W. MARQUIS,

Professor of Steam Engineering, The Ohio State University.

June 9, 1917.

SWEET'S CATALOGUE

Operation.

Schoedinger's rotary suction ventilator contains the inner air passage through which the passing winds and breezes blow with accelerated force, unhampered by conflicting cross currents, causing a pronounced vacuum in the head of the ventilator. The head of the ventilator is much larger than the stem, allowing the rising foul air to spread out along the horizontal line of the diaphragm, where it is caught by the suction of the swiftly moving air currents discharging from the passage above and carried out.

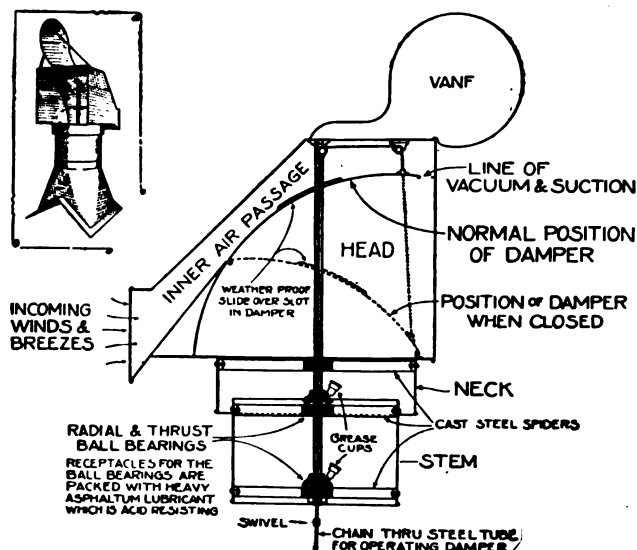
The diaphragm consists of a smooth, curved galvanized surface, which greatly assists in the free passage of the air, especially at low wind velocities.

The ample vane always holds the mouth of the ventilator away from the wind, making same proof against weather, rain, storm and down-drafts.

As no mechanical power is used, no operating expense results.



SCHOEDINGER'S ROTARY SUC-
TION VENTILATOR
(Patented)



SECTION SHOWING NEW DAMPER IN THE HEAD OF
SCHOEDINGER'S ROTARY SUC-
TION VENTILATOR
(Patented)

B. F. STURTEVANT COMPANY

AUTOFORCE VENTILATOR DEPARTMENT

HYDE PARK, BOSTON, MASS.

FOR LIST OF BRANCH OFFICES SEE PAGE 510

REPRESENTATIVES EVERYWHERE

Product.

AUTOFORCE VENTILATOR.

For Heating and Ventilating Apparatus, see pages 510-28.

Patents.

This company holds the following patents in connection with ventilators: 634215 Oct. 3, 1899; 697125 Apr. 8, 1902; 702581 June 17, 1902.

Uses.

Autoforce ventilators are of special value in factories, foundries, theaters, hotels, churches, schools, residences, stables, garages, mills, tanneries, kitchens, etc.

Description and Advantages.

The Autoforce ventilator is superior to any other natural ventilator as it effectively utilizes the force of the wind to create a suction, which suction always pulls inside air through ventilator to the outside. Ventilators are built of galvanized iron, but can also be furnished of Toncan metal or of copper. Butterfly dampers with a fusible link designed to meet fire insurance requirements can be furnished as an extra. All ventilators have eyes riveted to sides, so that guy wires furnished by others may be readily attached.

If Autoforce air pumps are used, fewer of them will be required to perform the work than with other types of ventilators.



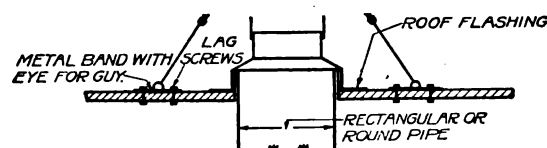
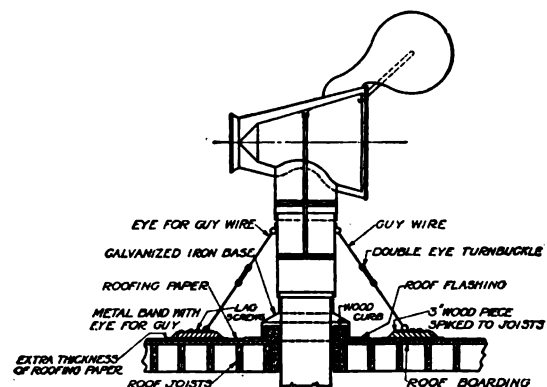
Specifications.

Specifications should read as follows:

The natural draft ventilation shall be.... No... Autoforce, made by the B. F. STURTEVANT COMPANY, each ventilator to remove....cu. ft. air per hour.

Installation.

Erect plumb and firm, and guy in four directions with double galvanized iron wires, taking up the slack in each with a double eye turnbuckle.



SECTIONS OF AUTOFORCE VENTILATOR GIVING METHOD OF ANCHORING TO BOTH WOOD AND CONCRETE ROOFS

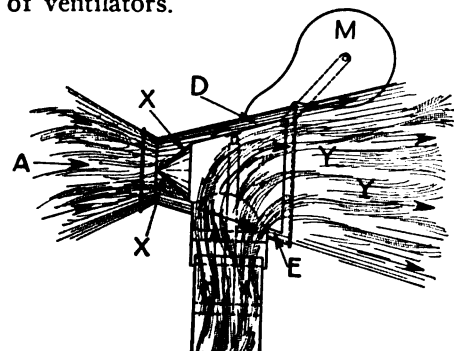
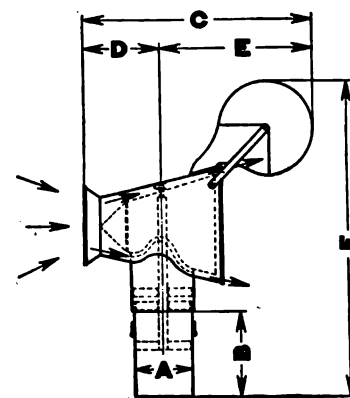


DIAGRAM SHOWING ACTION OF VENTILATOR

DIMENSIONS, AUTOFORCE VENTILATORS

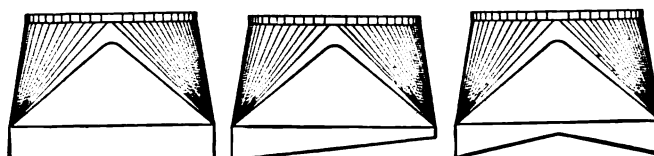
No.	Weight lbs., not packed	All dimensions are in inches						Cu. ft. of air displaced per hour with wind vel. 8 miles per hour
		A	B	C	D	E	F	
4	6	4	5	15	5½	9½	22	5,000
6	16	6	7	22½	8	14½	30	11,300
8	30	8	8½	30	10¾	19¼	39	20,100
10	40	10	10	37½	13½	24	46	31,400
12	52	12	12	45	16½	28½	54	45,200
14	85	14	14	52½	19	33½	63	61,500
16	114	16	16	60	21½	38½	71	75,900
18	173	18	18	67½	24	43½	80	90,700
20	240	20	20	75	26½	48½	90	101,700
24	315	24	24	90	32½	57½	106	156,000
30	512	30	30	112½	40	72½	132	300,000



DIMENSION DIAGRAM

Air entering at A is spread out by nose of inner cone X; since the ring of air emerges at increased speed, it tends to decrease pressure in front of exit YY; suction thus created draws air up connecting flue C; tailpiece M keeps pump at all times headed to wind, so that continuous satisfactory operation is secured.

Note that operation is on same successful principle as the steam injector or Hancock inspirator.



STANDARD BASES FOR AUTOFORCE VENTILATORS

Order specially, if desired

AMERICAN HARDWOOD MANUFACTURERS ASS'N.

Bank of Commerce and Trust Building

MEMPHIS, TENN

Products.

OAK TIMBERS, MILL STOCK, LUMBER, DIMENSION, VENEERS.

Also, Hickory, Maple, Elm, Ash, Chestnut, Poplar, Cottonwood, Cypress, Basswood, Beech, and Sycamore.

Kinds of Oak.

White oak and red oak. Commercially there is very little difference except that where great strength and durability are the essential requirements white oak is usually preferred. Normally there is but little variation in price, but when there is a difference it is in favor of white oak.

Distribution of Oak.

In the United States the growth of oak is widely distributed, but commercial timber is confined principally to the Southern states including Missouri, and to the states east of the Mississippi and north of the Ohio as far north as New York. Oak from time immemorial has been used practically for every purpose for which wood is suitable. Wherever the requirements are for great strength, hardness, durability (and great beauty of restrained and dignified type), oak is appropriate. It has ever been to mankind the symbol of strength, durability, might, dignity and sturdiness, because of the inherent qualities of the wood.

Value to the Engineer.

When wood enters into the engineer's problem oak is an unfailing reliance. Oak is suitable for almost every purpose. It is not recommended above every wood for every purpose, but there is hardly a use for wood in which it will not serve satisfactorily. Oak has been a standard for so long a time that every complete engineers' manual has full mechanical data regarding it.

(Full information as to the availability and proper uses of the other hardwoods listed above will be furnished to interested parties on request.)

Uses of Oak.

Mill Construction—Oak is typically superior when used in mill construction—mill construction being defined as that type of building construction in which the interior framing and floors are of timber; arranged in heavy solid masses, and smooth, flat surfaces, so as to expose the least number of corners, and to avoid concealed spaces which may not be readily reached in case of fire.

Oak has the combination of bending and compression strength, shearing strength and shock resisting ability above any other commercial hardwood. For columns, girders, cross beams and other parts it has continued to demonstrate its practical value ever since the type known as mill construction has been employed.

Factory Flooring—When flooring is to be subjected to severe wear as is usually the case in the typical manufacturing plant or warehouse, no other wood is so practical as oak. It makes a solid foundation for the fastening of machinery and is sufficiently resilient to absorb some of the strain that must otherwise be carried by the machinery. It withstands the rough usage caused by truck wheels and other severities of factory and warehouse use.

Bridges and Trestles—Oak is extensively used for bridge and trestle timbers because of its great shock resisting ability which exceeds that of most other woods. Wood is subjected to no severer strain than in bridges, but the strength of oak meets all the requirements. Its durability adds great value to its use for it reduces the amount of replacements.

Bridge Plank—Millions of feet of oak are manufactured into bridge plank every year and oak really has no competitor for railroad and turnpike flooring. Oak



RECONSTRUCTING AN IMPORTANT LUMBER RAILROAD (ENTIRELY OF OAK) THROUGH A FLOODED HARDWOOD FOREST

This illustrates a feat of engineering whose difficulties are perhaps little understood by those outside the industry

above all other woods, fills the requirements of this particular use of wood. Almost every kind of strain is placed on bridge plank and because of its strength, toughness, durability and resiliency oak is almost universally preferred.

Switch and Cross Ties—In the case of switch and cross ties, strength, durability and resistance to decay are the important requirements. No other wood in this or any other country approaches anywhere near oak in the number used. Oak ties are the standard for practically every trunk line in the United States. They are also used extensively in mining and timber railroad operations.

Poles, Cross Arms, Brackets—Oak is not usually thought of as material for telephone, telegraph, and other wire lines yet the annual use of such in the United States reaches the respectable total of 236,842 ft. Oak is specially qualified for cross arms for electric lines for here strength and durability are particularly needed. Brackets are employed to fasten wires to poles where no cross arms are used. Oak fills this place in larger numbers than all other woods combined.

Ships and Boats—Before the introduction of armor plate, oak was used almost exclusively in the building of ships and boats. The keels of every great wooden vessel now sailing the ocean are of oak, their ribs and rails are of oak and all those parts that absorb the severe strain and that are not easy of replacement. There has been very little attempt to substitute any other wood in these particular places.

Car Stock—Oak is peculiarly adapted for car construction purposes. The beams and framing of freight and passenger cars are constantly undergoing strain, carrying heavy weights and being subjected to severe jolts. Oak has every quality that makes it ideal in these places. About 25% of all wood used in the construction of cars is oak.

Agricultural Implements—A purpose for which oak is peculiarly adapted is in agricultural implements. It is readily bent, and will stay bent, and is easily workable. Agricultural implement stock requires peculiar qualities of strength in small strips, and here oak excels.

Vehicles—Oak finds one of its principal uses in vehicle stock. This is another case of where strength and durability are required in small parts and that is

why oak is of such value to the manufacturers of vehicles of all kinds.

Mine Timbers—For props, poles, shafts, ties and planking used in mines, oak is essentially advantageous. The mine timbers undergo severe strain from heavy weights, rough usage and frequently from dampness. Oak resists all of these in an unusual degree and is therefore in great demand by mine operators.

Machine Construction—Much machinery, particularly the heavier types, requires strong wood foundations, supporting rails and strong handles that will not crack or break when subjected to rough usage and severe jar. Oak is exceedingly well adapted for these purposes for it has all the needed strength, toughness and elasticity.

Other Industrial Uses—Frequently the engineer must decide industrial problems of almost every conceivable nature. It may be of advantage to know that oak reaches its largest consumption in planing mill products. For furniture it leads all other woods and is nearly half of the entire amount of wood consumed by furniture plants. It leads its nearest competitor by 328,815,422 ft. It is used in making all kinds of fixtures for stores, banks and the like, for cooperage stock, boxes, electrical appliances, dowels, gates, pulleys and conveyors, pumps, wood pipes, playground and amusement park equipment, foundry flasks, machinshop patterns, silos, tanks, stirrups, trees, horns, hames, line rings, trunk frames, and various other articles made from wood.

Supply of Oak.

A consideration which has great weight with users is that the supply of oak is almost inexhaustible. Oak is our most abundant hardwood, and the amount of oak standing in the forests is approximately 40% of all the American hardwoods combined. It is therefore certain that the supply of oak will last indefinitely. This splendid wood will continue to be used, so the users of it may plan as far ahead as they will, with the assurance that when oak is needed it will be available.

Information.

Engineers are invited to write us for any kind of information on the subject of oak, or relative to the availability and uses of any of the other hardwoods listed.



A TWO-MILE VISTA OF SUPERB HARDWOOD LOGS
Waiting to be converted into lumber and timbers for industrial and railroad uses

A. C. DUTTON LUMBER CORPORATION

Pacific Coast Lumber, Timber, Lath and Shingles

SPRINGFIELD, MASS.

NEW YORK, N. Y., 5724 Grand Central Terminal Building
WESTERN OFFICES, SEATTLE, WASH., SPOKANE, WASH., SAN FRANCISCO, CAL.
DOCKS, MILLS, WAREHOUSES AND STORAGE YARDS, POUGHKEEPSIE, N. Y.

Products.

DOUGLAS FIR.

Also distributors of Red Cedar; Gray Fir; Washington Spruce, via the Panama Canal; California Sugar and White Pine; Redwood; Port Orford Cedar.

Facilities.

This company owns one of the best equipped docks and yards on the Atlantic coast. Deep sea vessels dock there, bringing large cargoes of lumber and shingles from the Pacific coast.

Dressed lumber is piled on end in specially constructed sheds, so that the lumber will not warp. There is shed room and warehousing space for more than 12,000,000 ft. of dry lumber, and two mills which can turn out anything from lattice and mouldings to a timber 24 by 24 in., 90 ft. long.

Douglas Fir.

Government tests, as well as the use of this lumber by leading architects and engineers, prove it the strongest coniferous wood for its weight for structural purposes obtainable in America. It is 25% lighter weight than the next strongest. Sap growth is light and firm; will not discolor, and is not a defect as in other woods. Grain is clear and straight.



TRADE-MARK

Compare weights with strength in the tables and the superiority of Douglas Fir, for columns, beams, and flooring in mill construction and for framing timbers in residences, is easily apparent.

U. S. Forest Service Bulletin No. 88, June 17, 1911, says: "As a structural timber it (Douglas Fir) is not surpassed."

Douglas Fir is kept in stock for immediate delivery, in rough lumber and heavy timbers up to 24 by 24 in., 90 ft. long.

Uses of Douglas Fir in Engineering Construction.

Heavy timbers, stringers, joists, posts, etc.
Heavy factory flooring.
House and store flooring, vertical or flat grain.
Porch flooring, casings and base.
Partition, ceiling and mouldings.
Window and door jambs.
Rustic or novelty siding.
Stepping.
Interior and exterior finishing.
Sheet piling.
Dock and boat timbers.
Ship decking and planking.
Car and bridge timbers.
Car siding, flooring and roofing.

TABLE 1: AVERAGE STRENGTH VALUES, AIR SEASONED STRUCTURAL TIMBERS WITH ORDINARY DEFECTS

1	2	3	4	5	6		7	8	9	10	11		12	13
Species	Number of tests	Grade of material	Cross section of stringer, in.	Moisture, per cent.	Weight per board foot, lbs.		Modulus of rupture, lbs. per sq. in.	Modulus of elasticity, 1000 lbs. per sq. in.	Center load required to break an 8 x 16-in. stringer on a 15-ft. span, lbs.	Center load required to cause a 1/4 in. deflection in an 8 x 16-in. stringer on a 15-ft. span, lbs.	Relative weight of Douglas Fir and Long Leaf Pine		Relative maximum strength of Douglas Fir and Long Leaf Pine, per cent.	Relative stiffness of Douglas Fir and Long Leaf Pine, per cent.
					Air dry	Oven dry					Air dry	Oven dry		
a Douglas Fir	10	d Select and merchantable	8 x 16	16.4	2.75	2.37	6740	1621	51,200	9110	100.0	100.0	100.0	100.0
b Long Leaf Pine	9	d Merchantable	4 x 11 to 8 x 16	21.2	3.42	3.00	5750	1704	43,700	9560	124.3	126.6	85.2	105.0

Note: a. Results from Table No. 11, U. S. Forest Service, Bulletin 88. b. Results from Table No. 3, U. S. Forest Service, Circular 189.

c. Results from Table No. 3, U. S. Forest Service, Bulletin 88.

d. Timbers of the two species were graded by different rules. The pine, however, contained fewer knots than the Douglas Fir.

See data in column "Number of Knots," pages 110 to 113 U. S. Forest Service Bulletin 108.

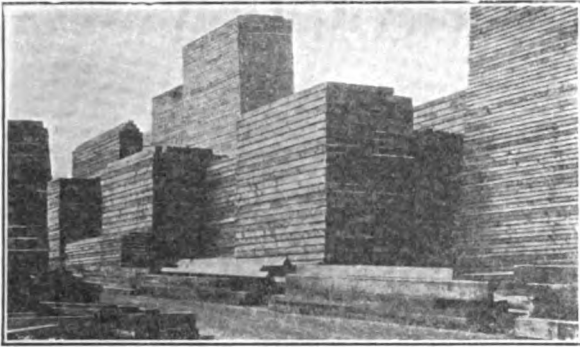
TABLE 2: AVERAGE STRENGTH VALUES, GREEN STRUCTURAL TIMBERS WITH ORDINARY DEFECTS

1	2	3	4	5	6		7	8	9	10	11		12	13
Species	Number of tests	Grade of material	Cross section of stringer, in.	Moisture, per cent.	Weight per board foot, lbs.		Modulus of rupture, lbs. per sq. in.	Modulus of elasticity, 1000 lbs. per sq. in.	Center load required to break an 8 x 16-in. stringer on a 15-ft. span, lbs.	Center load required to cause a 1/4 in. deflection in an 8 x 16-in. stringer on a 15-ft. span, lbs.	Relative weight of Douglas Fir and Long Leaf Pine		Relative maximum strength of Douglas Fir and Long Leaf Pine, per cent.	Relative stiffness of Douglas Fir and Long Leaf Pine, per cent.
					Green	Oven Dry					Green	Oven Dry		
a Douglas Fir	138	c Select and merchantable	8 x 16	31.4	3.11	2.39	6250	1554	47,400	8730	100.0	100.0	100.0	100.0
b Long Leaf Pine	17	c Merchantable	6 x 10 to 10 x 16	29.0	3.87	3.00	6090	1458	46,200	8180	124.3	125.7	97.4	93.7

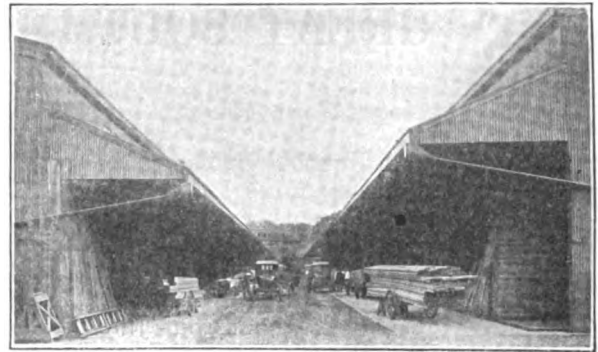
Note: a. Results from Table No. 8, page 44 U. S. Forest Service, Bulletin 88. b. Results from Table No. 1, page 4 U. S. Forest Service, Circular 189.

c. Timbers of the two species were graded by different rules. They were, however, of approximately the same quality.

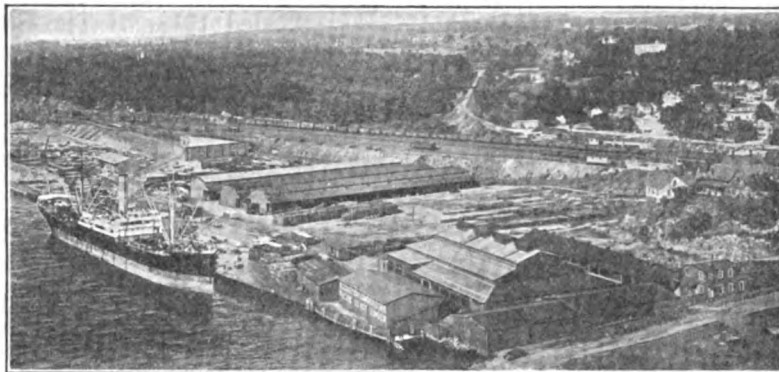
Douglas Fir probably contained more knots than the pine. (See Fig. 28 U. S. Forest Service Bulletin 108. All long leaf is Grade I.)



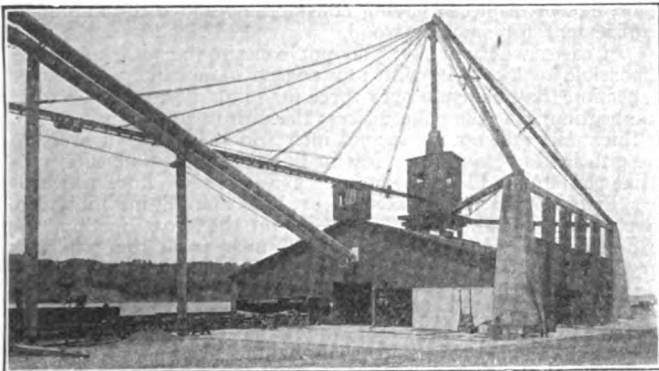
Huge Piles of Douglas Fir Dimension and Timber



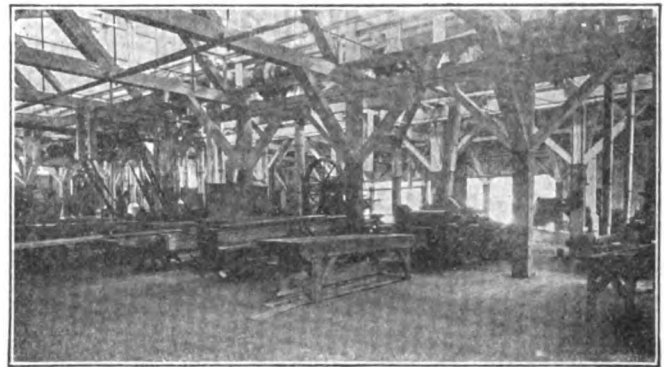
Modern Dry Sheds



Receiving Lumber via Panama Canal



Timber Mill for Re-sawing and Dressing Structural Timber



Mill No. 2, for Small Re-sawing and Sticking



Pacific Coast Lumber and Timber in One End of the Yard Ready for Quick Delivery
GLIMPSES OF THE LARGE DOCKS, YARDS, AND STOCKS OF THE A. C. DUTTON LUMBER CORPORATION, POUGHKEEPSIE, N. Y.
Note the complete facilities for re-manufacturing, handling and shipping

GREAT SOUTHERN LUMBER COMPANY

BOGALUSA, LA.

Products.

LUMBER and LUMBER PRODUCTS of extra dense SOUTHERN LONG LEAF PINE (*Pinus Palustris*) from an exceptionally fine stand of virgin timber. Especial facilities for Marine, Railway and Heavy Industrial Material.

Also Turpentine, Rosin, Naval Stores (Bogalusa Turpentine Company); Waterproof Jute or Container Liner, Kraft Pulp (Bogalusa Paper Company, Inc.).

Brand.

Every shipment of Bogalusa product is identified by the trade-mark Bogalusa imprinted, wherever practicable, upon the lumber itself. This signifies our guaranty of superior manufacture and accurate and uniform grading.

Uses.

Long leaf pine is widely used for practically all purposes to which any of the so-called soft woods are adapted. Its chief uses are in all portions of frame structures including trim and floors; railway ties, timbers, planking, and car material; bridge timbers; poles; piling; ship timbers and planking; timbers and flooring in "mill construction"; in short, Bogalusa Brand extra dense long leaf pine is pre-eminent in all structural uses, heavy and light.

Facilities.

The plant of the GREAT SOUTHERN LUMBER COMPANY is the largest single sawmill installation in the world, with a capacity of 1,000,000 ft. daily. It is able to care in the promptest and most efficient manner for every requirement from the largest to the smallest.

Standard Specifications.

For the convenience of engineers, herewith is appended standard specifications as adopted by the Associated Factory Mutual Insurance Companies, the American Society for Testing Materials, and the Southern Pine Association. Specifications adopted by the American Railway Engineering Association also appear in "The Bogalusa Book." See last paragraph on next page.

Specifications Suggested for a Special Grade of Long Leaf Pine for Use in Mutual Factories*.

In making contracts for beams, columns and plank to be used in "Slow Burning Construction," the following specifications are recommended:

Density—No part of the material shall have a density of less than 30 lbs. per cu. ft. when tested by boring smooth holes 1 in. in diameter and 2 in. deep in ends of the stick, drying to constant weight at 212° Fahr. and weighing borings and computing density from volume of the hole.

Rosin—None of the heartwood shall show less than 4% of rosin by weight when borings are taken with a 1-in. bit with a hole 2 in. deep, dried to constant weight at 212° Fahr. and extracted with benzole, the extracted rosin evaporated until it is not soft or sticky when touched with the finger at 70° Fahr.

Heartwood—Heartwood shall show the entire length in all four faces of every stick, and sapwood shall not extend more than 2 in. from the corner at any place, measured perpendicularly to the corner across the face.

Growth Rings—For timbers 6 by 8 in., or larger, there must show on the cross section between the third and fourth inch measured radially from the heart center or pith, not less than 6 annual rings of growth, a majority of which shall show at least one-third summer wood, which is the dark portion of the annual rings; but wide ringed material excluded by this rule will be acceptable, providing that in the majority of the annual rings the dark ring is hard and in width equal to or

*See "Dry Rot in Factory Timbers," by F. J. Hoxie, 1915; Inspection Department Associated Factory Mutual Insurance Companies, Boston.

BOGALUSA

greater than the adjacent light colored ring.

For pieces in which the center is not included, there must show on the cross section an average of not less than 6 annual rings of growth, with not less than one-third summer

wood. Timbers will be rejected in which there is no sharp contrast in color between the spring wood and summer wood.

Defects—No timber with knots greater than 1 in. in diameter, or rot, or injurious shakes will be accepted.

Branding—Long leaf pine sold under this specification shall be branded with the letters "F. M.", the name of the lumber manufacturer, the location of the sawmill from which it comes, and the date of sawing, in letters at least 1 in. high.

Southern Yellow Pine Timber Specifications Officially Issued 1918, by The Southern Pine Assn.

Definition for Southern Yellow Pine—This term includes the species of yellow pine growing in the southern states from Virginia to Texas, that is, the pines hereto known as long leaf pine (*Pinus palustris*), short leaf pine (*Pinus echinata*), loblolly pine (*Pinus taeda*), Cuban pine (*Pinus heterophylla*), and pond pine (*Pinus serotina*).

Under this heading two classes of timber are designated: (A) dense southern yellow pine and (B) sound southern yellow pine. It is understood that these two terms are descriptive of quality rather than of botanical species.

(a) *Dense southern yellow pine* shall show on either end an average of at least 6 annual rings per inch and at least one-third summer wood, or else the greater number of the rings shall show at least one-third summer wood, all as measured over the third, fourth and fifth inches on a radial line from the pith. Wide ringed material excluded by this rule will be acceptable, provided that the amount of summer wood as above measured shall be at least one-half.

The contrast in color between summer wood and spring wood shall be sharp and the summer wood shall be dark in color, except in pieces having considerably above the minimum requirement for summer wood.

In cases where timbers do not contain the pith, and it is impossible to locate it, with any degree of accuracy, the same inspection shall be made over three in. on an approximate radial line beginning at the edge nearest the pith in timbers over 3 in. in thickness, and on the second inch (on the piece) nearest to the pith in timbers 3 in. or less in thickness. In dimension material containing the pith but not a 5-in. radial line, which is less than 2 x 8 in. in section or less than 8 in. in width, that does not show over 16 sq. in. on the cross section, the inspection shall apply to the second inch from the pith. In larger material that does not show a 5-in. radial line the inspection shall apply to the third inch farthest from the pith. The radial line chosen shall be representative. In case of disagreement between purchaser and seller the average summer wood and number of rings shall be the average of the two radial lines chosen.

(b) *Sound Southern yellow pine* shall include pieces of Southern pine without any ring or summer wood requirement.

General Timber Specifications—Southern yellow pine timbers are graded in accordance with the several rules herein described. The defects enumerated and admitted in the various grades are described as follows:

KNOTS—Shall be classified as round and spike in form and for quality as sound, incased, loose and unsound; knots are also classed as to size.

A *sound knot* is one which is solid across its face and which is as hard as the wood surrounding it; it may be red or black, and is so fixed by growth or position that it will retain its place in the piece.

A *loose knot* is one not firmly held in place by growth or position.

A *pith knot* is a sound knot with a pith hole not more than ¼ in. in diameter.

An *incased knot* is one whose growth rings are not intergrown and homogeneous with the growth rings of the piece it is in. The incasement may be partial or complete; if intergrown partially or so fixed by growth or position that it will retain its place in the piece, it shall be considered a sound knot; if completely intergrown on one face, it is a watertight knot.

An *unsound knot* is one not as hard as the wood it is in.

A *pin knot* is a sound knot not over ½ in. in diameter.

A *standard knot* is a sound knot not over 1½ in. in diameter.

A *large knot* is a sound knot more than 1½ in. in diameter.

A *round knot* is one which is oval or circular in form.

A *spike knot* is one sawn in a lengthwise direction; the mean or average width shall be considered in measuring these knots.

WANE—Is bark or lack of wood from any cause on edge of timbers.

SHAKES—Are splits or shakes in timbers which usually cause a separation of the wood between annual rings.

A *ring shake* is an opening between the annual rings.

A *through shake* is one which extends between two faces of timber.

Shakes not hereinbefore described, unless known to have extensive penetration, shall not be considered a defect under this classification.

SIZES—All rough timber except No. 1 Common, must be full size when green. $\frac{1}{4}$ in. shall be allowed for each side surfaced.

LENGTHS—Standard lengths are multiples of 2 ft., 8 to 20 ft. inclusive; extra lengths are multiples of 2 ft., 22 ft. and longer. When lineal average is specified, standard of lengths shall be multiples of 1 ft.

HEART TIMBERS—All timber specifications, except "Merchantable" and "Select Structural Timbers" specifying heart requirements, shall be considered as a special contract and shall specify whether the heart requirements refer to surface or girth measurements in each piece.

No. 1 Common Timbers—May be either *dense* or *sound* pine. Unless otherwise specified this grade will admit any amount of sapwood. Rough timbers, 4x4 in. and larger, may be $\frac{1}{4}$ in. scant in either or both of its dimensions, shall be well manufactured and may have $1\frac{1}{2}$ in. wane on one corner one-third the length of the piece, or its equivalent on two or more corners, the wane measured on its face.

Timbers 10x10 in. in size may have 2 in. wane as above; the larger sizes may have wane as above in proportion to sizes. No. 1 Common Timbers may contain sound knots and pith knots, provided that the diameter of any one knot shall not exceed the following in size:

2 " in 4x4 to 6x6	3 $\frac{1}{2}$ " in 12x12 to 12x14
2 $\frac{1}{2}$ " in 6x8 to 8x10	4 " in 14x14 to 14x16
3 " in 10x10 to 10x12	4 $\frac{1}{2}$ " in 16x16 to 16x18

In sizes not mentioned the diameter of knots admissible will increase or decrease in proportion to the size of the timbers on same basis as above specified.

No. 1 Common Timbers will admit shakes extending one-sixth the length of piece, round or ring shakes, unsound knots $1\frac{1}{2}$ in., or less, in diameter, a limited number of pinworm holes well scattered, sap stain and seasoning checks. Unless otherwise specified this grade will admit any amount of sap stain.

SQUARE EDGE AND SOUND TIMBERS—May be either *dense* or *sound* pine. Unless otherwise specified this grade will admit any amount of sapwood. They shall be well manufactured and shall be free from defects such as injurious ring, or round shakes and through shakes that extend to the surface, unsound and loose knots and knots in groups that will materially impair the strength and shall be free from wane. Seasoning checks and sap stains shall not be considered defects.

MERCHANTABLE TIMBERS—May be either *dense* or *sound* pine. All Merchantable Timbers shall be well manufactured and free from defects such as injurious ring, or round shakes and through shakes that extend to the surface, unsound and loose knots and knots in groups that will materially impair their strength. Seasoning checks and sap stains shall not be considered defects. Sizes under 9 in. on the largest dimension shall show two-thirds or more heart surface on one of the wide surfaces; sizes 9 in. and over on the largest dimension shall show two-thirds or more heart on both of the wide faces. When sticks are square, the face showing the most heart shall govern the inspection on sizes under 9 in. and the two faces showing the most heart shall govern the inspection when 9 in. and over. Heart showing the full length, even if not two-thirds of the area as above, shall meet the requirements of this quality. Wane not exceeding one-eighth of the dimension of the face and one-quarter of the length of the piece on one corner, or the equivalent on two or more corners on not to exceed 10% of the pieces, shall be admitted.

Rule for Select Structural Material.

(A rule incorporating suggestions by the United States Forest Service.)

Requirements for Density and Rate of Growth—Shall contain only sound wood and be well manufactured, and shall conform to the definition of *dense* southern pine as adopted by the American Society for Testing Materials, August 21, 1915.

Unless otherwise specified, select structural material shall show 85% of heart, girth measurement, measured anywhere in the length of the piece. Any greater or less requirement as

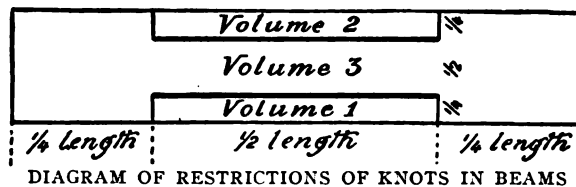
to heart shall be expressed in terms of per cent of girth measurement. Sap stain is not a defect in this grade.

For the purpose of determining whether any given piece meets the requirements for density and rate of growth, the following rule suggested by the United States Forest Service, shall be applied. It will be sufficient if either end pass the test.

(1)—**PITH PRESENT OR ACCURATELY LOCATED**—(a) Radial line of 5 in. present. (Apply inspection over third, fourth and fifth inches.) (b) Radial line of 5 in. not present. (1—Apply inspection to the second inch 2 by 3, 2 by 4, 2 by 6, 3 by 3, 3 by 4, 4 by 4, or any other dimension material that has less than 16 sq. in. on the cross section. 2—In the larger material apply inspection to the third inch farthest from the pith.)

(2)—**PITH NOT PRESENT OR CANNOT BE ACCURATELY LOCATED**—(a) Material over 3 in. thick apply inspection to third inch nearest the pith. (b) Dimension material 3 in. or less in thickness, apply inspection to second inch of piece nearest pith.

(3)—Radial line chosen shall show a representative number of annual rings of growth and per cent of summer wood.



Restrictions on Knots in Beams—Beams shall not have in Volume 1 sound knots greater in diameter than one-fourth the width of the face on which they appear—maximum knot $1\frac{1}{2}$ in. Shall not have in Volume 2 sound knots greater in diameter than one-half the width of the face on which they appear—maximum knot 3 in. The aggregate diameter of all knots within the center half of the length of any face shall not exceed the width of that face. The diameter of a knot on the narrow or horizontal face of a beam is to be taken as its projection on a line perpendicular to the edge of the timber. On the wide or vertical face the smallest dimension of a knot is to be taken as its diameter.

Restrictions on Knots in Columns—Shall not have knots greater in diameter than one-third the least width of the column—maximum knot 4 in.

Restrictions on Shakes and Checks in Beams—Round or ring shakes shall not occupy, at either end of a timber, more than one-fourth the width of green material, nor more than one-third the width of seasoned material. Any combination of checks or shakes which would reduce the strength to a greater extent than the allowable round shakes will not be permitted. Shakes shall not show on the faces of green or seasoned timber.

Restrictions on Cross Grains in Beams—Beams shall not have diagonal grain with slope greater than 1 in 20 in Volume 1.

Information.

Engineers, and others, are invited to consult the company for any information desired regarding qualities, uses and prompt availability of Bogalusa Brand material. An authoritative booklet, including the above and other specifications as well as tables of working unit stresses, load limits, etc., will be sent gratis on request.



SECTION OF 260-ACRE SAWMILL OPERATION, BOGALUSA, LA.

THE PACIFIC LUMBER COMPANY

(OF ILLINOIS)

Midwestern and Eastern Distributors of California Redwood

1124 Lumber Exchange Building
CHICAGO, ILL.

NEW YORK, N. Y., 522 Fifth Avenue

KANSAS CITY, MO., Grand Avenue Temple Building

SUBSIDIARY TO
THE PACIFIC LUMBER COMPANY

Manufacturers and Pacific Coast Distributors

WORKS: SCOTIA, HUMBOLDT COUNTY, CAL.

OFFICES: 311 California Street, SAN FRANCISCO, CAL., and Central Building, Sixth and Main Streets, LOS ANGELES, CAL.

FOR EXPORT: A. F. THANE & COMPANY

SAN FRANCISCO, CAL., 311 California Street

NEW YORK, N. Y., 233 Broadway

FOREIGN REPRESENTATIVE: A. F. THANE & COMPANY, LTD.

ANTWERP, BELGIUM

SHANGHAI, CHINA

HAVANA, CUBA

Product.

REDWOOD LUMBER, a non-resinous wood permeated with an odorless natural preservative.

Uses.

Redwood, because of its unusual and distinctive characteristics as shown below, is specially adapted to many industrial and engineering uses, some of which are given in the following general headings. These subjects are treated more fully in the pages indicated:

	Page
Railroad Construction.....	371
Rolling Stock Equipment.....	371
Tanks and Vats.....	372
Pipe and Flume.....	373
Insulation for all Refrigerating Purposes.....	374
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Gutters, Curbing, etc.....	379
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Distinctive Characteristics of Redwood.

Redwood is a soft wood of a character highly valuable for specialty manufacturing and utilitarian purposes because it is unusually resistant to decay, rot and fire, and because of its insulating qualities. Until recent years little was known of the extraordinary values of Redwood as a specialty wood, but as Redwood is becoming better understood by industry its users are increasing continually. Moreover, production and transportation facilities are now available to supply the large demands of the future.

Color—The heart wood ranges from light cherry color to mahogany, generally an old rose color. The sap wood (of which there is very little) is a cream color.

Resistance to Decay—A natural preservative which permeates Redwood accounts alike for the great age of the timber (Redwood trees are the oldest living things) and for the lumber's remarkable resistance to decay. A Redwood log buried in the ground for 600

years was found to be still sound and was cut into first class lumber.

Resistance to Fire—Containing as it does, no pitch or other resinous substance, Redwood is slow to ignite, and its resistance to fire (as demonstrated in the San Francisco conflagration of 1906) adapts it to many commercial purposes.

Non-conductivity—The large number of minute air cells regularly spaced and of uniform shape make Redwood highly non-conductive to heat or cold, and, when properly dried keep it from expanding or contracting in use.

Texture—Soft, yet firm, of even, close grain, and unusually free from knots and blemishes.

Weight—Light, compared with other "soft woods."

Strength—In strength and stiffness Redwood compares favorably with other woods. A Government bulletin, entitled "Test of Structural Timbers" says: "Redwood is one of the most desirable species from which heavy structural timbers may be secured."

For instance, Redwood is equal in strength to cypress, and slightly stronger than eastern cedars. This conclusion is the result of tests made by experts in the United States Forest Service.

Special Qualities—Preponderance of heartwood. Large timbers. Close, even grain. Lightness of weight. Strength. Absence of pitch and resin. Presence of natural preservative that permeates the wood. Fire-resistant. Non-conductivity of heat or cold. Freedom from insect or worm activities. Non-shrinking. Non-swelling. Non-coloring. Acid and alkali resistance. Odorless and tasteless. Unaffected by electrolysis.

These properties of rot and fire resistance, minimum warp and shrinkage, as well as lack of odor, and its close grain and easy woodworking texture, have created a wide demand for Redwood for many industrial uses, many forms of railroad construction and maintenance, and for industrial building purposes.

Growth.

Redwood grows principally in the northern counties of California, on the Pacific slopes of the Coast Range. It is from this section that Redwood for com-

mercial purposes is obtained. The Redwood used for commercial lumber is not the Sequoia Gigantea—the famous “Big Trees” in the National Parks of the Sierra Nevada—but is a different species, the Sequoia Sempervirens (Everliving). The trees are extremely large and attain great heights, varying from 150 to 350 ft. in height, and from 3 to 15 and sometimes 20 ft. in diameter. Growing very slowly, in a moist climate, they are known to have obtained ages up to from 2000 to 3000 years. The character, size, age and climatic conditions of Redwood growth are no doubt factors in its utilitarian advantages.

Mills, Facilities and Capacity.

THE PACIFIC LUMBER COMPANY is the largest manufacturer and distributor of Redwood lumber. Our annual production capacity is now over 125,000,000 ft. of Redwood.

Owning many thousands of acres of the finest Redwood timber lands in Humboldt County, California, together with two large sawmills and planing mills, located in Scotia, California, THE PACIFIC LUMBER COMPANY further enhances its production facilities by owning all the commercial, housing and recreational buildings in the town of Scotia, in which the employees live.

It has exclusive use of the Leaver drying kilns, invented and constructed by an officer of the company to assist nature in drying Redwood for industrial use, at the same time not disturbing the natural preservative that permeates Redwood.

In logging operations, sawmills, planing mills, storage yard and shipping plants, every modern mechanical device is employed.

Conservation—Conservation is intelligent use. We are operating on that principle, not only in logging, where waste is reduced to the minimum, but in manufacturing, where, due to the completeness of our facilities and the demand for Redwood for such a wide range of uses, we are able to cut up and refine our lumber so as to utilize every part of the log, both high and low grades—even the sawdust and bark. This makes not only for conservation of timber but for service and economy to our patrons. This conservation and the ownership of so many thousands of acres of uncut timber, close by the mills, assure a plentiful supply of Redwood for industrial uses for many years to come.

Stocks and Shipments.

Sawed and seasoned Redwood lumber of all sizes, together with a large variety of milled products, are continually carried in stock at the mills at Scotia—usually this stock approximates 75,000,000 ft. Production and shipping are facilitated by an electric overhead monorail system, which operates throughout the mills, yards and shipping houses.

Direct rail shipments to the middle west and east are now made via the Northwestern Pacific Railroad, whose tracks adjoin the mills.

A large stock of Redwood is also carried at our “quick shipment” depot, in Chicago, to supply middle west and eastern demands where time is a factor. Shipments can be made from Chicago, either in carload or less than carload lots.

Trade-mark.

Wherever practicable, the registered trade-mark shown here is placed upon Redwood from THE PACIFIC

LUMBER COMPANY, a mark to indicate to the trade and user that the product is the result of every refinement in the production of Redwood. In the cases where shipping tags are used, the trade-mark label is on the tags.



As fast as possible, arrangements are being made to further protect buyers of our Redwood, by extending the trade-mark to other forms and sizes of Redwood.

Sales Offices.

All sales in the territory east of the Rockies are made by THE PACIFIC LUMBER COMPANY of Illinois.

Its general offices are in Chicago, in the Lumber Exchange Building, 11 South LaSalle Street, and there is a branch office in Kansas City in the Grand Avenue Temple Building.

The Eastern territory is handled through the New York office, in the Fifth Avenue Guaranty Building, 522 Fifth Avenue.

Invoices for all material shipped into mid-West and eastern territory will be rendered from the Chicago office.

Sales in Pacific Coast territory are made from THE PACIFIC LUMBER Co.'s San Francisco office, 311 California Street. A branch sales office is located in the Central Building, 6th and Main Streets, Los Angeles.

Use of Redwood by Railroads.

Redwood's resistance to rot and its long life under extreme conditions of soil and climate are recognized by railroad, mining, and construction engineers, and Redwood is extensively used by them for a great variety of purposes.

Redwood does not have to be treated with artificial preservatives to prolong its life. Nature impregnated Redwood with a natural preservative that grew into the wood. For engineering purposes in contact with ground or moisture, Redwood can be depended on to maintain its full strength and service from 15 years upward.

Some of the many railroad uses for Redwood are:

Railroad Equipment—

Siding, Ceiling and Inside Lining for Freight Cars	Baggage and Express Car Moulding, Casing, Lining and Sheathing
Refrigerator Car Roofing, Lining and Ceiling	Passenger Car Ceiling, Bottom Lining, Outside Sheathing and Panels
Stock, Box and Metal Covered Car Roofs	Window and Door Facing
Insulating Board and Wall Stripping for Powder Cars	Moulding, Sash and Cabinet Work
Boxing; Temporary Grain Doors	Eave Facia Moulding
Postal, Baggage and Express Car Lining and Ceiling	Sign and Letter Boards

Bridges, Culverts and Trestles—

Foundation Timbers; Cribbing, Cross Ties and Mud Sills	Concrete Forms; Water Pipe, Trestle; Caps, Posts, Sills
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Buildings—

Foundation Timbers	Shingles and Cornice
Sheathing; Underflooring	Siding
Ceiling; Wainscot; Finish	Office Case Work

Roadway and Maintenance—

Ties	Cribbing
Fence Boards	Finishing Lumber
Flumes; Culverts	Road Signs

Posts—

Line and Lamp Posts (Electrical Department)	Sign and Signal Posts
	Fence Posts

Motive Power—

Locomotive Boiler Lagging	Patterns
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Signal Department—

Trunking, Signal Towers	Capping
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Tanks—

Water	Oil
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Redwood Railroad Ties.

The hardest possible usage to which wood can be subjected is the railroad tie.

It is not only in constant contact with the ground, but it must stand the strain and stresses of swiftly moving heavy trains. In his report on "Timber; An Elementary Discussion of the Characteristics of the Properties of Wood," to the Division of Forestry, U. S. Department of Agriculture, Filbert Roth, special agent in charge of timber physics, gives the following table on

THE RANGE OF DURABILITY IN RAILROAD TIES

	Years
Redwood	12
Black Locust.....	10
Cypress and Red Cedar.....	10
Oak (White and Chestnut).....	8
Chestnut	8
Tamarack	7 to 8
Cherry, Black Walnut, Locust.....	7
Elm	6 to 7
Long Leaf Pine.....	6
Hemlock	4 to 6
Spruce	5
Red and Black Oaks.....	4 to 5
Ash, Beech, Maple.....	4

To get best service out of Redwood ties under heavy equipment, tie plates should be used.

Redwood ties have been in extensive use for many years in the United States, as well as in South America, England and the continent, Australia and the Orient. Because of Redwood's resistance to decay and freedom from attacks by destructive insects such as the white ant so common in the tropical countries, Redwood is in great demand in such countries.

Actual Performance of Redwood Ties.

The two following letters from prominent railroad engineers give an accurate record of the adaptability of Redwood in railroad tie service.

SAN FRANCISCO, CAL.,

April 29, 1914.

DEAR SIR:

Practically all of the tracks of the Northwestern Pacific Railroad Company, some 500 miles, are laid with Redwood ties. Many of the ties which were used in the original construction of the lines ultimately consolidated into the Northwestern Pacific, were in the track 18 to 20 years before removal. When built, 50- and 56-pound rail was laid upon these ties without tie plates. Upon tangents and upon branch lines where the traffic was light, some of these ties were taken out of the track at the end of 25 years practically sound so far as decay was concerned. However, through adzing on account of outer rail or curve rolling, and frequent re-spiking for gauge, the ties had become useless.

In 1908, the Northwestern Pacific replaced old 56-pound steel between Cloverdale and Ukiah with heavy rail, and at that time many of the ties replaced were those laid in this track in 1889.

At present, the Northwestern Pacific is using a 6 x 8" Redwood tie, with Harriman Lines' flat tie plate, 8 x 8½", weighing 6.36 pounds, and believe that such ties will give from 12 to 15 years of service except where laid on sharp curves. We are operating over this track ten-wheel engines with driving wheel load of 134,000 pounds, total loaded weight of engine, 176,000 pounds, and the tie plates in five years have no more than bedded themselves in the tie.

Considering the durability of the wood, and with proper tie plate protection under rail of adequate weight and size for the power used, we believe a Redwood tie of the size above mentioned gives better service than a 7 x 9 tie of less durable woods.

Yours truly,

(Signed) W. S. PALMER,

President and General Manager,

Northwestern Pacific R. R. Co.

SAN FRANCISCO, CAL.,

February, 10, 1917.

DEAR SIR:

Southern Pacific Company uses Redwood ties by preference to any other ties available on the Pacific Coast.

Our ordinary consumption is from 750,000 to 1,000,000 Redwood ties per year, perhaps an average of about 900,000 for maintenance of track (tie renewals).

With Southern Pacific Company rolling stock in use at present we always tie plate Redwood ties, and also tie plate other ties, excepting on unimportant branch lines.

Some years ago when the weight on engine driving wheel axles was about one-half what it is now, we did not tie plate Redwood ties.

The life of Redwood ties in track is variable as affected by decay, dependent upon the local conditions, character of soil and rainfall, etc., but the Redwood tie under any conditions is the most durable tie available here.

I have known Redwood ties to be in use in main line track as long as 22 years, and the average Redwood tie under all conditions can be relied on with us for about 12 years, perhaps more.

Yours respectfully,

(Signed) WILLIAM HOOD,

Chief Engineer,

Southern Pacific Company.

Car Siding Stations, etc.

Redwood is splendidly adapted for car siding and roofing because it is sufficiently strong, light in weight, does not shrink, swell or warp, is hard to set on fire and burns very slowly, is not subject to wet or dry rot, and takes and holds paint perfectly.

The absence of shrink or swell is particularly desirable for car siding and roofing because of the travel of the car through varying climatic conditions.

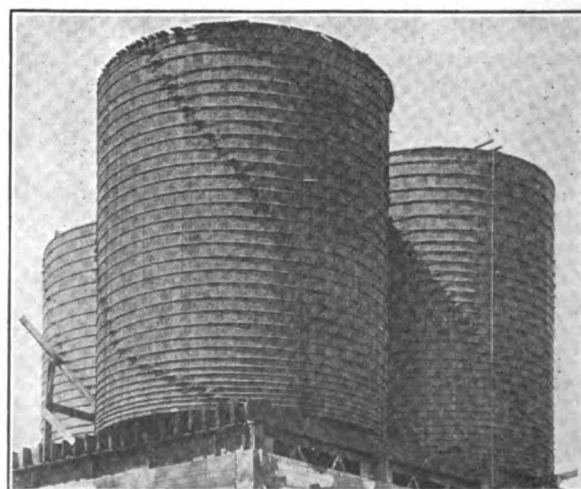
Redwood is generally specified for railroad stations in the western country because of its extreme durability in contact with the ground and exposure to the weather, its satisfactory painting surface, and its fire resistance. Redwood is specified for such work to reduce the upkeep cost on small stations.

Redwood Tanks and Vats.

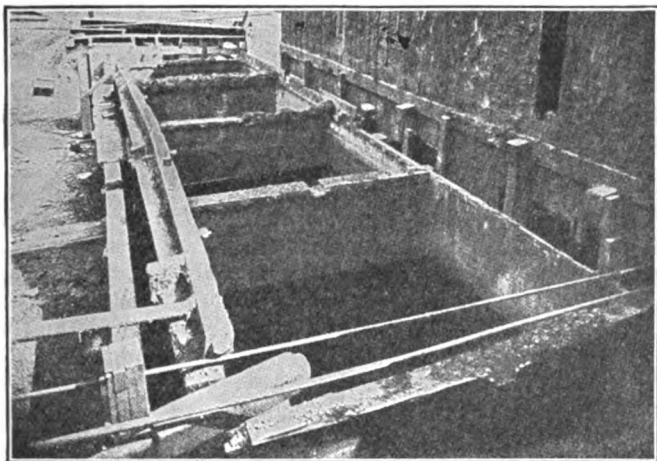
Redwood makes a superior stave for tanks.

Redwood is a non-conductor of heat and cold; 2 in. of Redwood is equivalent in insulating power to approximately 30 in. of steel or concrete. This is an element of high importance in the stave for this use because it preserves the temperature of the contents of the tank.

Redwood staves are made from clear heart straight-



REDWOOD TANKS AFTER WITHSTANDING SEVERE FIRES



REDWOOD TANNING VATS IN USE SINCE 1852

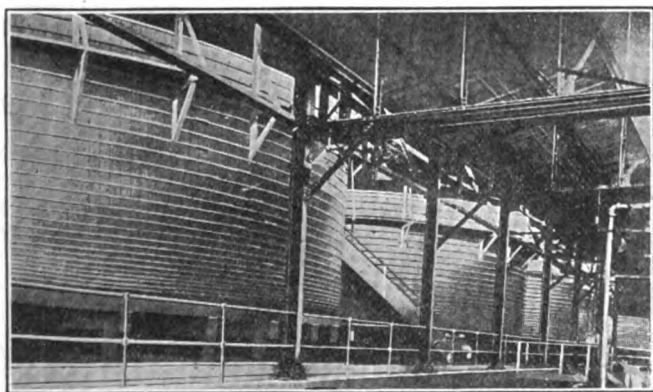
Note the bored Redwood pipes for carrying solutions used in the tanning process

grain stock, and come in standard sets of 6 to 9 ft. and 10 to 20 ft. in length.

Redwood's long life and its resistance to decay or corrosive acids and alkalis make it extremely valuable for tanks. Redwood tanks can handle muriatic acid solutions up to 6%, and up to 28% of nitrohydrochloric acid.

Redwood tanks are used in copper mines, where strong solutions of destructive acids are necessary in refining processes; in chemical works, tanneries, breweries, soap factories and other manufacturing processes where the tank is called upon not only to stand up under years of service, but remain unaffected by the contents. There are thousands of Redwood tanks in use for water storage, in wineries, for oil, fire protection, railroads, etc.

Redwood tanks will resist fire, are not injured or affected by arid climates or extremes of temperature. Redwood wears evenly under all sorts of service.

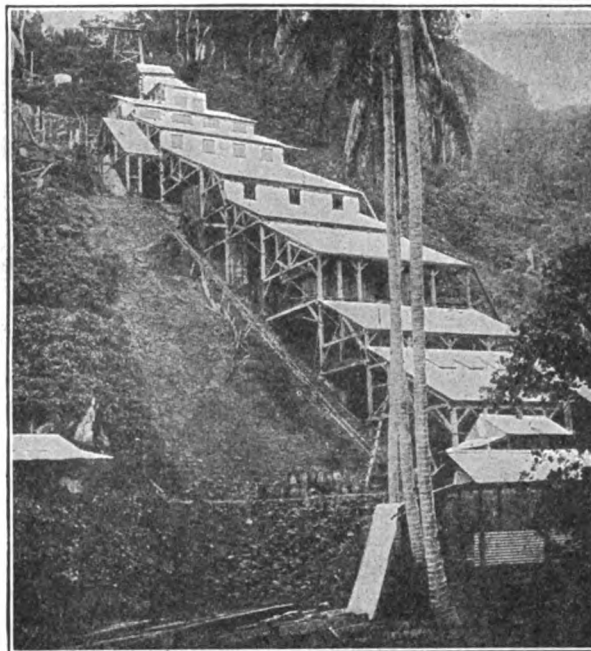


50 BY 12-FT. COPPER LEACHING TANKS OF REDWOOD
In the Anaconda Copper Mining Company's plant, Anaconda, Mont.

Redwood for Pipe and Flumes.

For pipe and flumes there is really no competition with Redwood, where permanency in installation and the highest type of service are demanded.

Redwood makes a superior stave for pipe. There are many Redwood stave pipe lines in operation today that have been in continuous service from 20 to 30 years, and show, under careful examination, no appreciable signs of decay. The average life of Redwood stave pipe is not definitely known. The original installations made in 1886, 1889 and succeeding years, are still in practically



REDWOOD TANKS RESIST ADVERSE CLIMATIC CONDITIONS
Colorado Mining Company, Philippine Islands

as good condition as when installed; and it is fair to assume that the ultimate life of a well built continuous stave Redwood pipe is from 60 to 75 years.

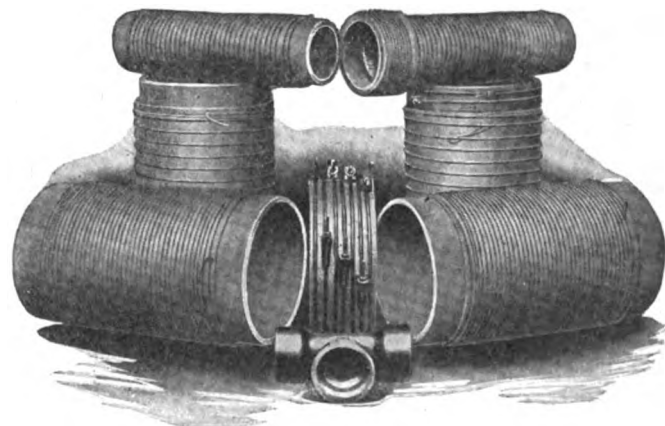
Redwood is a non-conductor; 2 in. of Redwood is equivalent in insulating power to approximately 30 in. of steel or concrete. This is an element of high importance in the stave for this use because it preserves the temperature of the contents of pipe.

Redwood staves are made from clear heart straight-grain stock, and come in standard sets of 6 to 9 ft. and 10 to 20 ft. in length.

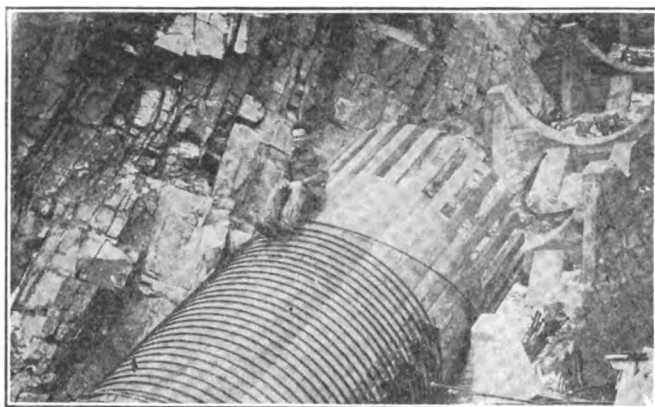
On large installations the cost of Redwood pipe is about one-quarter of the cost of cast iron, and from 25% to 33% less than steel. At the then prevailing price of cast iron pipe (in May, 1917), a 24-in. Redwood pipe line would cost about 25% as much as a cast iron line of equal size, while a 60-in. or larger cast iron pipe line would be entirely out of the question, as cast iron pipe is not made in such sizes.

Redwood pipe installations are made from 2 in. up to 13 ft. in diameter. It is made in two forms—"machine banded" and what is known as "continuous stave" construction.

"Machine banded" pipe is made in completed sec-



MACHINE BANDED WIRE WOUND REDWOOD PIPE



8-FT. REDWOOD CONTINUOUS STAVE PIPE
Inverted siphon, U. S. Reclamation Service, Gilman, Cal.

tions, in standard length of 6 to 20 ft., from 2 to 32 in. in diameter, and is shipped ready to be laid.

Redwood pipe is used as main lines for municipal water plants, penstocks for hydro-electric plants, in mines where drainage water is not only hot but carries mineral and chemical solutions detrimental to metal and other kinds of wood pipe; for sluicing, conduits, sewage disposal, irrigation systems, etc.

"Continuous stave" Redwood pipe is a built-up installation, and is usually used for lines above 20 in. in diameter and up to the largest size. It is shipped to the installation as staves. The stave arrangement is staggered and the ends splined. This gives a continuous pipe line that is best adapted for long lines conveying large volumes of water.

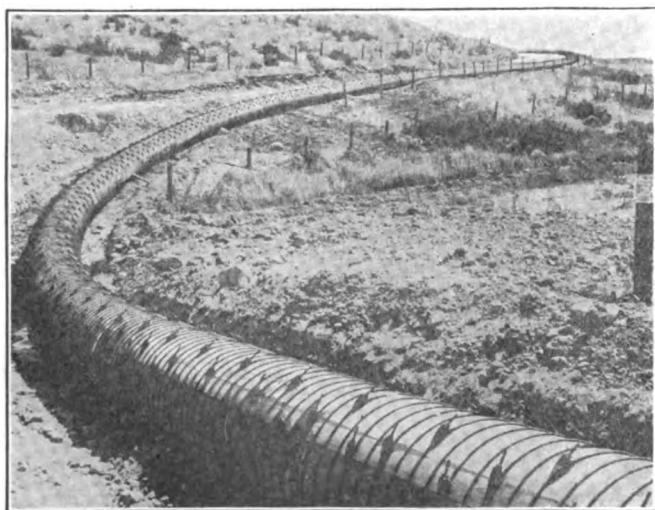
"Continuous stave" installations can handle, in large pipe, a pressure head of about 350 ft.; and in smaller diameters it can be installed with strength sufficient to carry 400 ft. head. "Machine banded" pipe can be made with a guarantee to withstand a static pressure of 800 ft. There are lines in Nevada carrying 500 ft. head, which is 216 lbs. to the sq. in.

Comparative Advantages, Redwood Pipe vs. Metal.

Redwood pipe in service and cost offers these distinct advantages over metal:

Costs less than other pipe of equal efficiency.

Has a life equal to any other pipe except cast iron.



REDWOOD CONTINUOUS STAVE PIPE, OPERATING UNDER
100-FT. HEAD
Installed for the City of San Diego, Cal.

Will survive many replacements of steel hoops or wire bands even when the hoops or bands are heavily galvanized or coated with asphalt.

Carries from 10% to 20% more water than any other kind of pipe when both are new, and from 30% to 50% more when both are 10 years old.

Flow capacity is not interfered with by accumulation of blisters and other foreign matter on the inner walls, such as in metal or concrete pipe, and which accumulation decreases the flow by increasing friction.

Not affected by electrolysis.

Not attacked by worms or insects, including the notorious white ant of the tropics.

Not affected by soils, which in many instances destroy other pipe.

Will not freeze under a temperature which bursts a metal pipe. If the water freezes, the flexibility of the pipe prevents bursting. It neither expands nor contracts with heat or cold, therefore does not require expansion joints.

Not afflicted with temperature cracks such as occur in cement or concrete pipe.

Water is not discolored, stained or tainted, and it remains cool, even when the pipe is laid on the surface in hot climates.

Redwood is a non-conductor of heat, and hot fluids and hot water can be pumped through it with a minimum of radiation.

Easily transported, particularly in rough or mountainous country, in "knock down" shape.

A Redwood pipe is the highest type of service durability. As the durability of Redwood staves is 5 or 6 times that of naked steel hoops, it is usual to protect hoops with asphaltic or other protecting coatings. There is no definite rule as to the life of the steel band on a Redwood pipe. That depends entirely on the soil that the pipe lies in. If it is salty it will attack the steel much more quickly than an installation in clay. In making Redwood pipe installations, the pipe companies investigate the bed for the pipe very thoroughly, and the pipe is equipped with protected hoops to give it the maximum life.

Insulating Qualities of Redwood Ideal for Cold Storage Requirements.

Redwood cellular structure when studied under a microscope, looks very similar to a comb of honey between the dark annular rings. Every one of these millions of cells in the growing tree is full of sap, but when the tree is cut into lumber, the lumber must be "seasoned" or dried, before it goes into commercial use. This "seasoning" process consists merely of evaporating the natural moisture of these cells. Each cell, therefore, becomes a dead air space.

The cellular make-up of Redwood is uniform both in the thickness of the cell wall as well as the size of the cell. It is plainly evident, therefore, that heat applied to one side of a piece of Redwood, to travel through the Redwood must pass through a thin cell wall and then another dead air space, and so on. Heat passing through this combination rapidly dissipates.

Prof. L. J. Towne, of Columbia University, gives the relative power of conduction of 1 to 20 between wood and stone, cement or clay products. This means that stone and cement are 20 times a better medium for the conduction of heat or cold than is wood. The millions of dead air cells between the annular rings of Redwood are what give Redwood its insulating power.

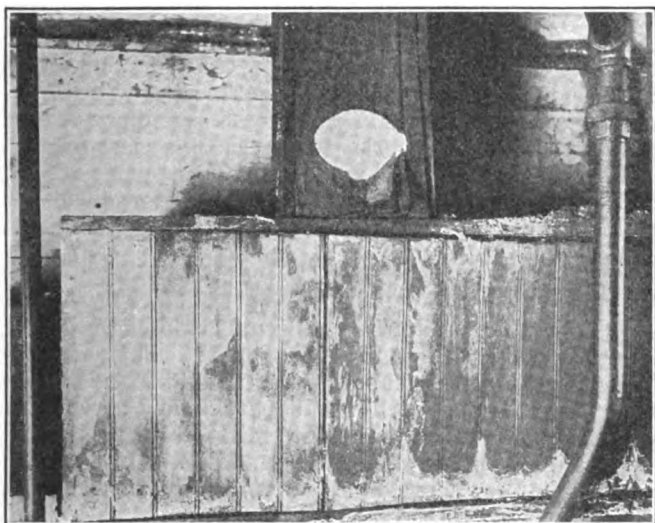
A large manufacturer of silos in the east, one of the pioneer concerns in the use of Redwood for silos,

makes the statement that 2 in. of Redwood is equivalent to 30 in. of concrete in insulating power. This manufacturer has studied Redwood thoroughly from this angle for the reason that the success of a silo depends upon the non-conductivity of the silo wall—as dissipation of the natural heat of the silage through the silo wall increases the per cent. of waste silage.

Installations of Redwood Insulation in Cold Storage Plants.

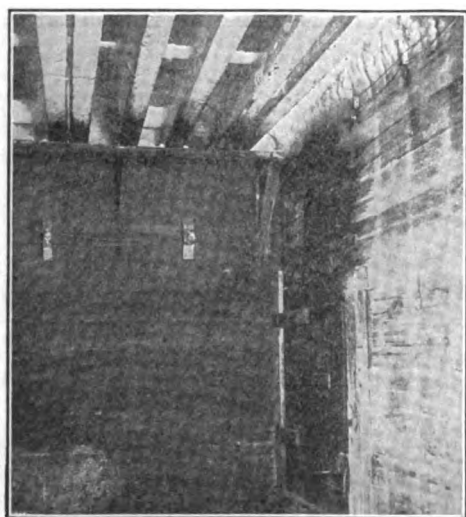
Manufacturing plants use Redwood as a substitute for corkboard for insulating.

There are some splendid examples of Redwood's insulating power, as well as its remarkable longevity under the most severe service in the old plant of the National Ice & Cold Storage Co., San Francisco. This plant was built in 1902 and Redwood was used throughout. The system of brine casing is incased in Redwood boxes made of 1-in. matched and surfaced Redwood. Nearly all of these insulation boxes are still in use. The



INSULATING BOXES OF MATCHED 1-IN. REDWOOD AROUND BRINE PIPES

15 years old. Engine room temperature, 80°; inside of box, 5°. Frost formed around pipes is gradually forcing box out of shape, but there has been no decay, warp nor check in the wood. Insulating qualities shown by absence of frost on exterior of box



REDWOOD ICE STORAGE ROOM AFTER 15 YEARS' SERVICE

In plant of National Ice & Cold Storage Co., San Francisco. In spite of severe conditions of service, this room is still airtight, and there has been no decay in planking or timbers

temperature in the brine pipes is 6° above zero, and they have gradually built up around the pipe, inside of the box, an incrustation of frost that completely fills the box. In spite of the fact that the temperature of the inside of these insulation boxes is 6° above zero, and the temperature in the engine room of the plant is 80°, there is no shrink, warp, swell, twist nor check in these boxes, nor is there any gathering of frost on the outside of the box which would indicate free conductivity through the wood.

Not only this plant, but most of the icehouses on the Pacific Coast use Redwood as lining for cold storage and ice rooms. In the plant above referred to there are ice storage rooms that have been in continuous use for 15 years, and where Redwood has been incased with frost and ice for that period, and in spite of this severe service these rooms are thoroughly airtight—the joints of the wood are tight.

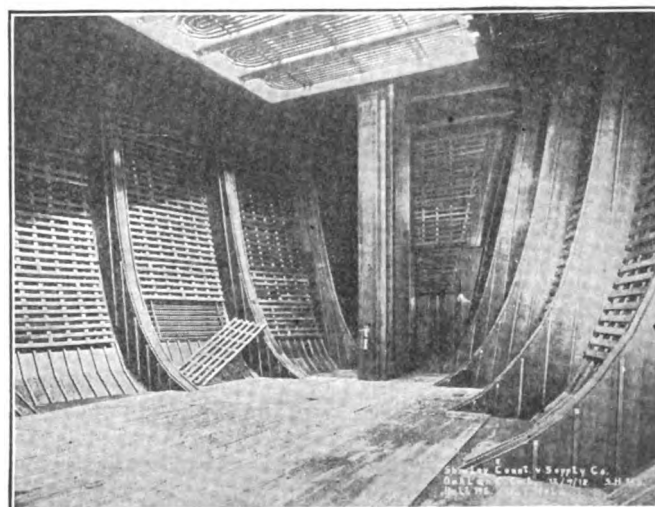
Redwood Insulation in Refrigerator Vessels.

During the war the Shipley Construction Co. of Brooklyn, New York, fitted out on the Pacific Coast, for the Government, eight refrigerator vessels, each of approximately 10,000 tons dead weight capacity. The holds of these vessels were no more or less than immense Redwood refrigerator rooms and a number of the vessels, owing to disturbances in the Panama Canal, were forced, in order to get to the Eastern Coast, to go through the Straights of Magellan. This necessitated their passing the equator both south and north bound, and they were utilized in their trip east for carrying machinery, so that they were not frozen down until they reached the East Coast. Without any repairs whatever, the refrigerating machinery was then started, and the interiors of the vessels brought to a freezing point. When the machinery was shut off, the $\frac{7}{8}$ -in. Redwood insulation was sufficient to maintain the temperature with less than 1° of loss in 24 hours. Had the heat of the tropics disturbed the placement of the Redwood in any way, of course it would have been impossible to maintain this temperature.

The following are quotations from a letter recently written us by the shipbuilders: BROOKLYN, N. Y.

Referring to your request for our opinion relative to the use of California Redwood in the insulation of refrigerated meat vessels.

We have pleasure in stating that we have used this wood exclusively for the insulation of eight large meat carrying



HOLD OF REFRIGERATOR SHIP
Showing Redwood Insulation, $\frac{7}{8}$ -in. thick

steamers having an aggregated capacity of over 2,500,000 cubic feet of insulated space. These vessels carry frozen beef cargoes at temperatures below 15 degrees F. and have been in service for periods varying between twenty-one months and twelve months, chiefly sailing between South American and European ports and North American and European ports. The vessels have been operated by the United States Navy and the United States Shipping Board.

The Redwood has proved entirely satisfactory for the purpose and we do not hesitate in saying that where we can procure it in quantities sufficient for the purpose, we would prefer to use it instead of — or timbers usually obtainable in these parts. The wood lends itself to being economically worked and as it does not check, the amount of loss incurred by waste is very small in comparison with the commercial grades of —.

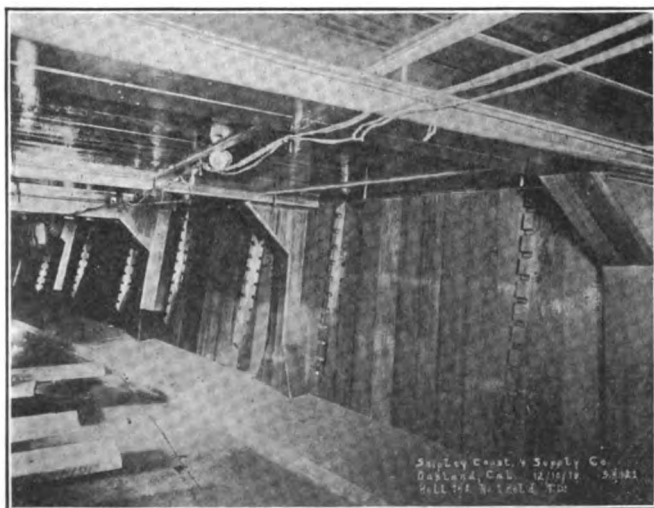
Redwood is quite sufficiently hard for the purpose, even when fitted on the wearing surfaces of insulated decks. However, in these positions under the hatchways it must be protected by an upper layer of harder wearing lumber such as — or —. This also applies to —, —, or any other lumber used for insulating so that California Redwood is not at any disadvantage in this respect.

The absence from checking has proved a great advantage, inasmuch as it enables side and overhead insulation to be contained by one thickness of board without the use of paper. With commercial — it is necessary to use double boards with paper in between so that the insulation filling will not sift out through checks which almost invariably appear in the boards, due to the wet and dry conditions experienced in insulated steamers between voyages carrying refrigerated cargoes and general cargoes respectively.

At least one of the steamers fitted with Redwood was very badly damaged in one of her insulated compartments by contact with a floating mine, resulting in flooding the entire compartment. After the vessel had been dry docked and dried out the Redwood was found to be in no way damaged by immersion in sea water, and in fact did not have to be replaced except where the insulation filling had to be replaced and the original Redwood removed for this purpose.

Very truly yours,

SHIPLEY CONSTRUCTION & SUPPLY CO.,
Per L. Williams,
Marine Department.



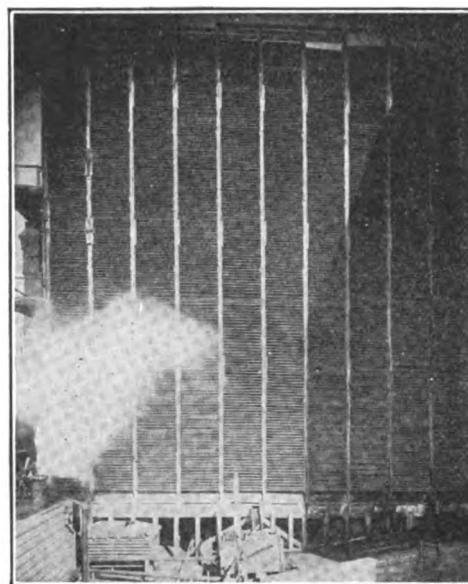
HOLD OF REFRIGERATOR SHIP USED IN EQUATORIAL WATERS

A 24-hour stoppage of refrigeration resulted in a rise of only 1°. Redwood insulation prevents any damage being done to goods in storage as a result of temporary breakdowns of the refrigerating machinery

Redwood Ideal for Cooling Tower Service.

No item in the design of a cooling tower is more important than the selection of the proper material of which it is to be built, because the requirements are most exacting if the tower is to withstand the severe service to which it is subjected.

The wide range of temperature changes, together with the excessive moisture causes rapid deterioration



COOLING TOWER MADE OF REDWOOD FRAMES AND LATTICE

of either metal or ordinary wood construction. Redwood, however, due to its being permeated with a natural preservative and to its remarkable resistance against decay, is the ideal material for use in this class of construction. Installations made in various parts of the country have made remarkable records for durability and long life under the most severe operating conditions.

Redwood for Roofs.

Redwood possesses a number of qualities that make it highly preferable for roofs, and particularly in factories where there is humidity and condensation to contend with. It has been found particularly serviceable in connection with the so-called "sawtooth" type of roof.

In many kinds of business such as textile mills, paper mills, etc., where there is humidity or rising steam, there is trouble with condensation that drops back on to the products handled, and creates a manufacturing loss. This is due to the fact that the roofing materials do not properly insulate the sharp differences in temperature between the exterior and interior, and particularly where there is severe cold weather.



A 4-ACRE ROOF REPAIRED WITH CALIFORNIA REDWOOD
Part of roof of Whitman Mill, New Bedford, Mass.

It is not necessary to subject Redwood to artificial preservatives to protect it from rot and decay—it possesses a natural preservative that resists rot both in contact with water, moisture or humidity, or subjected to variable conditions of heat or dryness, or severe alternating dry and moist conditions. Redwood can be denied

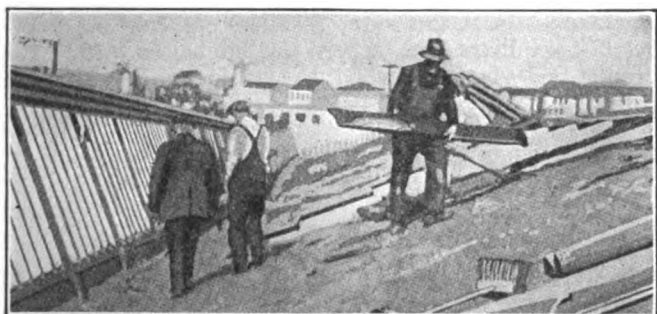
ventilation by sealing in metal, and under conditions of this kind it has a high resistance to dry rot; this same resistance to dry rot is present even if the wood is not denied air.

In Redwood, as in other woods, the heart stock will last longer than the sap. There is a sharp distinction between heart and sap in Redwood, as the natural color of the heart wood is a soft reddish brown, while the sap wood is cream color. Redwood sap wood, however, is as durable as any other soft wood when painted.

Redwood's natural resistance to decay under moisture or humidity gives it a maximum of life, while its inherent resistance to the attack of acids or alkalis, or the fumes of chemicals, makes it preferable in cases where such conditions prevail.

It is light in weight, and sufficiently strong under proper design.

Redwood also possesses the necessary attribute of holding its shape—when wet it does not swell and, when again dried, does not shrink perceptibly. Redwood is not sensitive to severe changes of temperature or atmospheric conditions which set up counteracting strains in wood. It can be depended on to hold its shape when



REPAIRING 4-ACRE SAWTOOTH ROOF WITH REDWOOD
A Closer View of the Preceding Illustration

one side is subjected to freezing and the other to heat or humidity.

Redwood is a thoroughly satisfactory surface to paint. Its surface affords a firm grip for the paint and makes it possible to get a thorough coverage. As Redwood, when thoroughly dry, is subject to a minimum of movement in the wood itself under varying conditions of heat or moisture, there is a minimum tendency to check the paint film from such cause.

Where Proper Insulation and Resistance to Decay are Particularly Valuable.

H. J. Hoxie, Engineer and Special Inspector of the Associated Mutual Fire Insurance Companies, Boston, Massachusetts, writes regarding this work:

"I am well aware of the excellent rot resisting qualities of California Redwood, also of its high insulating power. I believe there is an excellent field for Redwood for roofs, especially in paper mills, weave mills and other finishing mills."

The peculiar and uniform cellular structure of Redwood accounts for its insulating qualities, while the *natural* preservative prevents the formation of growth of decay producing fungi in Redwood lumber.

Redwood Fire Door Cores.

Redwood is one of the four woods specified by the Fire Underwriters Laboratories as a material

from which fire door cores should be built.

Of these four woods Redwood is the first preferred, for these reasons:

(1) Natural resistance to fire because of slow ignition and slow burning.

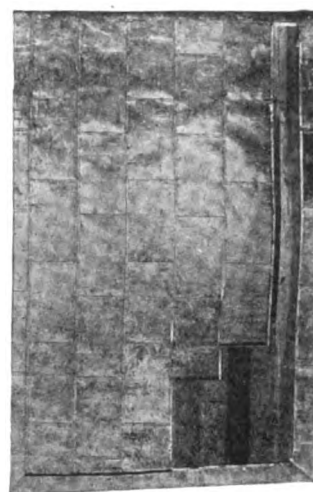
(2) Absence of pitch, resin, or other inflammable elements.

(3) Does not dry rot when denied ventilation.

(4) Will not "wet" rot due to moisture from sweating metal.

(5) Light in weight, strong and easy to work.

(6) Always hangs true, and is not affected by swelling or shrinking in the core by reason of moisture or dampness that might penetrate through steaming, sweating, etc.



FIREPROOF DOOR SHOWING REDWOOD CORE
Approved by the Fire Underwriters' Association

The following letter from a large Pacific coast manufacturer of fire doors is based on years of practical experience:

LOS ANGELES, CAL.,
Aug. 16, 1916.

GENTLEMEN:

In reply to your letter of August 15th.

There has been much discussion on the relative merits of various soft woods to be used in construction of fire doors.

In my experience I find that Redwood is the best wood in all cases, it having, you might say, no pitch in it, which makes it almost non-burnable. Also, it does not dry-rot when enclosed by metal and denied ventilation.

Most woods I have noticed that are encased in metal will sooner or later dry-rot, and I have noticed a number of doors after having been enclosed for seven or eight years were reduced to scrap or junk through dry-rot.

We are the largest manufacturers of fire doors on the coast, and we have never had one complaint about our material going bad. In fact, in the course of a change in one of the Pacific Telephone Buildings in San Francisco, the engineer in charge cut one of the metal doors in two that we manufactured, the door in mention having been in place about eight years; and he, the engineer, returned a part of the door to us, and a letter stating that the door was in just as good condition as the day we manufactured it.

Also, another thing that I noticed on the Redwood doors is that after they have been subjected to a fire they are not burned up. I could site a number of incidents, but I remember one in particular in which I went to examine the doors after a fire. I found that the door next to the fire had been charred possibly one-quarter of an inch deep. The fire did not get in any further; in fact it stopped, and as I said, this is due to the fact that there is no pitch in the wood to help it burn.

After the fire at the Times Mirror Company's plant (The Los Angeles Daily Times explosion), I noticed on the building across the alley there was a shutter protecting a window opening. Considering the great heat from the explosion and fire, the shutter had fulfilled its duty much more so than any other protection used on the adjoining window. In fact, some of them had hollow metal windows, and frames, and they had gone absolutely to pieces, but this Redwood shutter kept the fire out of this particular opening; and without doubt in my mind if they had been used on the adjoining openings they would have saved that building.

In conclusion, you can see where I stand regarding the use of Redwood. We will not use anything else because I deem it that our customers are entitled to the best and it is up to us to see that they get it.

Yours very truly,

CALIFORNIA FIRE PROOF DOOR CO.,
(Signed) MGR. J. A. MOTTASHED.

Redwood Fire Walls.

Redwood's slow ignition, slow burning, and the ease with which fire is extinguished have made it the recognized material for fire walls.

Experience on the Pacific Coast has demonstrated that a solid Redwood fire wall will perform its functions satisfactorily.

Building ordinance No. 399, of the city of Eureka, California, is typical of the permitted use of Redwood for fire wall purposes, and reads as follows:

"Sec. 2. The exterior walls and all party walls of the buildings included within the district above described, shall be constructed of concrete or brick, natural or artificial stone, or iron or a combination of any or all of the above described materials, or of Redwood as provided by this ordinance.

"Sec. 3. The height of all wooden buildings hereafter constructed within the fire limits shall be limited to 50 feet, from the sidewalk grade to top of fire wall or peak of roof.

"Sec. 4. All wooden buildings hereafter erected within the fire limits of the city of Eureka, except those built for, and used exclusively as dwelling houses, outhouses, and private stables, shall be constructed with solid walls, the same to be not less than four inches thick in all one and two story buildings, and in all three or more story buildings, the two upper stories shall be constructed with solid walls of like thickness, and the lower story or stories shall be constructed with solid walls not less than six inches thick. The above thickness of walls to be exclusive of plaster, weather boarding or rustic."

OAKLAND, CALIFORNIA,
April 11, 1917.

GENTLEMEN:

With reference to your communication of the 7th inst., would advise you we have selected Redwood in many parts of our new building on account of the resistance this lumber has to decay and deterioration, and also on account of its resistance to fire. We particularly selected Redwood for our elevator shaft on account of the well-known resistance of this wood to fire. The construction of our shaft is 2 x 6" Redwood timbers placed on top of each other, making a solid wall of 6" thick.

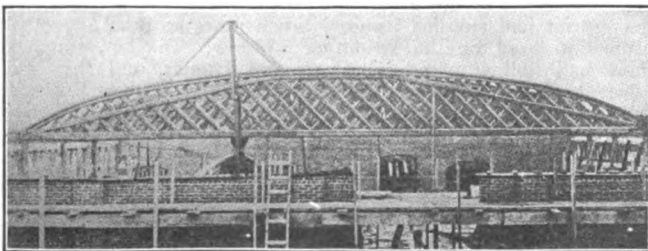
We gladly recommend this lumber to anyone desiring slow burning construction.

Yours very truly,
CALIFORNIA COTTON MILLS Co.,
Mgr. J. R. Millar.

Lattice Roof Trusses.

The wood lattice roof has been designed to meet the modern demand in industrial building for a light roof truss which can be built easily, quickly and at a low cost. The design is of such a nature that the truss can be built to span all ordinary lengths between walls without the need of intermediate supports, thus providing clear floor space in the building. Although light in weight it must be strong and constructed of material which can be obtained without delay.

Redwood's long life, resistance to fire, decay, and to corrosive acids make a Redwood lattice truss extremely suitable in construction where fire hazard, acid fumes, excessive moisture, or a combination of heat and humidity are present.



96-FT. REDWOOD LATTICE TRUSSES BEING ERECTED
Roof Boards, also of Redwood, Fastened Directly to Trusses

SWEET'S CATALOGUE

Concrete Forms.

For concrete form lumber Redwood is exceptionally valuable because it does not curl or shrink and can be used over and over again, and is light in weight.

This is particularly true in hot climates where the sun, beating against the outside of the concrete form, warps other lumber by drying the exterior faster than the inside of the form board that is next to the wet concrete.

It has been found by actual experience with Redwood for concrete form lumber that:

It strips better.

Can be used over and over because it does not change its shape.

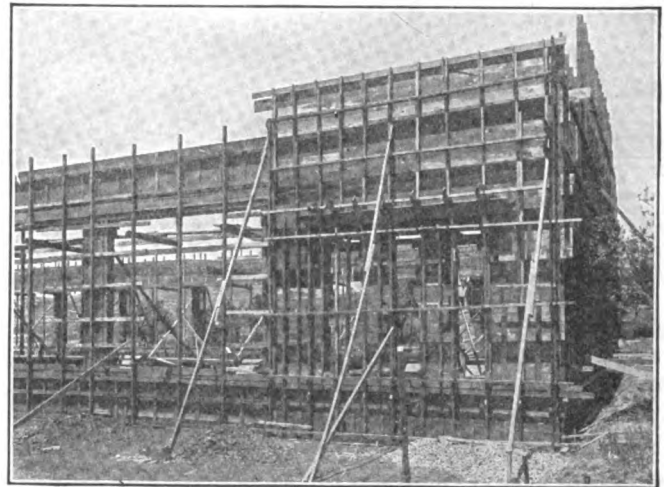
It is easier and cheaper to handle by the carpenter.

By tonguing and grooving the form lumber better results are secured, giving a tighter form and a smoother concrete job.

Redwood is particularly recommended for wall and floor work.

For building residences, where concrete foundations are provided, a big saving in the construction cost is possible by using Redwood boards for the concrete forms for the foundations and later using the same boards for sheathing the house.

It has for years been the universal practice of contractors to use Redwood for concrete forms in "footings," for pillars, etc., where the lumber is left in the ground and where Redwood will last indefinitely without rotting.



REDWOOD CONCRETE FORMS DO NOT SHRINK OR CURL
Redwood forms increase contractors' profits as the lumber is absolutely unaffected by moisture and may be used over many times

The following letter from a contractor testifies as to the high regard in which Redwood is held as a concrete form lumber.

OAKLAND, CAL.

GENTLEMEN:

In answer to your inquiry of recent date as to why we used Redwood lumber for concrete forms on the Sturges Tire Factory in Oakland, California, we wish to state that it was the first job on which we had done so, and it was experimental with us.

We had often spoken of Redwood for concrete forms, primarily because it was easy to handle and soft for nailing, and we thought that after stripping it could be used a second or third time.

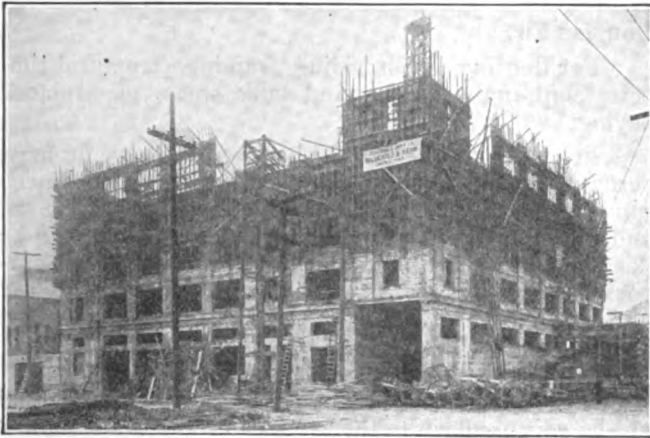
We are very pleased to say that the experiment far exceeded our expectations. The walls were twenty-two feet high and two hundred and eighty feet long, and after stripping we found no stains at all in concrete walls and when the alkali came to the surface it showed as white and clear as any

Continued on next page

that has ever come through after using — lumber. The dampness on one side and the exposure to sun and air on the other seems to affect the lumber very little, and causes no warping as in other timber, thereby giving a smaller percentage of waste.

For the above reasons we feel that in the future we shall use nothing but Redwood for forms, unless specified otherwise by the architect.

Very truly yours,
CHRISTENSEN BROTHERS,
C. Christensen.



REDWOOD CONCRETE FORMS ON BIG CONSTRUCTION WORK

Sheet Piling.

Redwood's durability in contact with the ground makes it especially valuable for sheet piling. It is used in the west almost entirely for this purpose where driven in soil or sand.

It is sufficiently strong for this purpose, and, when once placed, it can be depended on to last from 25 years upward, regardless of the condition of the soil or moisture. Redwood is so constituted by nature that it has an equal resistance in almost any type of soil.

In the western country, where drains, flumes, dams, sinks, septic tanks, bulkheads, sumps, etc., are common on every ranch or farm property, Redwood is always used because the first installation is regarded the final cost, not only in money, but in time and attention for many years.

Gutters, Curbing, etc.

Large quantities of Redwood 3 by 12 in., merchantable grade, are used for curbing and gutters in street work.

It is extremely durable in this service, lasting from 15 to 20 years, and particularly useful for outlying sections of big cities and in small communities.

For lining cesspools, culverts, subsurface drains, sumps, bulkheads, lagging, etc., Redwood can be depended on for from 15 to 25 years of usefulness.

Many small communities find it to advantage to use wooden gutters and curbing where stone is not available. Most any other kind of wood for this purpose has to be creosoted, while Redwood can be put down just as it is taken from the lumber yard. It contains its own natural preservative.

Irrigation Boxes and Head Gates.

Irrigation boxes and head gates are built of Redwood, to get the Redwood service in long life.

The same applies to drainage and sluice boxes.

Redwood is being successfully used instead of porous tile to drain farm lands.

This is usually done by making a 3-sided box of 1 by 12-in. boards, and setting the open side down. In this use it will last 15 years or more.

Read the experience of a user:

SAN FRANCISCO, CAL.,
July 7, 1916.

DEAR SIR:

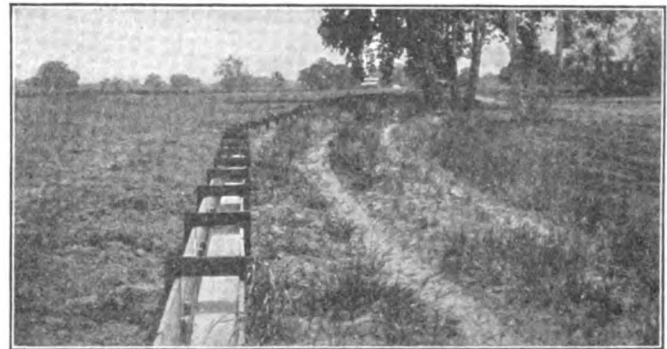
Referring to yours of July 6th, regarding use of Redwood boxes for drainage on my ranch—

I have found it profitable to use Redwood boxes in several thousand feet of drains. The ditches are about five feet deep, the soil is of such character they would rapidly fill unless tile or some substitute was put in.

Knowing the lasting qualities of Redwood in the ground, we have put in boxes, without bottoms, using a No. 2 grade of common Redwood, without sap.

The interior capacity of the boxes would run from 36 to 100 square inches. The cost of this box, compared with tiling, is far cheaper, and, of course, the boxes can be much more expeditiously laid.

Respectfully yours,
MILES STANDISH,
Of Standish & Hickey, Ltd.



REDWOOD IRRIGATION BOXES

The great durability of Redwood in contact with wet ground, in addition to its light weight and ease of working, puts it in a class without competition for this purpose.

Special Information Sheets.

Any or all of the following Redwood information sheets will be sent on application to our Chicago office, 1124 Lumber Exchange Building:

- (1) General Data Sheet on Redwood; its Production and Uses.
- (2) Tanks and Vats for Water, Acid and Alkali Solutions and Oil.
- (3) Pipe for Water, Chemicals and Sewage Conveying.
- (4) Caskets, Burial Boxes, Clothing Boxes and Chests.
- (5) Refrigerators, Ice Cream Cabinets, Fireless Cookers, Brooders, Incubators, Beehives, etc.
- (6) Farm and Dairy Buildings and Equipment, Silos, Tanks, Pipe, Outbuildings, Irrigation Flumes, Drainage Boxes, Greenhouses, etc.
- (7) Small Wood Specialties, Cigar Boxes, Toys, Battery Separators, Camera Stock, Pattern Stock, etc.
- (8) Furniture, Piano Cases, Talking Machines, Filing Cases, Desks, etc.
- (9) Railroad Construction and Equipment.
- (10) Industrial Building Materials.
- (11) Residential Building Materials.

All of our offices are prepared to consult with any lumber user concerning his needs, and to advise as to the suitability of Redwood and its economical use.

If interested in the adaptability of Redwood for your requirements, we shall be glad to give full information and advice without obligation on your part.

WEST COAST LUMBERMEN'S ASSOCIATION

Western Oregon and Washington Forest Products

Henry Building
SEATTLE, WASH.

NEW YORK OFFICE: Grand Central Terminal

PORTLAND, ORE., OFFICE: Yeon Building

Products.

WEST COAST WOODS:

Douglas Fir	Western Hemlock
Sitka Spruce	Western Red Cedar

Uses.

West Coast woods are particularly adapted to the following uses:

Flooring	Structural timbers
Finish	Ship timbers
Siding	Airplane stock
Shingles	Paving blocks

Timber Resources.

WAR INDUSTRIES BOARD BULLETIN 43—"The Northwest is now the last great reservoir of undeveloped timber wealth in this country."

REPORT OF THE COMMITTEE FOR THE APPLICATION OF FORESTRY OF THE SOCIETY OF AMERICAN FORESTERS—"The Pacific Coast region has today the world's greatest stand of high grade timber. Within 10 years it will be supplying the bulk of the Nation's lumber."

Sitka Spruce.

For airplane stock, finish, siding, and factory, shop and box grades.

The giant of the genus.

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS REPORT 67—"Spruce is the wood par excellence for the construction of aircraft."

Western Red Cedar.

For finish, siding, shingles.

Western red cedar furnishes three-fourths of the shingles used in the United States.

The life of a Rite-Grade shingle is limited only by the kind of nails with which it is put on.

Douglas Fir.

For flooring, finish, siding, framing, structural timbers, ship timbers, pipe and tank stock, wood block paving.

FOREST SERVICE BULLETIN 88—"Douglas fir may, perhaps, be considered as the most important of American woods. Its rapid growth in the Pacific Coast forests, and the great variety of uses to which its wood can be put, place it first. As a structural timber it is not surpassed."

Western Hemlock.

For flooring, finish, siding, boards, boxes.

Western hemlock is a distinctive wood and should not be confused with other species of the same family.

FOREST SERVICE BULLETIN 115—"The demand for western hemlock will no doubt increase when its properties are better known," and, referring to a possible prejudice against it because of its species name "A thorough investigation of its properties proves this prejudice to be unfounded."

Working Stresses.

In the table below are given the working stresses recommended by the Forest Products Laboratory, U. S. Forest Service, for West Coast Woods in Building use:

WORKING STRESSES

	Douglas Fir	Western Hemlock	Sitka Spruce	Western Red Cedar
Bending:				
Extreme fiber.....	1500	1300	1100	900
Horizontal shear (maximum).....	95	75	85	80
Compression:				
Parallel to grain (short columns).....	1100	900	800	700
Perpendicular to grain.....	325	300	250	200



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A WEST COAST FOREST

AMERICAN CREOSOTING COMPANY, INC.

COLONIAL CREOSOTING COMPANY, INC.
 GEORGIA CREOSOTING COMPANY, INC.
 INDIANA CREOSOTING COMPANY, INC.

GENERAL OFFICES

LONDON OFFICE
 4 Lloyd's Avenue, E.C.

401 West Main Street
 LOUISVILLE, KY.

SOUTHERN SALES OFFICE
 BOGALUSA, LA.

PLANTS

LIVINGSTON MANOR, N. Y. PATERSON, N. J.
 MANVILLE, N. J. TOLEDO, OHIO
 KANSAS CITY, MO. MARION, ILL.
 BOGALUSA, LA. DERIDDER, LA.
 TRENTON, ONTARIO

ROME, N. Y.
 RUSSELL, KY.
 BRUNSWICK, GA.
 HUGO, OKLA.

BLOOMINGTON, IND.
 INDIANAPOLIS, IND.
 SPRINGFIELD, MO.
 SHREVEPORT, LA.

SUDBURY, MANITOBA

OIL STORAGE STATIONS
 BAYONNE, N. J.

CHALMETTE, LA.

ANTWERP, BELGIUM

Products.

The world's largest producers of CREOSOTED MATERIALS, including Creosoted Cross Ties, Structural Timbers, Paving Blocks, Piling, Poles, Cross Arms, Fence Posts, Water Tanks, Silos, Lumber, etc.

Facilities.

A responsible organization with an established reputation, now supplying the treated tie requirements of over 30,000 miles of railroad; furnishing creosoted materials to the United States Government, states, counties and municipalities, and giving special service to the demands of construction engineers, traction lines, telegraph and telephone companies, factories, farmers and builders generally. A record of 3,800,000,000 bd. ft. forest products treated since 1904; annual capacity now 400,000,000 bd. ft.; ample storage capacity for season-

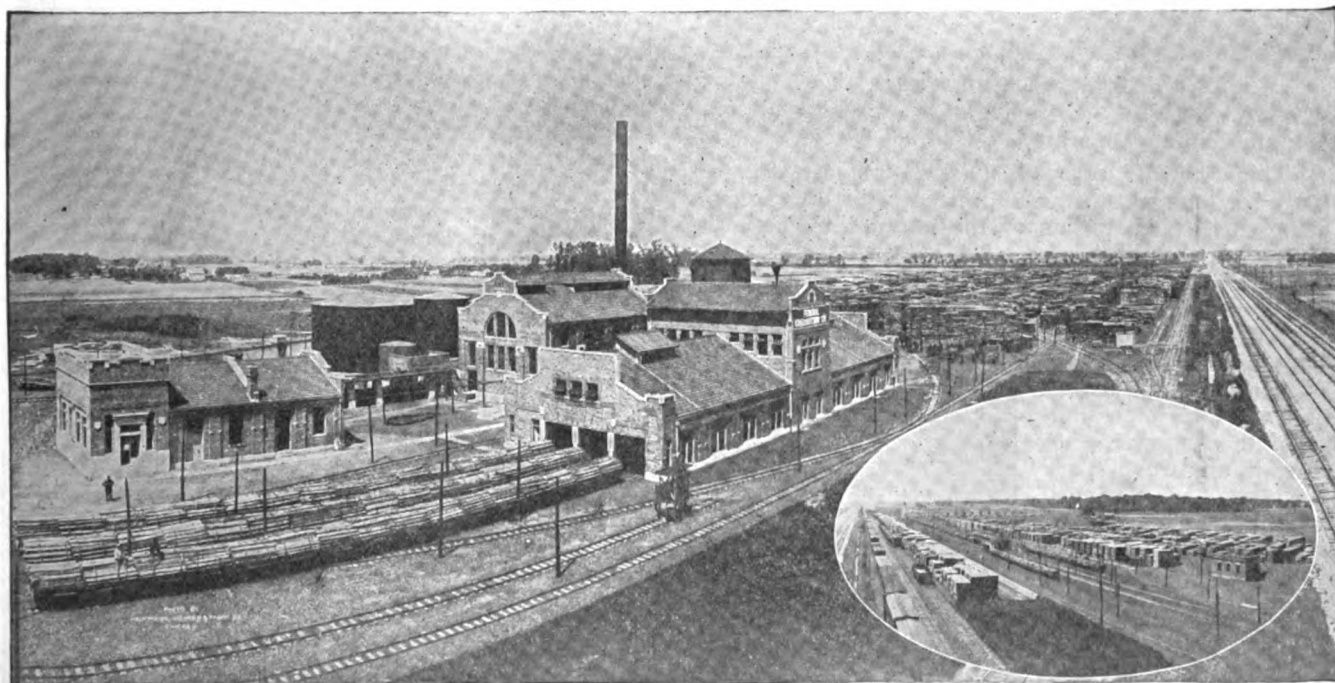
ing under approved scientific methods; fullest opportunity for plant inspection.

Lowry Process.

A pressure and vacuum process for the efficient and economical treatment of wood, patented in the United States and Canada, insuring maximum and uniform penetration with final retention (according to specifications) of minimum quantity of creosote oil consistent with proper preservative effect; a system affording accurate gauging and recording of results.

Creosote Oil.

Oil used is best obtainable grade of pure coal tar creosote oil, conforming to specifications of American Railway Engineering Association and American Wood Preservers' Association. Analyses furnished.



ONE OF THE PLANTS OF THE AMERICAN CREOSOTING COMPANY, INC.

LORD & BURNHAM CO.

Manufacturers of Sash Operating Apparatus for Hinged and Pivoted Sash
IRVINGTON-ON-HUDSON, N. Y.

Products.

SASH OPERATING and VENTILATING APPARATUS in various styles and sizes for Operating Hinged and Pivoted Sash in factories, foundries, car barns, round-houses, powerhouses, machineries, steamers, banks, churches, prisons, greenhouses, etc.; TRANSOM OPERATORS for heavy Transoms in such places as store fronts, hotels, public buildings, etc.

Rocker Shaft Apparatus.

Our standard apparatus (Fig. 1) consists of a worm and gear to turn a rocker shaft, to which are attached arms that in turn act directly on the sash through suitable rods. Arms are secured to shaft by combined bolting and set screw cap, or by set screw only if desired.

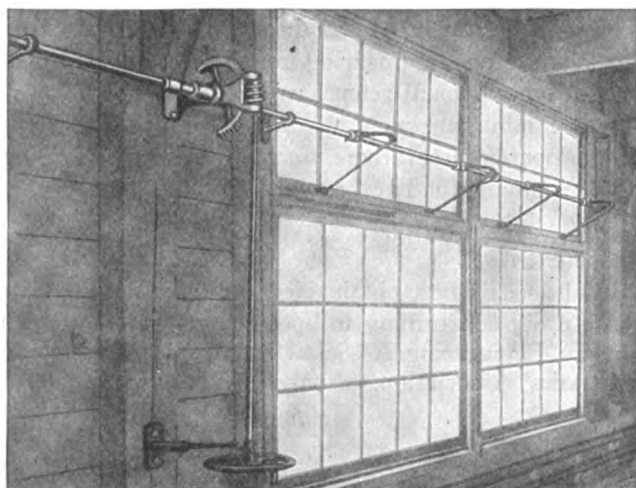


FIG. 1. ROCKER SHAFT APPARATUS

Rack and Pinion Apparatus.

This type of apparatus (Fig. 2) is intended primarily for long runs of heavy hinged sash. On account of the small pitch radius of the pinion ($1\frac{1}{2}$ in.) the leverage on the shaft is so much reduced that the torsion of the shaft is reduced to a minimum.

By means of shoulders on the pinion and guides on the rack these parts are so made that it is an absolute impossibility for them to cramp together in any way. They have been so designed that they always run on their pitch line.

The simplicity of this apparatus is a strong point in its favor. The direct horizontal thrust given to the sash prevents all harmful strains.

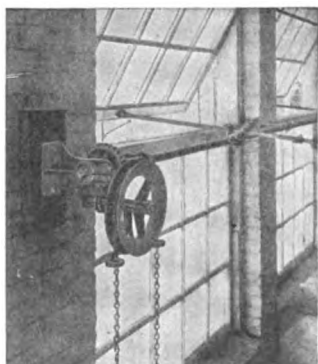


FIG. 2. RACK AND PINION APPARATUS

Tension Lever Apparatus for Long Runs.

We advocate the use of this tension lever system (Fig. 3) on runs of over 140 ft. in length. No bearings required for horizontally moving shafts; gear power has ball bearings; ball and socket joints on arms and rods; minimum friction and minimum back lash throughout; maximum freedom of motion. It is light, yet strong; free from complicated parts; easy to erect; enduring.

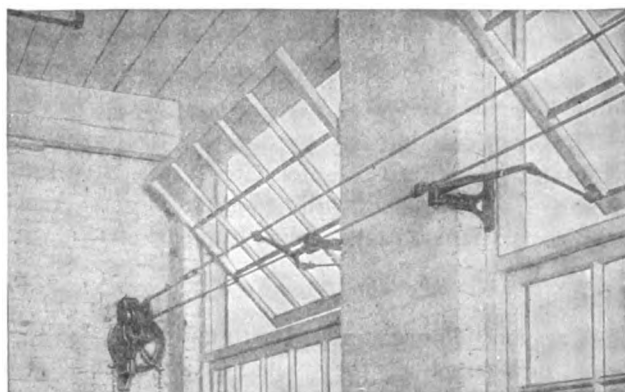


FIG. 3. TENSION LEVER APPARATUS

Transom Operators.

Transom operators (Fig. 4) made in 2 sizes: No. 1 for heavy and No. 2 for extra heavy transoms. This apparatus consists of 2 enclosed miter gears, one of which is threaded; the threaded gear engages with a vertical rod which operates the transom by an intermediate rod. For extra heavy transoms the vertical rod operates a rocker shaft at bottom of transom, thus allowing it to be supported by an arm and rod at either end, relieving it of all injurious strains, and holding it rigidly in position against wind pressure.

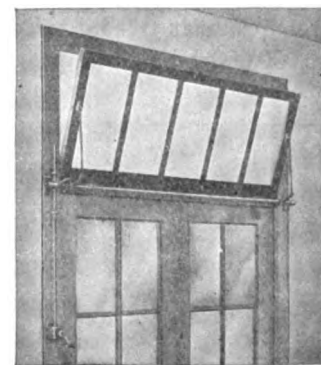


FIG. 4. TRANSOM OPERATOR

Erection.

Full directions for erecting are sent with apparatus, so that it can be easily installed by any mechanic.

Estimates and Co-operative Service.

On receipt of data giving description of sash and that part of the building where it is intended to install the apparatus, we will gladly submit sketches, suggestions, and estimates for furnishing our stock apparatus, or one specially designed to meet unusual conditions; also, estimates for erecting the apparatus when desired.

Catalogue.

Catalogue giving full and detailed description of each apparatus sent on request.

METALLIC SASH-OPERATOR CO.

23rd and Chestnut Streets
ST. LOUIS, MO.

CHICAGO REPRESENTATIVES: UNIVERSAL STEEL PRODUCTS COMPANY, 939-40 Webster Building

Products.

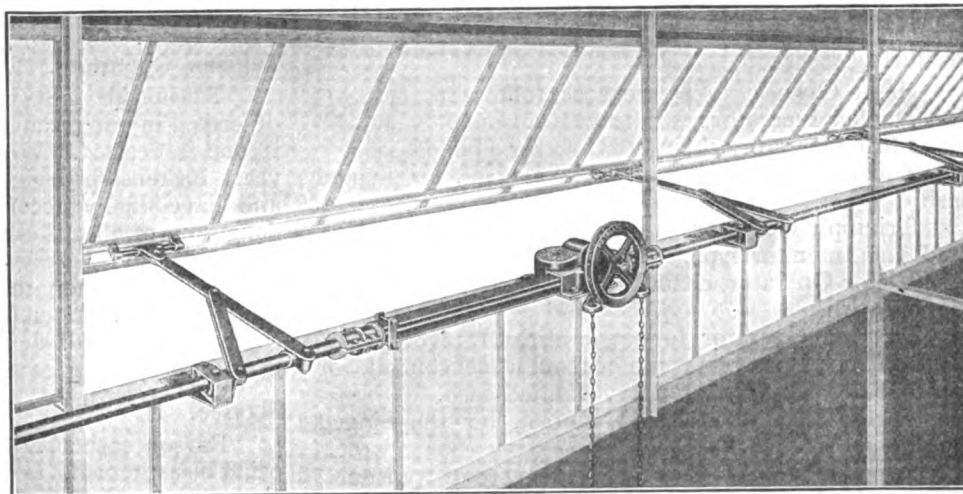
GEARED SASH OPERATORS.

Adaptability.

A complete line of these devices is manufactured by the company, to control any style or arrangement of solid steel, sheet metal or wood sash.

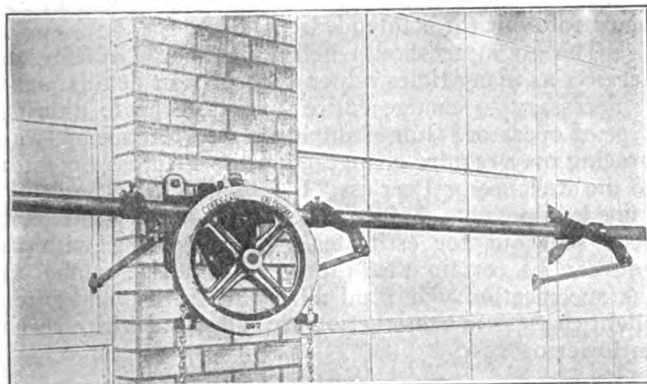
Co-operative Service.

A fully equipped engineering organization will, without charge, co-operate with engineers, architects, etc., in designing most economical and efficient sash operating equipment for individual or special installation anywhere. Inquiries are solicited. Further information, catalogues and *full sized details* furnished on request.



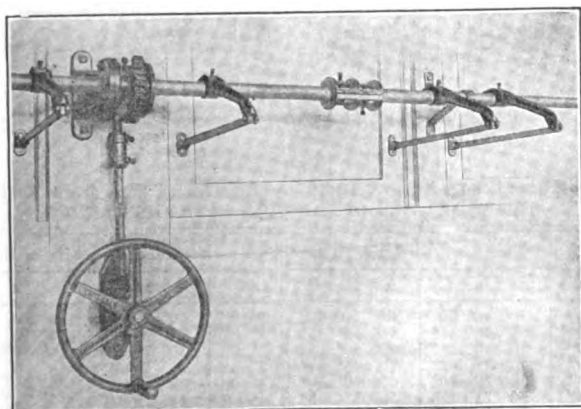
TENSION SASH OPERATOR, STYLE NO. 9

Designed for heavy top hung or continuous sash, or center pivoted sash in long runs. Construction of gear stations provides that shaft may twist at will without causing a binding action in rack and gear; thrust ball bearings reduce friction; erection costs are minimized by reason of simplicity of design. Made in 2 sizes



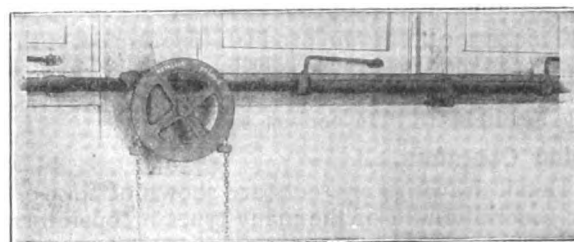
SASH OPERATOR, STYLE NO. 1

For controlling side pivoted and top or bottom hinged sash, 100 ft. or less, according to weight and position; continuous chain transmission of power from hand to gear; 3 sizes of gears; 2 sizes of connecting arms; wrought shaft brackets, of any length



SASH OPERATOR, STYLE NO. 3

Same as style No. 1, except a hand wheel, bevel gear and $\frac{3}{4}$ -in. rod to transmit power from hand to gear



SASH OPERATOR, STYLE NO. 4

For controlling top and bottom pivoted or side hinged sash, 200 ft. of either; shaft supported by roller brackets; power transmitted to gear by endless chain

Some Installations.

Hooker Electro Chemical Co., Echote, N. Y.
Parish & Bingham Co., Cleveland, Ohio
Western Cartridge Co., East Alton, Ill.
Phillips Sheet & Tin Plate Co., Weirton, W. Va.
Berlin Machine Co., Beloit, Wis.
Monsanto Chemical Works, St. Louis, Mo.
National Malleable Casting Co., Chicago, Ill.
Hupp Motor Car Co., Detroit, Mich.
Otis Steel Co., Cleveland, Ohio
Merchants Central Heating Co., Spokane, Wash.
Great Western Smelting & Refining Co., Chicago, Ill.
Tallahassee Power Co., Baden, N. C.
Busch-Sulzer Bros. Diesel Engine Co., St. Louis, Mo.
White Automobile Co., Cleveland, Ohio
Aluminum Ore Co., East St. Louis, Ill.
American Steel & Wire Co., Cleveland, Ohio, and Donora, Pa.
Goodyear Tire & Rubber Co., Akron, Ohio
Hoyt Metal Co., Granite City, Ill.
Sante Fe Shops, Albuquerque, N. Mex.
Holt Mfg. Co., East Peoria, Ill.
Canedy Otto Mfg. Co., Chicago Heights, Ill.
Missouri Pacific R. R. Roundhouses at Texarkana, Ark., and Newport, Ark.
Fairbanks, Morse & Co., Beloit, Wis.
Acme Steel Goods Co., Chicago, Ill.
Haughton Elevator Co., Toledo, Ohio
Springfield High School, Springfield, Ill.
Watervliet Paper Co., Watervliet, Mich.
Roundhouses, Schools, Shops, etc.

ESTABLISHED 1875

THE PAYSON MANUFACTURING COMPANY

Manufacturers of Sash Operating Devices and Builders' Hardware

2920 Jackson Boulevard

CHICAGO, ILL.

Products.

SASH OPERATING DEVICES as follows:

Duplex Operator, for heavy transoms.

Ideal Operator, chain control, for pivoted sash.

Superior Operator, hand wheel control, for pivoted sash.

Triumph Operator, hand wheel control, for pivoted sash, monitor type.

Victor Operator, chain wheel control, for vertically pivoted sash.

Monarch Operator, for single vertically pivoted sash.

Reliance Operator, chain or hand wheel control, for top or bottom hinged or heavy pivoted sash.

Peerless Operator, chain control, for top hinged continuous steel sash.

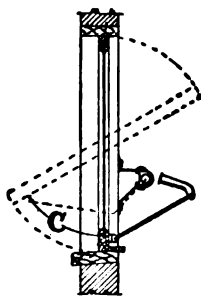
Simplex Transom Lifter, for all types of transoms; Payson No. 1 Casement Adjuster, for all types of casement sash; Payson Signal Sash Lock, for double hung windows; Payson No. 50 Concealed Transom Lifter, for transoms where concealed device is required.

Specifications.

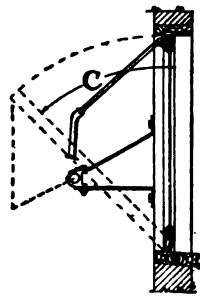
This list of Payson products is selected with the hope that it may be used freely by architects in writing specifications. The list contains standard articles that are guaranteed to give perfect satisfaction.

Torsion Operators.

Detail drawings and cuts are shown of four of the most generally used of the many types of operators we manufacture. So far as general design is involved, one of these four is almost certain to fulfil the requirements of any sash operating problem. The Ideal is used where chain control is required; and chain control is recommended because of its simplicity and ease of erection. The Superior, where a hand wheel must be used. The Triumph, for all monitor work where a hand chain hanging straight down can not be used. The Reliance, for lifting heavy loads and giving maximum ventilation.



Horizontally Pivoted Sash



Bottom Hinged Sash

DUTY DETAILS OF TORSION SASH OPERATORS

X	Standard			Extra Heavy			X	Standard			Extra Heavy		
	A	B	C	A	B	C		A	B	C	A	B	C
2' 0"	130'	75'	60°	150'	85'	60°	2' 0"	60'	40'	50°	90'	55'	50°
2' 6"	120'	75'	60°	150'	85'	60°	2' 6"	54'	40'	45°	81'	50'	45°
3' 0"	110'	60'	45°	150'	85'	60°	3' 0"	48'	30'	30°	72'	48'	30°
3' 6"	100'	60'	45°	140'	75'	45°	3' 6"	40'	25'	30°	66'	36'	30°
4' 0"	90'	50'	45°	130'	70'	45°	4' 0"	30'	20'	30°	50'	30'	30°
4' 6"	80'	45'	45°	120'	65'	45°	4' 6"	24'	15'	25°	40'	25'	25°
5' 0"	70'	40'	45°	100'	55'	45°	5' 0"	16'	10'	25°	28'	16'	25°
5' 6"	60'	40'	30°	90'	50'	30°	5' 6"	12'	6'	20°	21'	12'	20°

X—Height of sash. A—Maximum length of run. B—Maximum distance from power to end of run. C—Standard opening in degrees.

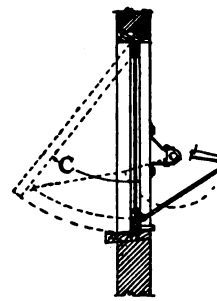
Tension Operators.

Tension devices, Peerless "A" and "B," are fully described in our catalogue, which we would like to send if one is desired. We have worked for a number of years on tension devices to operate long runs of sash, and have finally accomplished two things: that most dangerous of all makeshifts, the counterweight, has been eliminated and we have invented and perfected the only tension device where the leverage power increases as the load increases. If engineers want these improvements embodied in tension devices, specify the "Peerless" manufactured by THE PAYSON MANUFACTURING COMPANY.

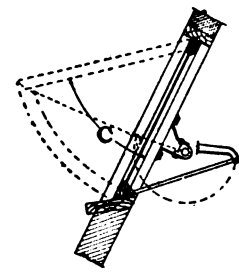
Service.

Payson sash operating devices are *made to order*, using measurements taken from the plans and checked at the building. Every job is exhaustively studied by Payson engineers, and a drawing showing the scheme thought most satisfactory is prepared and submitted to you for approval as to layout and general design. After this approval is obtained, if there is any question as to measurements, drawings are forwarded to the building to be checked. Time is really saved in this way, because the operators can then be erected from the blue print with the certainty that every part will fit the place for which it is intended.

The engineer should make liberal use of Payson service, as many times minor construction details make it necessary to change entire layouts, even to altering type of operator. For example, an interference by sway bracing may require change from the Peerless operator to the Reliance or Peerless "B." This should be determined, if possible, before specifications and plans have been sent out for estimates. By consulting with us you can be certain that the type of device named in the specification will fulfil all requirements, and often slight changes in construction are suggested which result in lowering cost.



Top Hinged Sash Hung Vertical

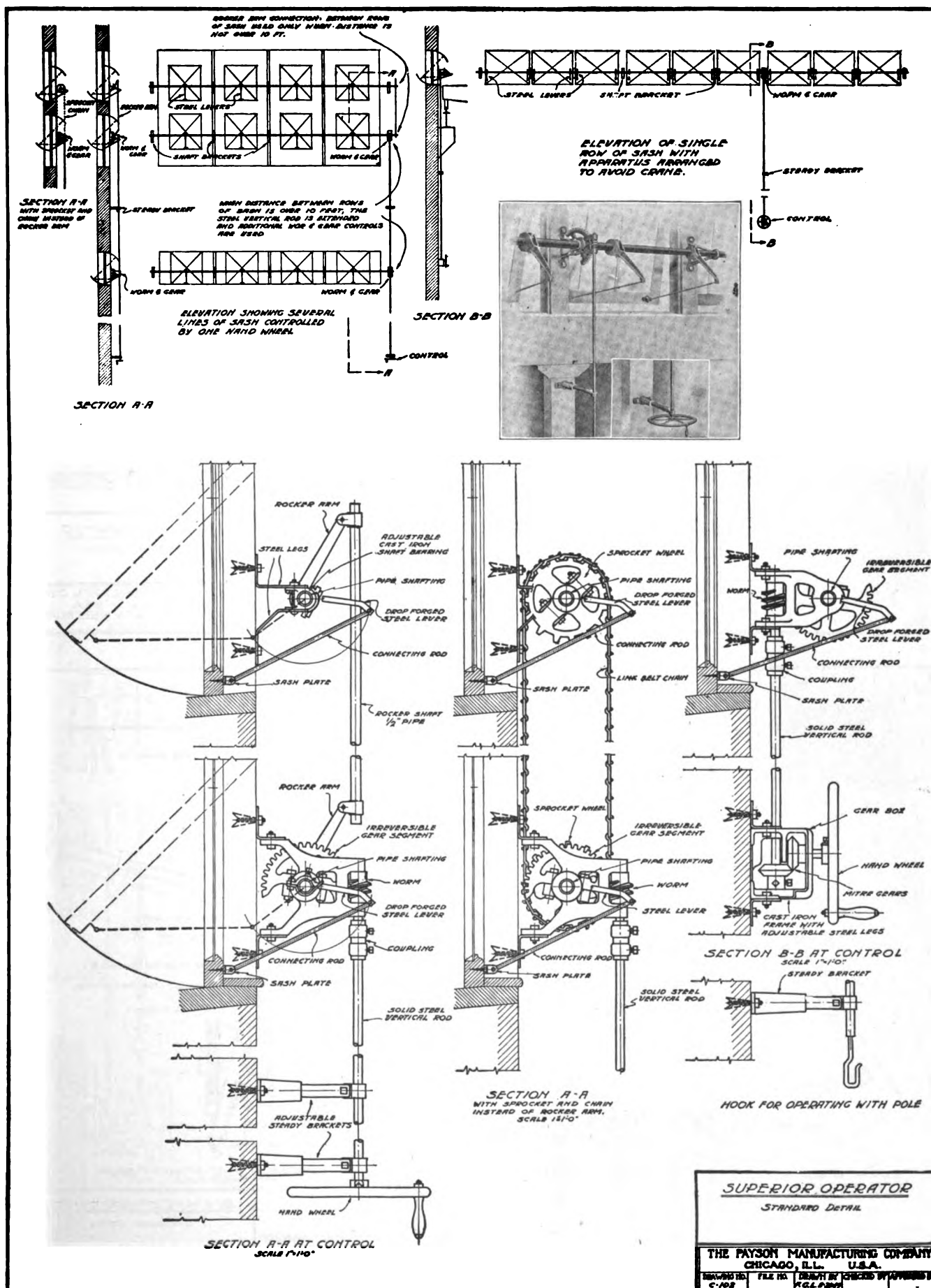


Top Hinged Sash at an Angle

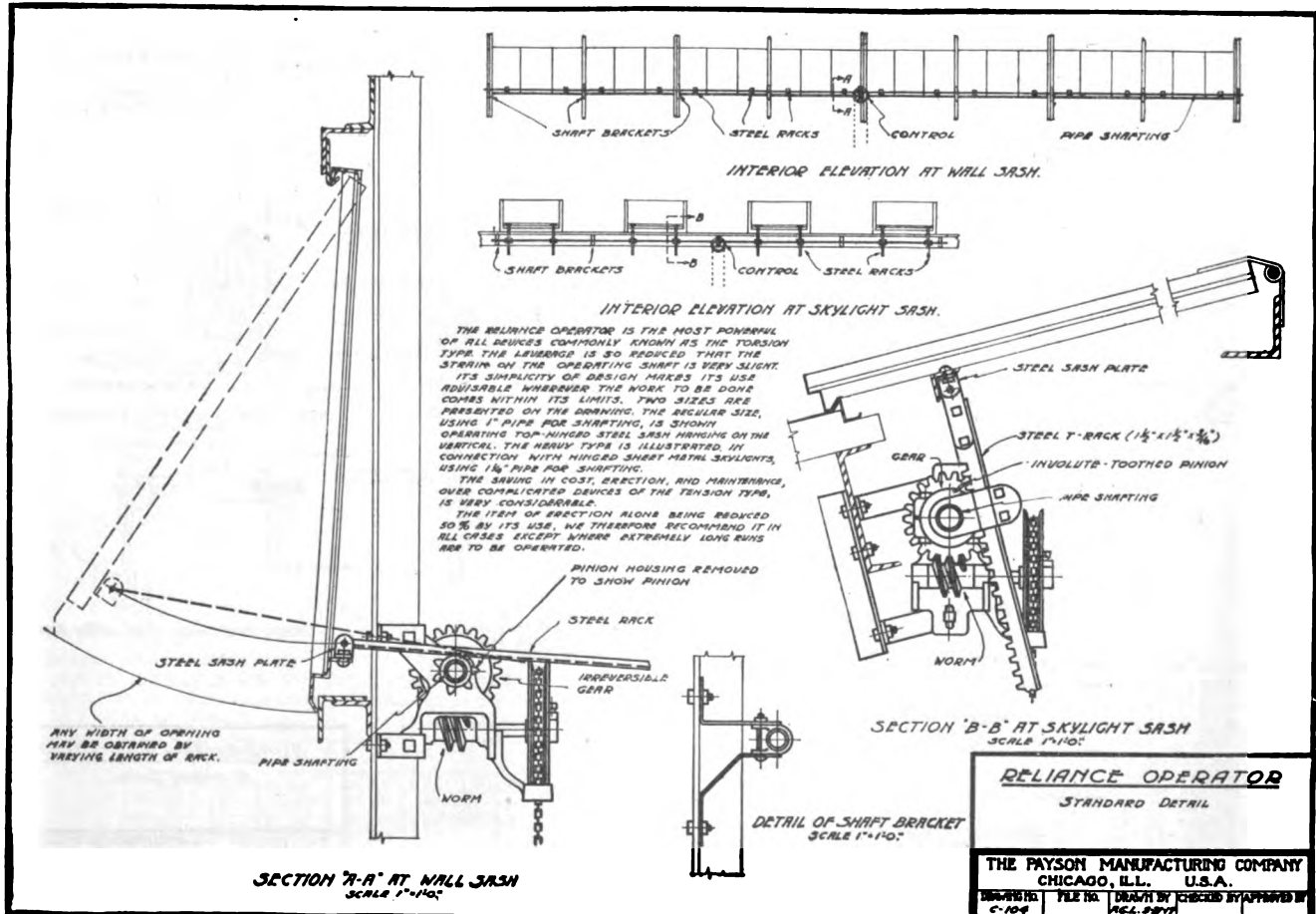
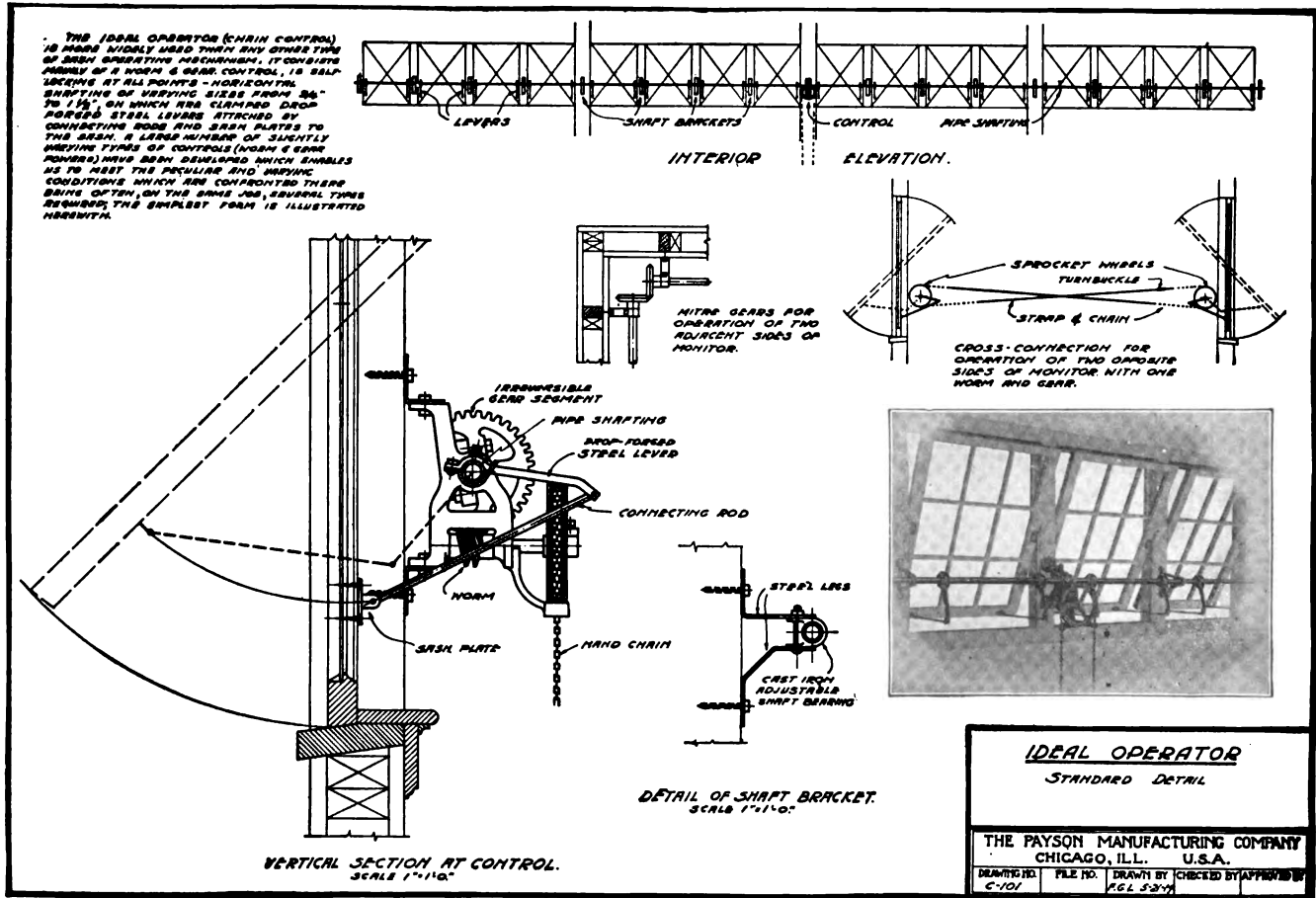
DUTY DETAILS OF TORSION SASH OPERATORS

X	Standard			Extra Heavy			X	Standard			Extra Heavy		
	A	B	C	A	B	C		A	B	C	A	B	C
2' 0"	70'	40'	60°	100'	60'	60°	2' 0"	40'	20'	60°	60'	40'	60°
2' 6"	60'	40'	45°	90'	55'	45°	2' 6"	34'	20'	45°	50'	40'	45°
3' 0"	50'	30'	45°	80'	50'	45°	3' 0"	30'	20'	45°	44'	30'	45°
3' 6"	40'	25'	45°	70'	45'	45°	3' 6"	26'	15'	45°	40'	30'	45°
4' 0"	36'	20'	30°	60'	40'	30°	4' 0"	22'	15'	30°	36'	25'	30°
4' 6"	30'	15'	25°	50'	35'	25°	4' 6"	18'	15'	20°	30'	20'	20°
5' 0"	24'	15'	20°	40'	25'	20°	5' 0"	14'	10'	20°	24'	16'	20°
5' 6"	20'	10'	20°	30'	20'	20°	5' 6"	10'	10'	20°	20'	10'	20°

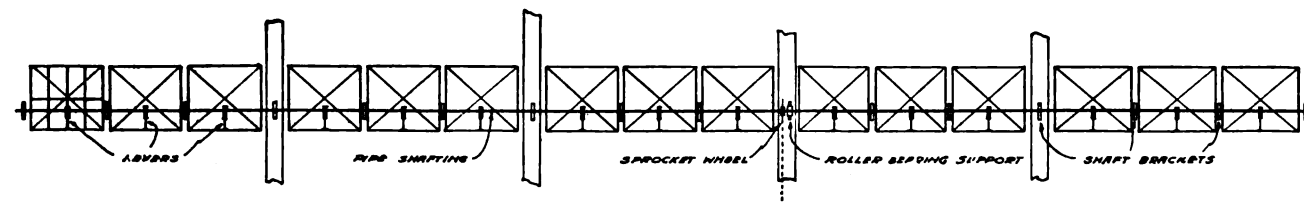
X—Height of sash. A—Maximum length of run. B—Maximum distance from power to end of run. C—Standard opening in degrees.



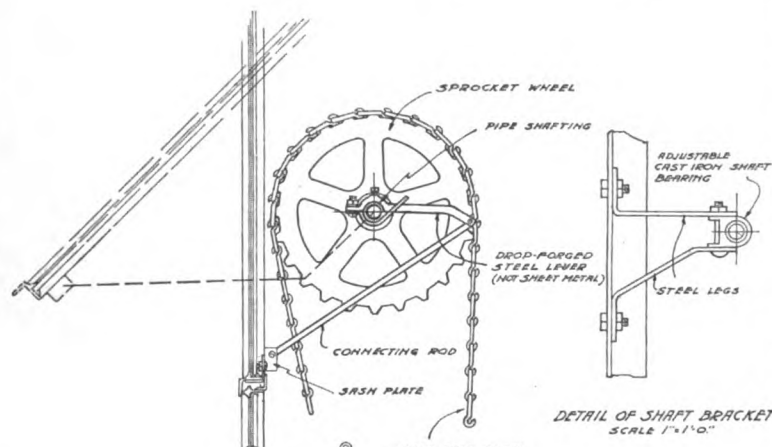
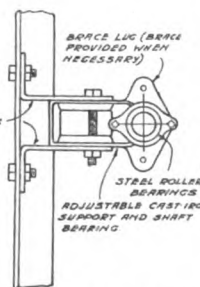
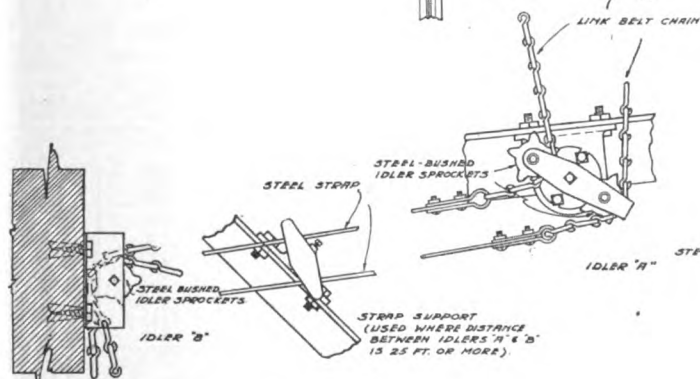
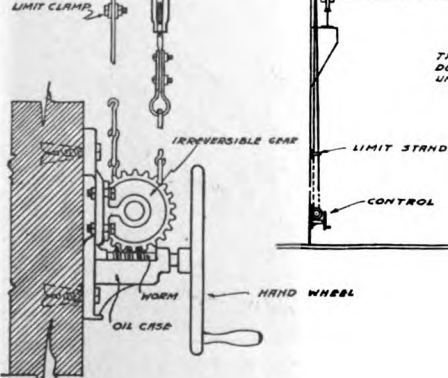
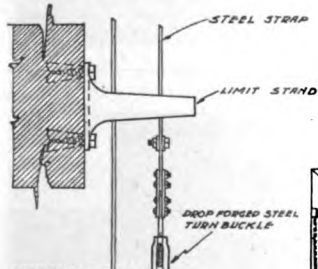
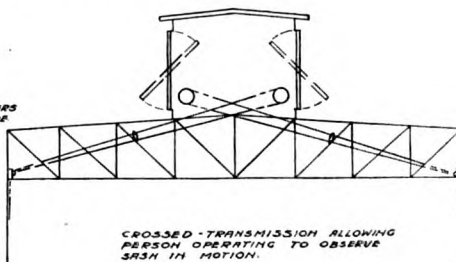
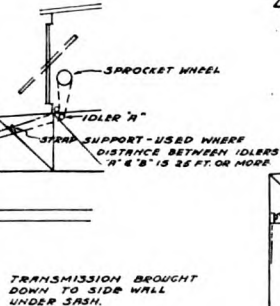
STANDARD DETAIL OF SUPERIOR SASH OPERATOR



STANDARD DETAILS OF IDEAL AND RELIANCE SASH OPERATORS



INTERIOR ELEVATION AT SASH

DETAIL OF SHAFT BRACKET
SCALE 1"=1'-0"DETAIL OF ROLLER BEARING SUPPORT
SCALE 1"=1'-0"VERTICAL SECTION AT CONTROL
SCALE 1"=1'-0"

THE TRIUMPH OPERATOR IS USED FOR OPERATING MONITOR OR CLARE-STORY SASH WHERE THE CONTROL MUST BE LOCATED AT A CONSIDERABLE DISTANCE FROM THE LINE OF SASH. LONG HORIZONTAL AND VERTICAL DISTANCES ARE TAKEN CARE OF WITH LESS COMPLICATION, AS FRICTION FROM REVOLVING RODS, UNIVERSAL JOINTS AND CORNER GEARS IS ELIMINATED. COST OF INSTALLATION IS GREATLY REDUCED.

IT PROVIDES THE SIMPLEST METHOD OF AVOIDING OBSTRUCTIONS SUCH AS CRANES, BOILERS, OVENS, ETC. OPERATES UNITS UP TO 120 FT. IN LENGTH WITH STANDARD CONTROL; HEAVIER SIZES FOR LONGER LENGTHS.

THE FLEXIBILITY OF THIS SYSTEM PERMITS ITS USE ON ALL TYPES OF PIVOTED SASH, WOOD, STEEL, OR SHEET METAL, REGARDLESS OF THEIR LOCATION AND INACCESSIBILITY. ON SASH FOUR FEET WIDE OR OVER, TWO LEVERS ARE USED - WITH SASH PLATES LOCATED ON SIDE EDGES OF SASH.

TRIUMPH OPERATOR

STANDARD DETAIL

THE PAYSON MANUFACTURING COMPANY
CHICAGO, ILL. U.S.A.

DRAWING NO. C-103 FILE NO. DRAWN BY CHECKED BY APPROVED BY

STANDARD DETAILS OF TRIUMPH ROLLER BEARING SASH OPERATOR

MISSISSIPPI WIRE GLASS COMPANY

220 Fifth Avenue
NEW YORK, N. Y.

TELEPHONE:
MADISON SQUARE 9370

BRANCH OFFICES

CHICAGO, ILL., 7 West Madison Street

ST. LOUIS, MO., 4070 North Main Street

Product.

"WIRE GLASS," for Windows and for Vault Lights.
Also best quality Figured Building Glass and
Standard Rough and Ribbed Glass for skylights.

Mississippi "Wire Glass."

The MISSISSIPPI WIRE GLASS COMPANY is the original manufacturer of solid "Wire Glass," and its product is universally recognized as the standard wire glass, being the material upon which the Underwriters' standard was based in 1899.

By our process of manufacture, Standard "Wire Glass" is cast solid, and has an average of less imperfections than any "sub-standard" wire glass on the market.

"Wire Glass" is rolled plate glass having a wire netting embedded equidistant from either surface. This process is automatically effected while the glass is in a molten state and, therefore, insures homogeneous and solid "Wire Glass."

The quality of metal and process of manufacturing Standard "Wire Glass" produce the very highest quality, with a tensile strength second to none.

Adaptability.

The object of "Wire Glass" is to afford perfect and constant fire protection at a minimum cost, at the same time admitting and diffusing the light. It is particularly suitable for use in windows, doors, transoms, monitors, skylights and all places where fire or break-age protection is required.

Light Diffusion.

The light may be increased in a room 30 ft. or more deep to from 3 to 15 times its present effect by using Maze, Syenite, Factrolite, Pentecor or Ribbed "Wire Glass," instead of plain glass in the upper sashes.

Conducting Condensation.

"Pentecor," when installed in skylights set at a proper angle, will conduct condensation and prevent dripping.

Advantages.

When employed as above mentioned, "Wire Glass" may be fractured by severe heat or sudden shock, but the wire mesh will hold the shattered pieces in place, preventing their falling and causing serious injury or loss of life. It will also prevent draught and hold a fire within the bounds of its origin.

Underwriters' Requirements, Extract from Rules (1905)

(2) SIZE OF GLASS—(a) The unsupported surface of the glass allowed shall be governed by the severity of exposure and be determined in each case by the Underwriters having jurisdiction, but in no case shall it be more than 48 in. in either dimension or exceed 720 sq. in. (b) The glass to be of such dimensions, after selvage is removed, that the bearing in the groove or rabbet is not to exceed $\frac{1}{8}$ in. less than the full depth called for in rules 6 and 7. (c) The glass to be retained by the structural part of the frame or sash independently of the material which may be used for weatherproof purposes. Only non-inflammable material to be used in setting glass in the sash.



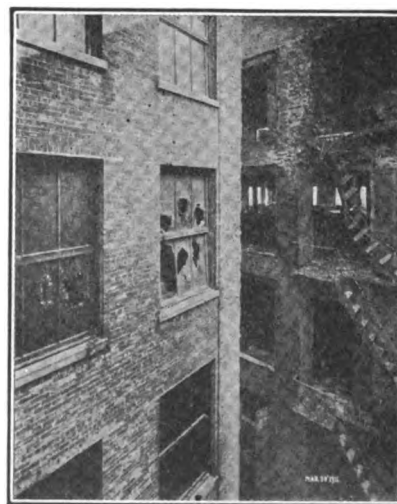
THIS LABEL (PRINTED IN RED) APPEARS ON EVERY PIECE OF THE STANDARD PRODUCT

DATA, MISSISSIPPI "WIRE GLASS"

Style	Thick- ness, in.	Maximum width, in.	Maximum length, in.	Approximate weight per sq. ft., lbs.
Polished.....	$\frac{1}{8}$	48	130	4
Polished.....	$\frac{3}{16}$	30	72	8
Maze.....	$\frac{1}{8}$	48	130	3 $\frac{1}{2}$
Maze.....	$\frac{3}{16}$	48	130	5 $\frac{1}{2}$
Factrolite.....	$\frac{1}{8}$	48	130	3 $\frac{1}{2}$
Factrolite.....	$\frac{3}{16}$	48	130	5 $\frac{1}{2}$
Syenite.....	$\frac{1}{8}$	48	130	3 $\frac{1}{2}$
Syenite.....	$\frac{3}{16}$	48	130	5 $\frac{1}{2}$
Rough.....	$\frac{1}{8}$	48	130	3 $\frac{1}{2}$
Rough.....	$\frac{3}{16}$	48	130	5 $\frac{1}{2}$
Ribbed.....	$\frac{1}{8}$	48	130	3 $\frac{1}{2}$
Ribbed.....	$\frac{3}{16}$	48	130	5 $\frac{1}{2}$
Pentecor.....	$\frac{1}{8}$	48	130	3 $\frac{1}{2}$
Pentecor.....	$\frac{3}{16}$	48	130	5 $\frac{1}{2}$

DATA, VAULT OR FLOOR LIGHTS

Rough "Wire Glass"....	$\frac{3}{8}$	12	12	9 $\frac{1}{2}$
Ribbed "Wire Glass"....	$\frac{3}{8}$	12	12	9 $\frac{1}{2}$
Ground "Wire Glass"....	$\frac{3}{8}$	12	12	9 $\frac{1}{2}$



ASCH BUILDING AND ADJOINING BUILDING, NEW YORK, N. Y.

Typifying efficiency, in modern fireproof construction, of "Wire Glass," as compared to inefficiency of old-style metal shutters with which the Asch Building was equipped.

Note the holes punched in the wire glass windows of the adjoining building by the firemen, to enable them to fight the fire from a point of safety, the wire glass windows forming a fire shield.

Reliability.

Mississippi "Wire Glass" having an indisputable reputation of being a superior product to the sub-standard makes, the company offers no guarantees as an inducement to stimulate sales. Customers know what they are getting when Mississippi "Wire Glass" is specified and installed.

How to Specify.

(Specify outright by name, and be protected.)

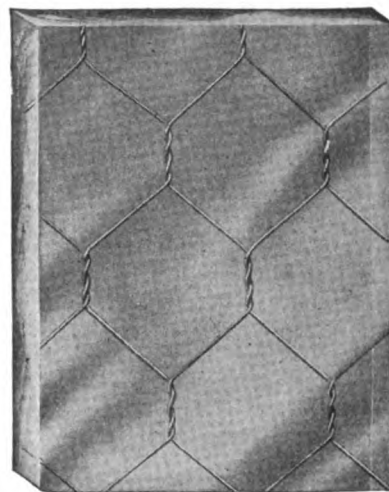
"Wire Glass" shall be installed in [specify location] and in all places marked W. G. on plans and elevations.

The "Wire Glass" to have a thickness of at least $\frac{1}{4}$ in. at thinnest point. Wire mesh to be not larger than $\frac{7}{8}$ in., and no wire used for such mesh to be smaller than No. 24 B. and S. gage. Plane of the wire mesh to be practically mid-way between the two surfaces of the glass.

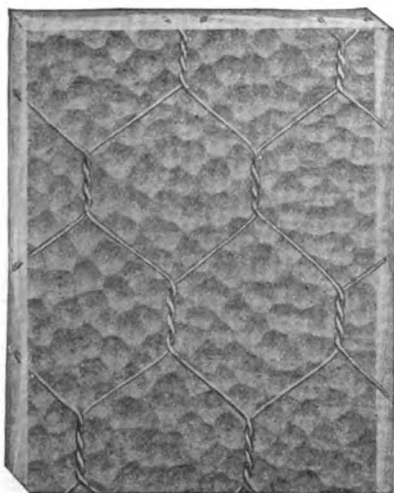
Selvage shall be removed from glass before framing.

[State here type or types of glass to be used and where.]

NOTE—Where the recognized standard and perfected product is required, specifications should call for "Wire Glass," the product of MISSISSIPPI WIRE GLASS COMPANY.



—Width—
POLISHED "WIRE GLASS"
Sizes up to 48 in. wide and 130 in. long
Thicknesses about $\frac{1}{4}$ and $\frac{3}{8}$ in.



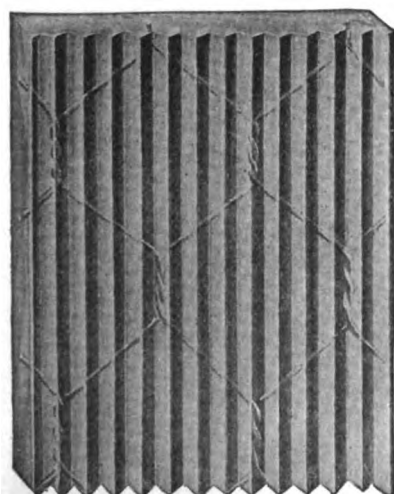
—Width—
ROUGH "WIRE GLASS"
Sizes up to 48 in. wide and 130 in. long
Thicknesses $\frac{1}{4}$ and $\frac{3}{8}$ in.



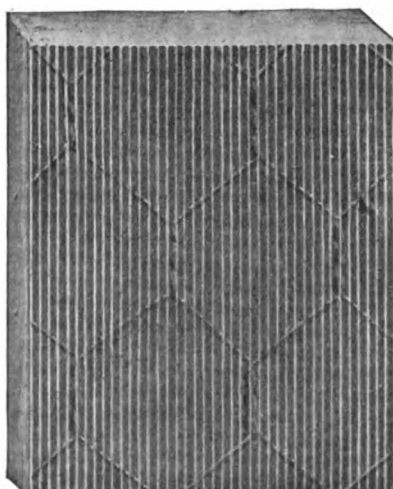
—Width—
MAZE "WIRE GLASS"
Sizes up to 48 in. wide and 130 in. long
Thicknesses $\frac{1}{4}$ and $\frac{3}{8}$ in.



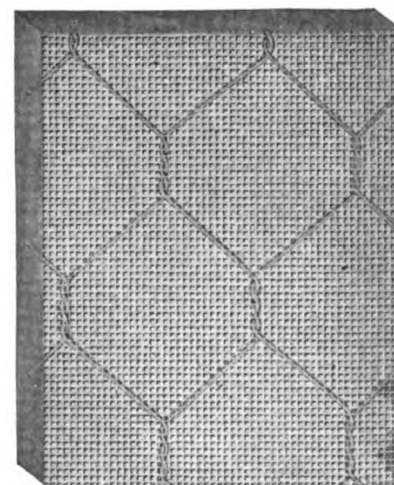
—Width—
SYENITE "WIRE GLASS"
Sizes up to 48 in. wide and 130 in. long
Thickness $\frac{1}{4}$ in.



—Width—
PENTECOR "WIRE GLASS"
Sizes up to 48 in. wide and 130 in. long
Thickness $\frac{1}{4}$ in.



—Width—
RIBBED "WIRE GLASS"
Sizes up to 48 in. wide and 130 in. long
Thicknesses $\frac{1}{4}$ and $\frac{3}{8}$ in.



—Width—
FACTROLITE "WIRE GLASS"
Sizes up to 48 in. wide and 130 in. long
Thicknesses $\frac{1}{4}$ and $\frac{3}{8}$ in.

Factrolite for Industrial Buildings.

EFFICIENCY OF FACTROLITE—The MISSISSIPPI WIRE GLASS COMPANY has had practically every kind of glass tested to determine efficiency in light transmission and finds Factrolite to be far ahead of anything else suitable for installation in industrial buildings.

The accompanying report and plotting speak for themselves.

TEST OF FACTROLITE—The tests were made by measuring the distribution of light in two planes perpendicular with each other, with light from an incandescent lamp 3 ft. distant, falling normally upon and passing through the glasses. The relative light intensities are recorded in per cent of the normal (0°—normal—equals 100%.)

REPORT NO. 24558

DISTRIBUTION OF LIGHT TRANSMITTED THROUGH FACTROLITE—INCIDENT LIGHT ON ROUGH SIDE OF GLASS—RELATIVE LIGHT INTENSITIES

Angles	First Plane		Plane Perpendicular to First Plane	
	Right	Left	Right	Left
0 (Normal)	100%		100%	
2½	60.5	86.5	85.2	75.4
5	41.8	51.8	41.0	28.9
7½	24.0	30.6	15.8	13.8
10	9.88	13.3	1.33	9.14
15	1.43	4.45	.39	1.31
20	.101	.81		

Total light transmitted through Factrolite incident light normal on rough side of glass: 84.5%.

ECONOMY OF FACTROLITE—Today, as never before, owners of industrial buildings are coming to realize that the utilization of daylight to its fullest extent by the use of proper glass means the conservation of energy required for artificial lighting, and the maximum production of the employees.

Whereas more heat is required to maintain a given temperature in a building with 80% of its wall area glass than is required for a wall area of 20% glass,

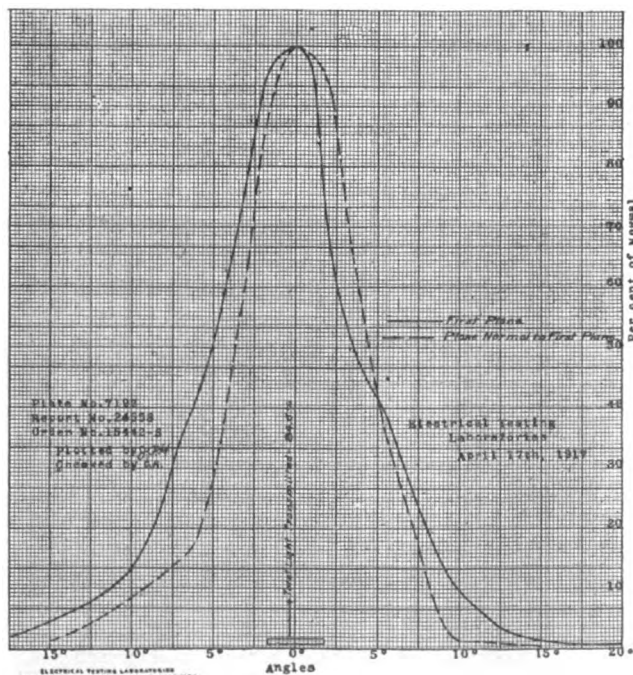


CHART SHOWING EFFICIENCY IN LIGHT TRANSMISSION WITH FACTROLITE

this additional heat is required for only five months of the year, whereas, with the 20% glass area, it is necessary to artificially light the building a large part of the time.

Factrolite breaks up the rays of the sun, diffusing the light and distributing it equally.

INSPECTION INVITED—Before placing a contract for glass, those interested are urged to get a sample of Factrolite and compare it with every other make of glass recommended for industrial buildings.

Without a doubt, they will become convinced that Factrolite offers the maximum of lighting efficiency with the minimum of cost, thus reducing the overhead and cost of maintenance, and increasing the efficiency of manufacturing the commodities.

Tests Made by the Electrical Testing Laboratories Showing Transmission and Illumination.

Test Report No. 28482 rendered to the MISSISSIPPI WIRE GLASS COMPANY on the distribution of illumination through figured sheet glass windows in a model room made by the Electrical Testing Laboratories of New York City.

OBJECT—An investigation to study the distribution of daylight illumination in a room with various types of ¼-in. figured sheet glass used in the window.

TEST ROOM—Model—Representing a room 50 by 100 by 14 ft.

Scale—1 ft. equals 25 ft. (24 by 48 by 7 in.)

Windows—Continuous on one side of room 3 ft. high, sill 4 ft. from floor.

Ceiling and Walls—White glass finish (commercial factory paint.)

Floor—Brown linoleum (having reflection factor of average factory floor.)

TEST STATIONS—Test stations in five lines, as shown.

SOURCE OF LIGHT—Concentrated filament incandescent lamp, representing the sun at 30° from horizon. The intensity of the sun was approximately proportioned to the size of the room.

Sky uniformly bright within $\pm 20^\circ$.

Light within the room—direct sunlight, 80% ; sky-light, 20%.

RESULT OF TESTS—Transmission of light through glass samples, in per cent of clear, Clear Glass taken as 100%.

Rough wire.....	98%
Syenite	87%
Maze wire.....	82%
Factrolite wire.....	88%
Pentecor wire horizontal.....	90%
Pentecor wire vertical.....	94%
Ribbed vertical.....	96%
Ribbed horizontal.....	99%

Horizontal illumination of working plane, equivalent to 40 in. above floor.

Samples.

Samples of the MISSISSIPPI WIRE GLASS COMPANY's products are filed with the Architects Samples Corporation, New York City.

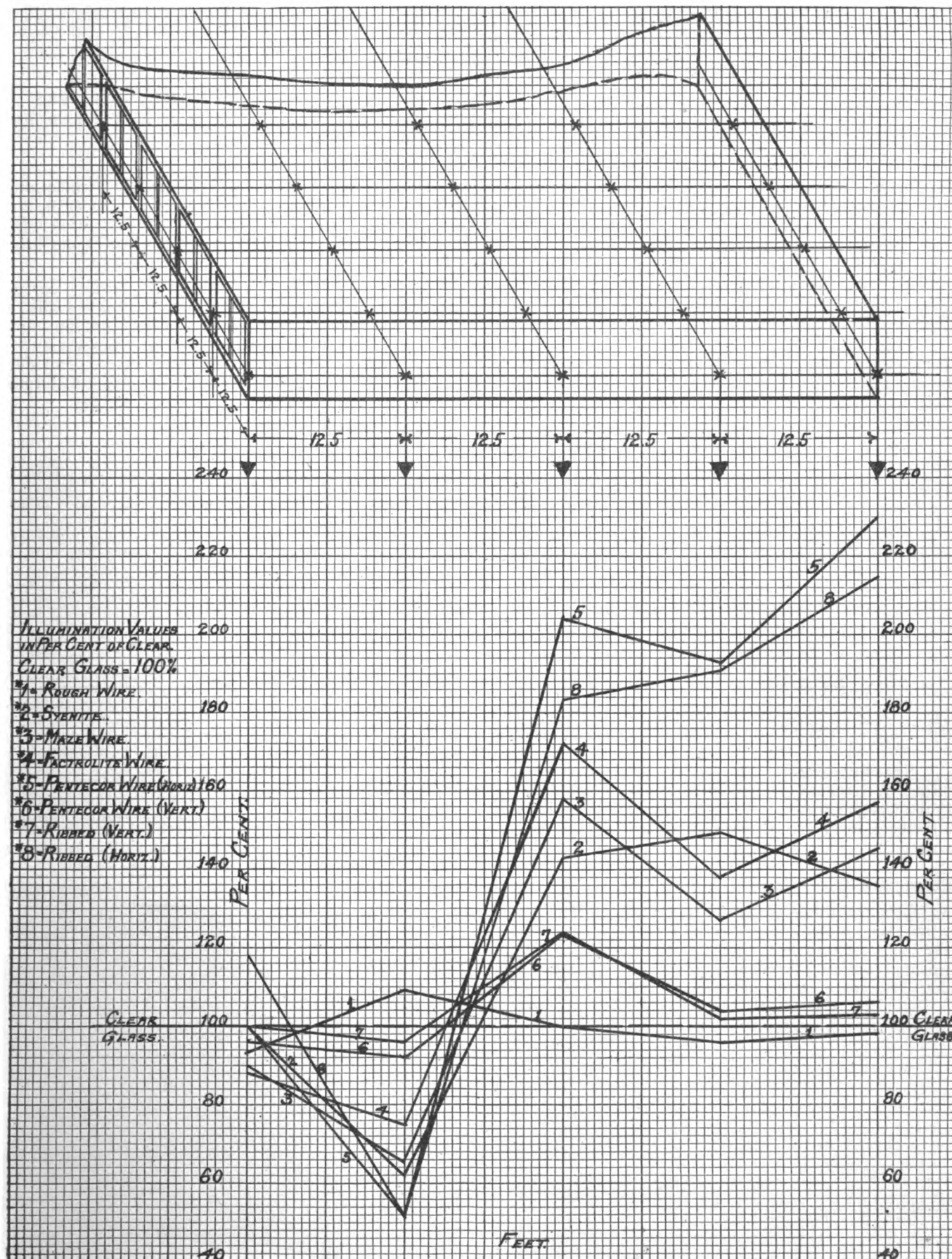


CHART OF ILLUMINATING VALUES OF MISSISSIPPI "WIRE GLASS"
Horizontal illumination on working plane equivalent to 40 in. above floor

WALTER COX, PRESIDENT

PENNSYLVANIA WIRE GLASS COMPANY

EXECUTIVE OFFICES

CABLE ADDRESS:
"WIRE GLASS, PHILA"

Pennsylvania Building
PHILADELPHIA, PA.

WORKS
DUNBAR, PA.

Products.

WIRE GLASS: Aqueduct, Cobweb, Ribbed, Rough, Florentine, Polished.

CORRUGATED WIRE GLASS.

Glass without Wire: Cobweb, Ribbed, Rough, Florentine.

Wire Glass.

Process—Solid wire glass, made by the Pennsylvania continuous process, is formed complete by one pouring and one rolling. It is the only process that makes possible the manufacture of wire glass as thin as $\frac{1}{8}$ in.

Approval—Wire glass, made by the PENNSYLVANIA WIRE GLASS COMPANY, having the distinctive mark (Cabled Strand) is standard under the rules of the National Board of Fire Underwriters.

Fire Protection—Wire glass is a valuable fire retardant, and therefore a safeguard to human life, and an important factor in the reduction of insurance rates. It is insisted upon by insurance underwriters in all instances where there is any fire hazard.

Quantities and Samples—Quantities will be listed from drawings furnished this company and approximate estimates provided. Our engineering department offers gratuitous advice on all glass problems.

Requests for samples should be made to the main office in Philadelphia, Pa., where they will be promptly acknowledged.

Specifications—Engineers should always specify "Solid Wire Glass manufactured by the PENNSYLVANIA WIRE GLASS COMPANY," and "to comply with the rules and regulations of the National Board of Fire Underwriters."

Corrugated Wire Glass.

Description—Corrugated wire glass is the new wire glass making possible the most economical and efficient building construction. It gives great diffusion of light and heat rays, reducing to a minimum shadows and glare.

Advantages—Corrugated wire glass is the best and cheapest form of construction for roofs and side walls, in whole or in part, and for covering areas or light wells where maximum amount of light is required and for marquees and canopies of all kinds. It is weatherproof and dustproof; the latter on account of its smooth surface—dirt and



TRADE-MARK

grease will not adhere to it. Installations of corrugated wire glass have a modern, up-to-the-minute appearance. Corrugated wire glass is one of the best fire retardants used in building construction.

Daylight Building—By using corrugated wire glass in roofs and side walls, a daylight building is obtained, without any shadows, glare or objectionable features.

Corrugated wire glass can be used in roofs and side walls alone, or in combination with corrugated materials or any other roof construction.

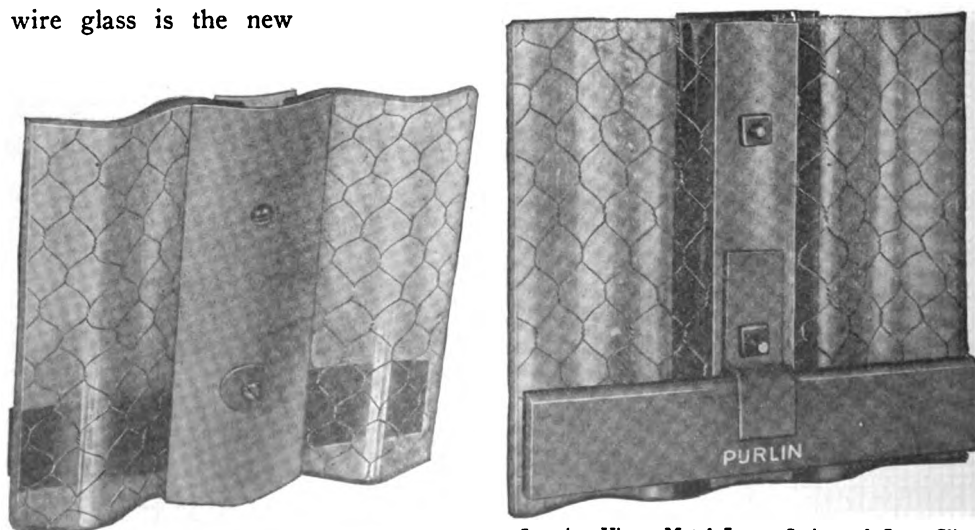
Standard Specifications—All glass shown or marked "C. W. G." on plans to consist of corrugated wire glass manufactured by the Pennsylvania "Solid" process. Roof purlins should be spaced 5' 1" center to center, if I-beams, or back-to-back, if channels, which allows 2" for lap at end joints. For siding, the spacing of the T-iron girts should be 5' 3" center to center, plus thickness of outstanding leg or supporting girt.

METHOD OF LAYING—Lay glass edge to edge and allow space between the sheets of glass. Cover joints with a $2\frac{3}{4}$ " asphalt strip painted with asphalt varnish on side next to glass, the full length of sheet of glass. Then cover with a $2\frac{3}{4}$ " No. 24-gauge metal strip, full length of glass and underneath place a $1\frac{1}{2}$ " metal strip. The main fasteners to be hooked to purlins with reinforcing clips securely fastened with $\frac{1}{4}$ " x $1\frac{1}{2}$ " rustproof stove bolts with lead washers placed on top of cover strip. Between the purlins or main fasteners, put in intermediate fasteners, not over 12" centers, consisting of rustproof $\frac{1}{4}$ " x 1" stove bolts with lead washers securely screwed down. Tighten bolts snugly so as not to strain glass.

ROOFING—Always have laps of glass come over purlins. Lay a 2" asphalt strip, coated on both sides with asphalt varnish, full width pressed into corrugations of glass, and on this lay the second row of glass with lap over lower sheets.

ACCESSORIES—Provide all metal caps and inner strips, bolts, washers, clips, asphalt varnish, asphalt strips, etc., necessary to make a watertight and workmanlike job. Provide 2 coats of asphalt varnish for all metal work.

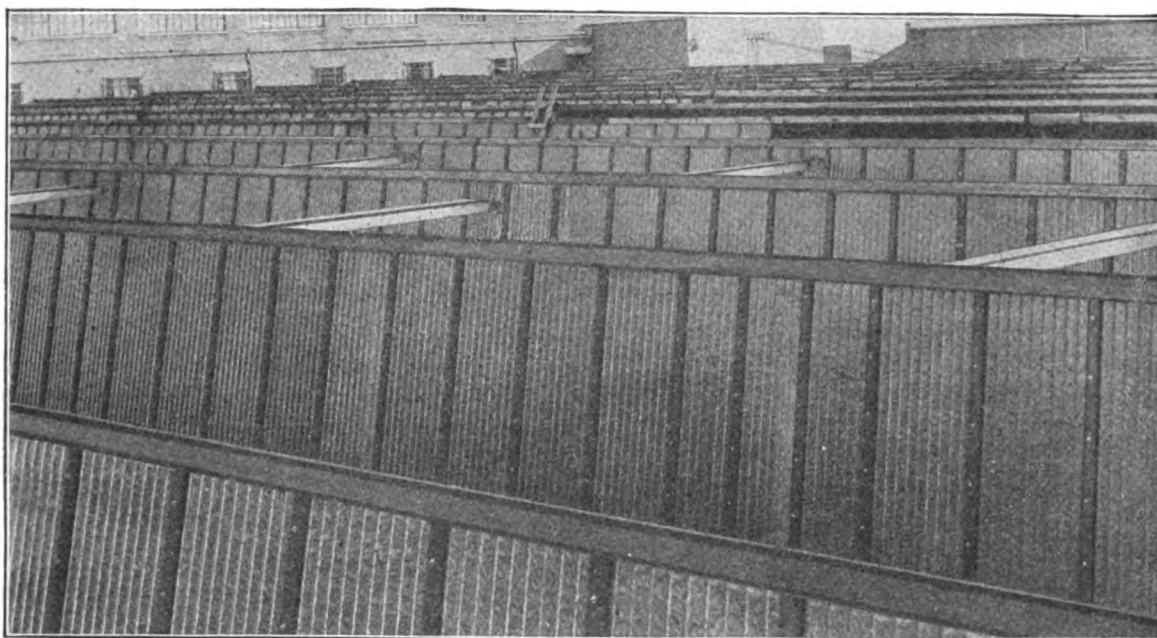
Provide ridge roll, securely bolted to purlins; all spaces to be made watertight by filling in with plastic cement.



Exterior View—Metal Cover Strip

Interior View—Metal Inner Strip and Iron Clip with Purlin

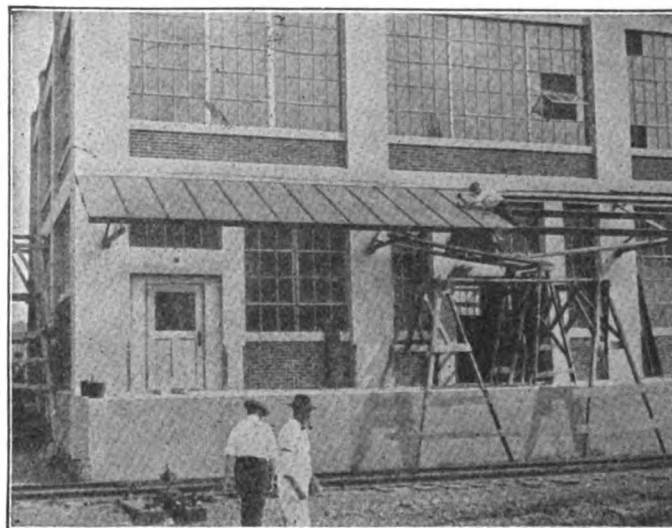
CORRUGATED WIRE GLASS



30,000 SQ. FT. OF CORRUGATED WIRE GLASS INSTALLED IN SAWTOOTH SKYLIGHT
This installation was so satisfactory that a repeat order for 60,000 additional feet was received



AN ENTIRE BUILDING CONSTRUCTED OF CORRUGATED WIRE GLASS



CANOPY OF CORRUGATED WIRE GLASS SHELTERING PLATFORM BUT NOT DETRACTING FROM LIGHT OF FIRST FLOOR



GLAZED WITH ORDINARY FLAT GLASS

Above photographs were taken at same hour of day under like conditions as to sunlight. Notice diffusion of light and absence of shadows in building glazed with corrugated wire glass



AFTER GLAZING WITH CORRUGATED WIRE GLASS

Notice diffusion of light and absence of shadows in building glazed with corrugated wire glass

THE WESTERN GLASS COMPANY

Manufacturers of Figured and Wire Glass

STREATOR, ILL.

Products.

FIGURED GLASS.
WIRE GLASS, Plain and Figured.
ROUGH and RIBBED GLASS.
SHEET PRISM GLASS.
POLISHED WIRE GLASS.

Figured Glass.

This is designed for use in hallways, areas, interior partitions, and similar constructions, where the admission of light without transparency is desired.

Made of the best materials obtainable and moulded in attractive patterns, it adds materially to the decorative effects of such installations.

Its distinctive advantages for this service have given it an established reputation.

DESIGNS—The figured glass is made up in a large number of designs, some of which are illustrated in the accompanying cuts. This glass can be supplied to match any style of architecture and to conform to architect's or builder's requirements.

SIZES AND WEIGHTS—Made in thicknesses of $\frac{1}{8}$, $\frac{3}{16}$ and $\frac{1}{4}$ in., with maximum dimensions of 48 by 120 in., and 48 by 132 in.

Rough and Ribbed Glass.

Made in thicknesses of $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$ in., with maximum dimensions of 48 by 120 in. for $\frac{1}{8}$ in. thickness, and 48 by 132 in. for other thicknesses. Especially adapted for heavy service in skylights, partitions and factory windows.

$\frac{3}{4}$ in. thick glass is furnished in rough glass or rough wire glass in cut sizes, not stock sheets.

Solite Glass

Used where the maximum *diffusion* of light, as well as the maximum *amount* of light is required.

Nearly 200,000 sq. ft. of $\frac{1}{4}$ -in. Solite glass was specified and used in the Naval Supply Base Building, Brooklyn, N. Y.

Special samples of Solite glass sent on application.

Wire Glass.

Wire glass can be furnished in any of the regular figured designs or in polished transparent sheets, as desired.

Made in thicknesses of $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$ in., in sizes up to and including 48 in. wide by 132 in. long.

It is made by a single-pour process and the reinforcement is a special wire fabric of our own design, with 3 twists and 5 loops at the vertical strand.

By our method of manufacture, this fabric is incorporated in the sheet of molten glass while it is being rolled.

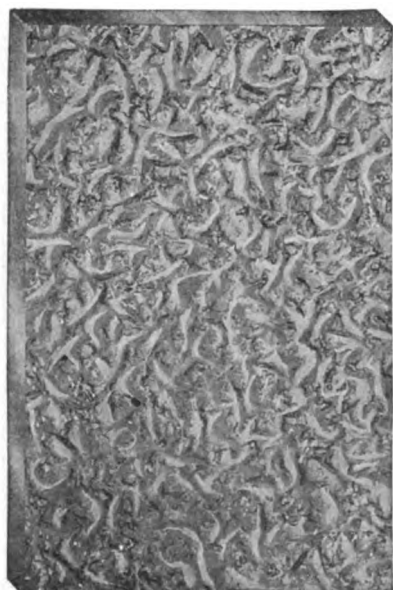
This makes the finished product better able to stand severe strains and sudden temperature changes.

The wire strand used is so thin that it does not obstruct the light and is scarcely noticeable under ordinary conditions.

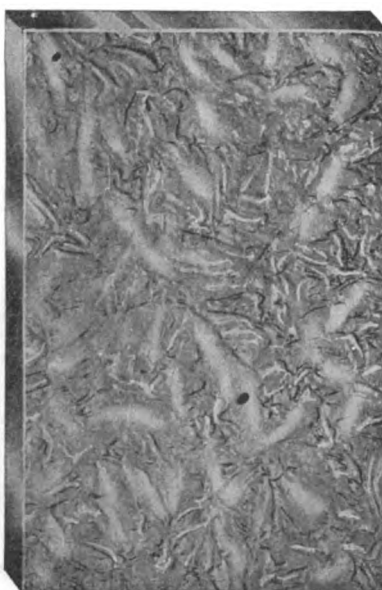
FIRE AND ACCIDENT PREVENTION—The main reason for using wire glass is the reduction of the fire and accident hazards.

Properly installed, wire glass furnishes an effective barrier to the spread of flames through exposed windows and other openings.

In this connection our product has stood the severe tests imposed by the Underwriters' Laboratories, Inc.,



MOSS FIGURED GLASS



CARNATION FIGURED GLASS



COMET FIGURED GLASS

and has been fully approved by the Fire Underwriters' Association.

Each sheet bears the identification marks of the Underwriters' Laboratories, Inc.

In windows subject to heavy wind pressures or liable to injury from carelessness or from flying bodies, the installation of wire glass insures against injury to pedestrians from falling glass and against the resulting damage suits.

SIZES—Standard wire glass is made as near as possible to $\frac{1}{8}$ in. thick in accordance with the rules of the Underwriters' Laboratories, Inc., covering standard construction of fireproof windows and skylights.

All kinds of wire glass furnished in the standard $\frac{1}{4}$ and $\frac{3}{8}$ in. thicknesses.

Wire glass is furnished in other thickness as called for by engineering requirements.

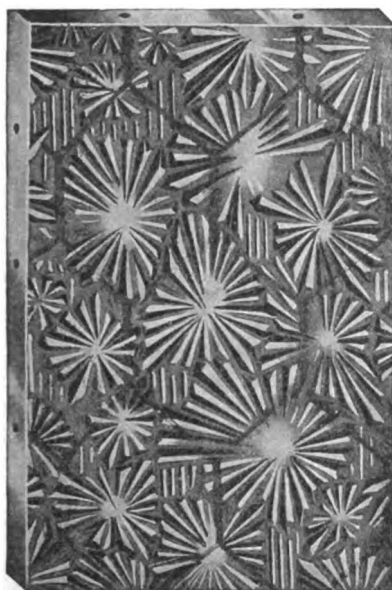
Sheet Prism Glass.

Where it is desired to project daylight well back into an interior, our sheet prism glass is an effective glazing medium for producing the maximum lighting efficiency.

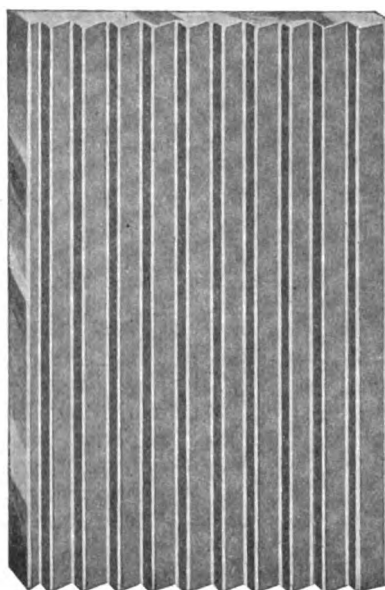
Furnished in standard thickness and in sizes up to 50 in. wide and 132 in. long.

WEIGHTS OF GLASS PACKED FOR SHIPMENT

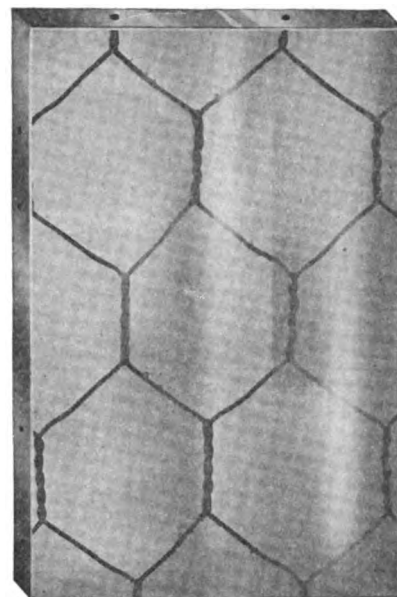
Thickness, in.	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	
Weight, lbs. per sq. ft.	2½	3½	4½	6	8	11



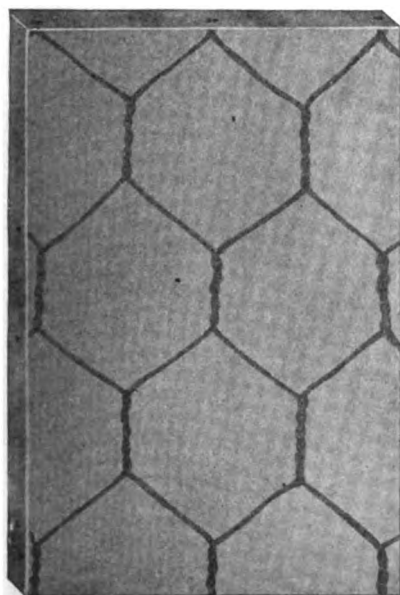
RADIANT WIRE GLASS



SHEET PRISM GLASS



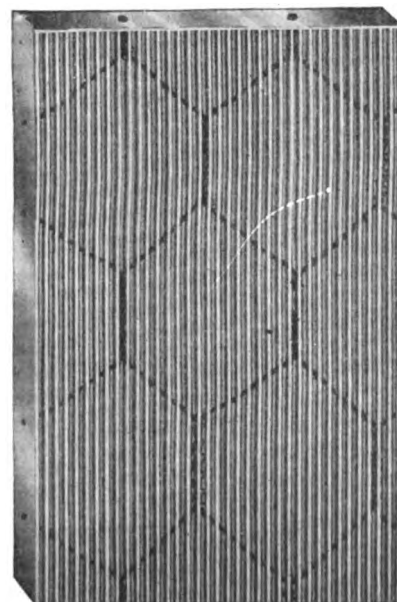
ROUGH WIRE GLASS



POLISHED WIRE GLASS



HOLLY WIRE GLASS



RIBBED WIRE GLASS

KLAUER MANUFACTURING CO.

Galvanized Metal Pipe and Flumes

DUBUQUE, IOWA

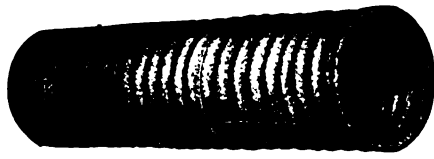
Products.

KLAUER'S "PERFECT" ROAD CULVERTS; "KLAUER-NEWCOMB PATENT" FLUMES; HEAD GATES; KLAUER "CUT OUT" or "FOOT" SWITCH.

Also manufacturers of Galvanized Metal Pipe, Manhole Covers, Coal Chutes, etc.

Klauer's "Perfect" Road Culvert, Solid Riveted.

Made of genuine open hearth iron or Keystone copper bearing galvanized sheet. Uniform in construction; increased depth of corrugations adding to its strength and durability, assuring service for many years.



KLAUER'S "PERFECT" ROAD CULVERT

PRICE LIST

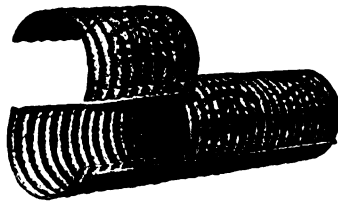
Diam. culvert, in.	No. 16 Gage		No. 14 Gage		No. 12 Gage	
	Price per ft.	Weight ft., lbs.	Price per ft.	Weight ft., lbs.	Price per ft.	Weight ft., lbs.
10	\$.85	8.5	\$1.05	10.6	\$1.45	14.7
12	1.00	10.2	1.25	12.8	1.70	17.6
15	1.25	12.8	1.55	16.	2.15	22.
18	1.50	15.3	1.85	19.1	2.60	26.5
20	1.75	17.9	2.10	22.3	2.90	29.73
24	2.00	20.5	2.50	25.5	3.45	35.2
30	2.50	25.57	3.15	31.9	4.30	44.
36	3.00	30.7	3.75	38.3	5.15	52.8
42	3.50	35.5	4.35	44.3	6.05	61.
48	4.00	40.9	5.00	51.	6.85	70.4
60	5.05	51.	6.25	63.8	8.60	88.
72	6.05	61.36	7.45	76.6	10.30	106.

Klauer's "Perfect" Nestable Culvert.

Strong, durable, convenient to transport and easiest nestable culvert to install. Made of genuine open hearth iron or Keystone copper bearing galvanized sheet.

PRICE LIST

Size, in.	Gage	Weight nestable, lbs.	List price
8	18	7 1/2	\$.75
8	16	8 1/2	.85
10	18	8 1/2	.85
10	16	10 1/2	1.00
12	16	11 1/2	1.15
15	16	14	1.40
18	16	17	1.70
20	16	19	1.90
20	14	23	2.30
24	16	22	2.20
24	14	26	2.60
30	14	33	3.30
36	14	39	3.90
42	14	45	4.50
48	14	51	5.10
48	12	70	7.00



KLAUER'S "PERFECT" NESTABLE CULVERT

Note perfect overlapping seam which forms tight joint and produces rigid section. No bolts nor rivets

"Klauer-Newcomb Patent" Flume.

Combines main essentials for perfect flume—durability, strength, watertight joints, maximum carrying capacity, simplicity of erection and allowance for contraction and expansion. Fabrication requires no bead-



"KLAUER-NEWCOMB PATENT" FLUME

ing or sharp bending of sheets; therefore, no breaking or peeling of zinc coating. Every joint permits expansion. Only flume using metal cross bars.

Head Gates.

Durable cast iron gates.

Easy to operate.

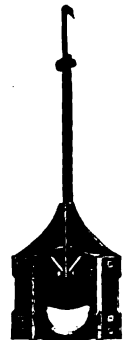
Can not get out of order. Watertight.

Disk can be raised to any height and locked.

PRICE LIST

Diam. of opening, in.	Height of standard, ft.	Weight, lbs.	Price complete
6	6	60	\$9.60
8	6	75	12.00
10	6	87	14.00
12	6	90	15.00
16	6	140	22.00
18	6	179	28.00
20	6	213	33.00
24	6	252	39.00

Furnished in 6-ft. standards unless otherwise ordered.



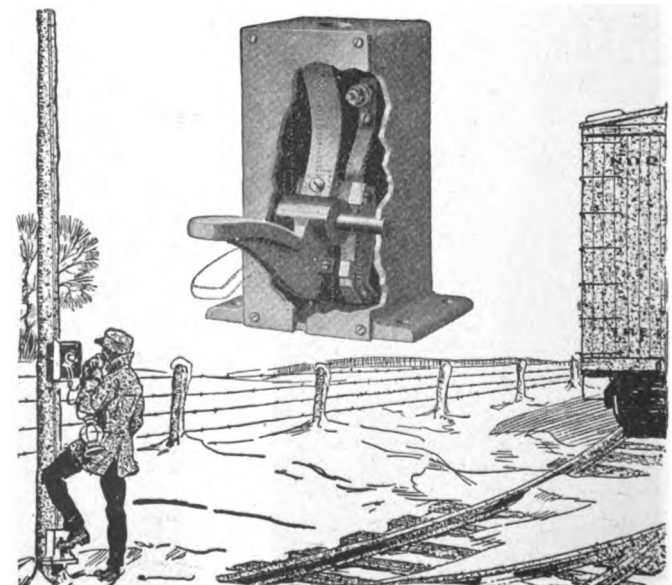
HEAD GATE

Klauer "Cut Out" or "Foot" Switch.

The switch breaks both wires of the train despatching telephone circuit between the line and the instrument, and also short circuits the instrument pair of wires, the idea being to protect the instrument from lightning or foreign currents which may reach the telephone circuit.

In addition to protecting the telephone instrument, when not in use, the service at the point at which switch is installed is conserved, where, if damaged by lightning, the instrument might be out of service for some time before discovery.

The Klauer "Cut Out" switch allows any number of instruments on one circuit *without any overloading*, as the instrument is cut in on the circuit *only* while being used.



KLAUER "CUT OUT" OR "FOOT" SWITCH

L. S. GELSER & SON, INC.

Manufacturers of Reinforced Concrete Pipe

FILLMORE, N. Y.

Product.

GELSER REINFORCED CONCRETE SLUICE and BELL END PIPE, for use in sewers, sluices, culverts, etc.

Advantages.

Cost is but one-half that of best cast iron and two-thirds that of best corrugated pipe, while they will withstand all road traffic equally well.

They will not rust like iron pipe or rot like terra cotta, neither will sulphur water, the great enemy of cast iron, have any deleterious effects on them—in fact, they grow stronger with age and are absolutely permanent.

Construction.

Pipe are manufactured by expert concrete workmen, mixing being done thoroughly by machine, the aggregates consisting of the best portland cement procurable, the highest grade of washed sand and gravel and pure spring water, which, altogether, insure a perfect product when properly cured.

Curing is accomplished by keeping pipe under cover protected from all air currents for a period of ten days after moulding, and thoroughly sprinkling three times each day.

Reinforcement.

Sluice Pipe—Tongue and groove, 2-ft. lengths. Mixture, $2\frac{1}{2}$ parts sand and gravel, 1 part cement. Reinforced with 6 to 9 twisted splice wire hoops to 2-ft. length; gauge, No. 6 to No. 10, according to size.

Bell End Pipe—Mixture, 1 cement, 2 sand, 4 crushed stone, mixed to quaking consistency and thoroughly spaded while being poured into

forms. Made in 4-ft. and 6-ft. lengths. Reinforced with American Steel & Wire Co. Triangle Mesh.

Guarantee.

This company agrees to furnish pipe, free of charge, in place of any which break during transportation, or for a period of 5 years after being installed.

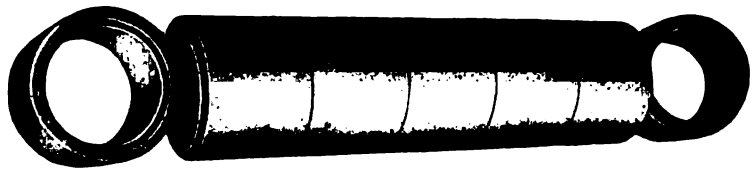
From the nature of concrete, it is safe to assume that if these pipe will stand for 5 years, they will stand for all time.

State Road Work.

This company specializes in pipe for this class of work and guarantees same to meet specifications of state highway departments.

Shipment.

Sufficient stock of well seasoned pipe is carried at all times to fill orders promptly.

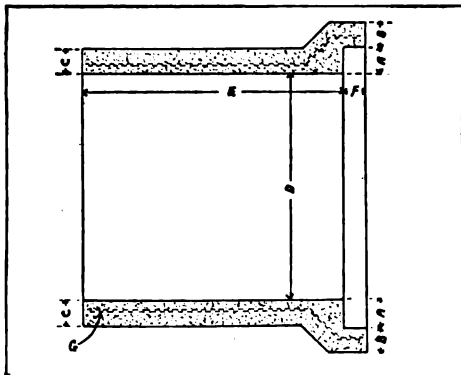


REINFORCED CONCRETE SLUICE PIPE

STANDARD SPECIFICATIONS

Size, in.	Weight, per ft., lbs.	Thickness, in.	Length, ft.
8	45	$1\frac{1}{2}$	2
10	58	2	2
12	92	$2\frac{1}{4}$	2
15	109	$2\frac{1}{4}$	2
18	157	$2\frac{3}{4}$	2
24	245	$3\frac{1}{2}$	2
30	369	$3\frac{3}{4}$	2
36	480	$4\frac{1}{4}$	2

Price on application.



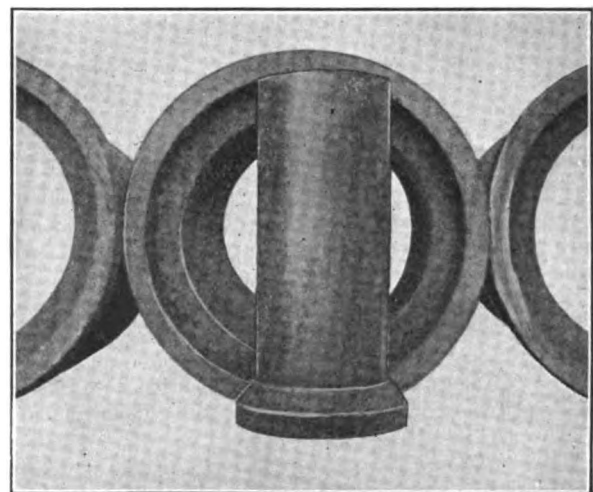
DIMENSIONS DIAGRAM REINFORCED CONCRETE BELL END PIPE

STANDARD SPECIFICATIONS

Dimensions						Weight per lin. ft. lbs.	Reinforcement G—A. S. & W. Triangle Mesh
D in.	A in.	B in.	C in.	E ft.	F in.		
12	$2\frac{1}{4}$	2	2	4 and 6	$2\frac{1}{4}$	95	1 layer size .040
15	$2\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{1}{4}$		$2\frac{1}{4}$	115	1 " " .058
18	3	$2\frac{1}{4}$	$2\frac{1}{4}$		$2\frac{1}{4}$	165	1 " " .080
24	$3\frac{1}{2}$	3	3		$3\frac{1}{4}$	255	1 " " .126
30	4	$3\frac{1}{2}$	$3\frac{1}{2}$		$3\frac{1}{2}$	380	2 " " .080
36	$4\frac{1}{2}$	4	4		$3\frac{1}{2}$	500	2 " " .107
42	5	$4\frac{1}{2}$	$4\frac{1}{2}$		$4\frac{1}{2}$	850	2 " " .126
48	$5\frac{1}{2}$	5	5		$4\frac{1}{2}$	1000	2 " " .180
54	$6\frac{1}{2}$	$5\frac{1}{2}$	$5\frac{1}{2}$		$5\frac{1}{2}$	1200	2 " " .208
60	$6\frac{1}{2}$	6	6		6	1500	2 " " .208

Price on application.

SWEET'S CATALOGUE



REINFORCED CONCRETE BELL END PIPE

Some Users.

Pennsylvania State Highway Department, Harrisburg, Pa.
Tuxedo Park Association, Tuxedo, N. Y.
Harrison County, Clarksburg, W. Va.
Marion County, Fairmont, W. Va.
Edward T. Beck, Warren, Pa.
F. C. Elliott, Trustee, Athens, Ohio
Rose Township, Jefferson Co., Pa.
Armstrong Township, Indiana Co., Pa.

LOCK JOINT PIPE CO.

TELEPHONE:
ORANGE 4771, 4772

MAIN OFFICE AND WORKS
AMPERE, N. J.

Product.

"LOCK-JOINT" CONTINUOUS REINFORCED CONCRETE PIPE, for Sewers, Water Lines, Intake and Discharge Pipes, etc.

The Lock-Joint System for Sewers.

This system provides a continuous reinforced concrete pipe, laid in sections, in which joints between sections are so made as to insure freedom from leakage or obstacles to flow.

The standard design has a circular section cast with a bell and a spigot end, the bell being flush with the outside circumference of pipe.

Sizes range from 24 to 108 in. in diameter in 4-ft. lengths, and longer lengths when necessary. This company has a large stock of moulds and a force of expert superintendents, and is in a position to furnish pipe anywhere.

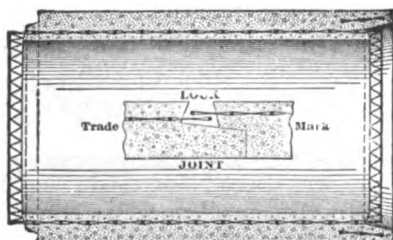


DIAGRAM OF SECTION OF PIPE AND LOCK-JOINT

Advantages—Pipes are made above ground, in a vertical position, resulting in maximum density of the concrete.

Entire exterior and interior surface can be inspected. Joints are on the interior of the pipe and also can be easily inspected.

The "lock-joint" gives the same strength in the joint as in the body of the pipe—therefore no weak spots.

Minimum of trench necessary to be open. Lay the pipe as fast as bottom is reached, then immediately backfill, as soon as pipe is laid.

Pressure Pipe.

This company manufactures and installs reinforced concrete pipe in sizes 15 to 108 in. diameter for water supply or any purpose where pipes are subject to hydraulic head up to 150 ft.

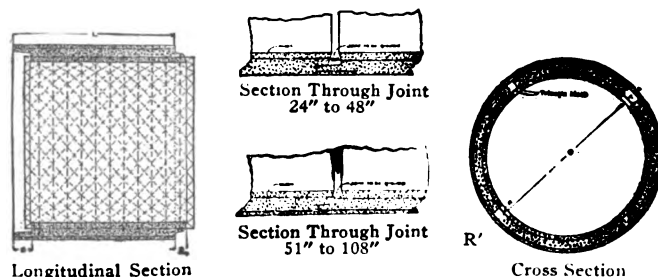
These pipes are manufactured of a richer mix of concrete. Great care is taken in the mixing of the same.

Individual pipe sections are made in lengths of 6, 8, 10 or 12 ft., to meet specific conditions, 8 ft., however, being a standard length for the larger sizes and 12 ft. for the smaller sizes.

The smaller sizes are made with lead and iron expansion joints. The larger sizes are generally made with copper expansion joints. These joints are made to take care of the expansion and contraction in the pipe line due to temperature changes and settlement.

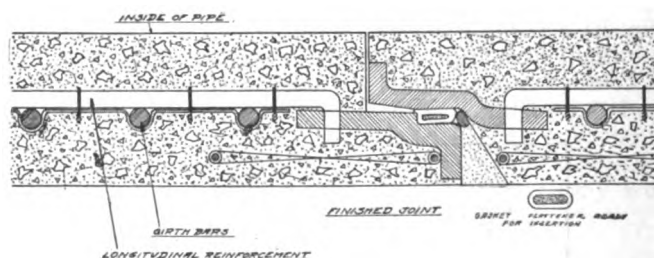
Advantages—Reinforced concrete pipes manufactured under methods used by this company are smooth and joints offer no hindrance to flow of water.

There are no offsets or projections to encourage growth in the pipes, with the result that the carrying

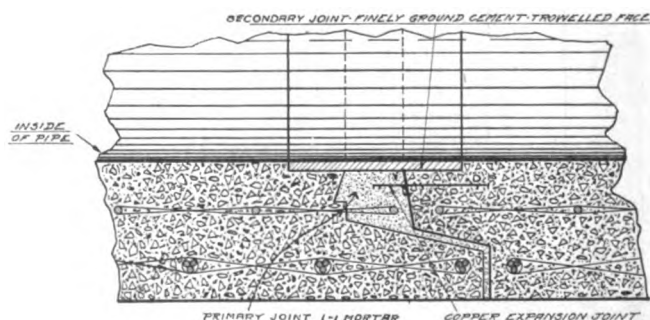


DIMENSION DIAGRAMS STANDARD SEWER PIPE

Dimensions							Reinforcement	A. S. & W. Triangle Mesh
D	T	L	B	S	R	R'		
in.	in.	ft.	in.	in.	in.	in.	Layer	Style number
24	3	4	3	1 1/2	1		1	28
27	3 1/2	4	3	1 1/2	1		1	28
30	3 1/2	4	3	1 1/2	1		1	27
33	4	4	4	2 1/2	1 1/2		1	35
36	4	4	4	2 1/2	1 1/2		1	34
39	4	4	5 1/2	3 1/2	1 1/2		1	34
42	4 1/2	4	5 1/2	3 1/2	1 1/2		1	34
45	4 1/2	4	5 1/2	3 1/2	1 1/2		1	34
48	5	4	5 1/2	3 1/2	1 1/2		1	23
51	5	4	5 1/2	3 1/2	1 1/2	1	2	26
54	5 1/2	4	5 1/2	3 1/2	1 1/2	1	2	26
57	5 1/2	4	5 1/2	3 1/2	1 1/2	1	2	34
60	6	4	5 1/2	3 1/2	2	2	2	34
63	6	4	5 1/2	3 1/2	2	1	2	34
66	6 1/2	4	5 1/2	3 1/2	2	1	2	34
72	7	4	5 1/2	3 1/2	2	1	2	23
78	8	4	5 1/2	3 1/2	2	1	2	33
84	8	4	5 1/2	3 1/2	2	1	2	33
90	8	4	5 1/2	3 1/2	2	1	2	31
96	8 1/2	4	5 1/2	3 1/2	2	1	2	39
108	9	4	5 1/2	3 1/2	2	1	2	38



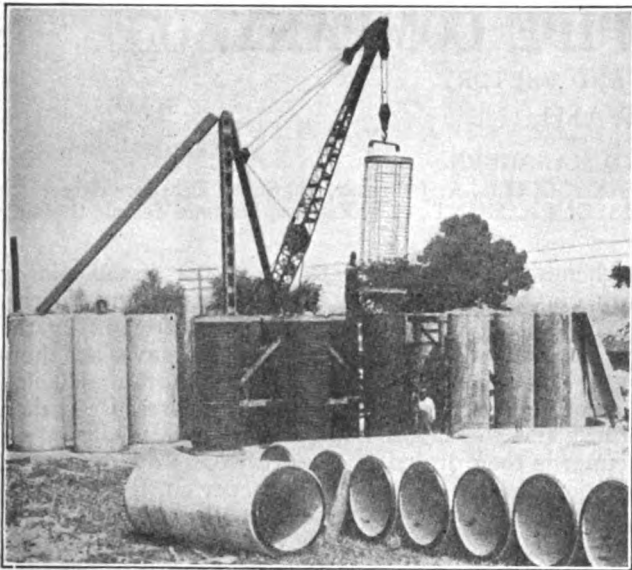
LEAD EXPANSION JOINT



COPPER EXPANSION JOINT

capacity of these pipes is as great as, if not greater than, any other type of pipe.

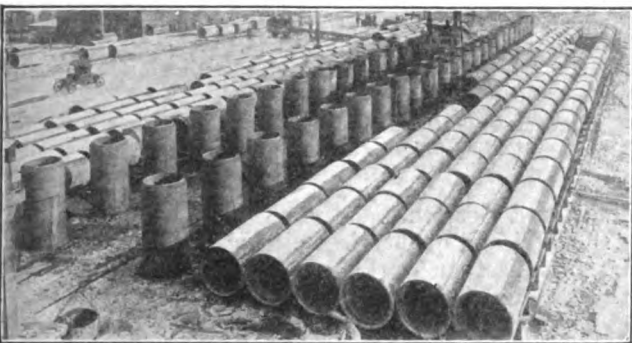
From actual test, "n" in Kutter's formula has been found to be less than .011. In addition to this, well made reinforced concrete is known to be an extremely permanent material.



YARD AT KANSAS CITY, MO.
Showing manufacture of 48-in. copper expansion joint pipe



66-INCH PRESSURE PIPE MADE AT WINNIPEG PLANT FOR
GREATER WINNIPEG WATER DISTRICT



A LOCK-JOINT PLANT MAKING 42-INCH PRESSURE PIPE

Subaqueous Pipe.

For powerhouses, water works, sewage plants, etc., made in approximately 20-ft. lengths, with cast iron flanges mounted into each end. Lengths are lowered into place and flanges are bolted together by divers.

Special designs for special cases.

Cost.

Inasmuch as the pipes are, in almost all cases, manufactured on the ground, local price of materials, such as sand, stone, and cement and steel, naturally influences the cost. However, reinforced concrete pipe is, in almost all cases, considerably less expensive than metal pipe.

Immediate Shipments.

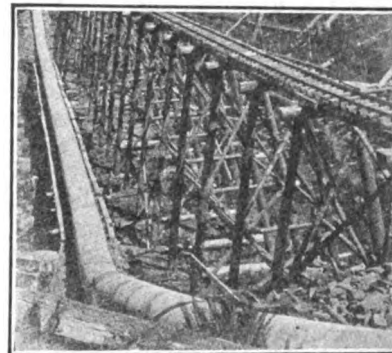
12-in. to 48-in. bell end state highway culvert pipe.
24-in. to 48-in. standard sewer pipe.

Estimates, etc.

Plans, specifications and estimates will be furnished to those desiring same, on receipt of information giving heads to be carried, sizes and quantities of pipe, location of work, and prices of sand, stone and cement, delivered along the line, as the pipes are manufactured on the job.

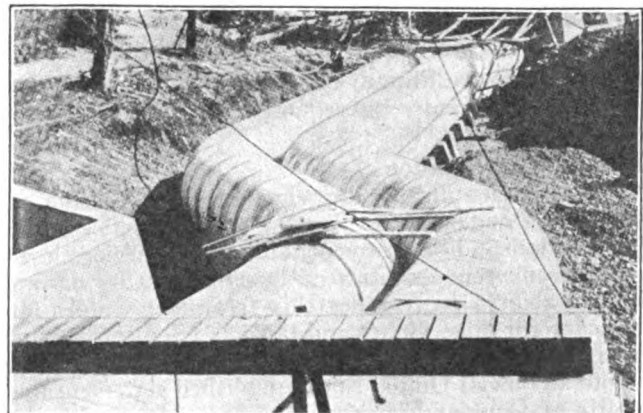


42-INCH WATER LINE, SEATTLE, WASH.



VIEWS OF 42-INCH "LOCK-JOINT" PIPE FOR SOOKE LAKE
WATER SUPPLY, VICTORIA, B. C.

Length of line, 27½ miles; longest tangent on line, 600 ft. Siphon shown under 80-ft. head. 53% of line laid on curves



TWIN LINE PENSTOCK, 72-IN. PIPE, POMPTON LAKES, N. J.

AMERICAN WOOD PIPE COMPANY

EXECUTIVE OFFICES AND FACTORY
TACOMA, WASH.

BRANCH OFFICES AND MANAGERS

NEW YORK, N. Y., J. M. GAYNOR, 30 Church Street
SALT LAKE CITY, UTAH, S. A. ROBERTS, Dooly Building

CHICAGO, ILL., A. J. BERGER, 140 South Dearborn Street
MISSOULA, MONT., C. F. FARMER, Masonic Temple Building

Products.

MACHINE BANDED WOOD (DOUGLAS FIR) STAVE PIPE: (a) "American-reinforced" Preservative Coating; (b) "American-reinforced" Creosote Impregnated.

CONTINUOUS STAVE WOOD PIPE (DOUGLAS FIR): (a) Natural Stave; (b) "American-reinforced" Creosote Impregnated Stave.

Also manufacturers of Semicircular Continuous Wood (Douglas Fir) Stave Flume: (a) Natural Stave; (b) "American-reinforced" Creosote Impregnated Stave; Cedar Pipe Casing; Wood Tanks (Douglas Fir).

Machine Banded Pipe.

Manufactured in sizes 2 to 30 in. diameter, and for all heads up to 600 ft. Staves of highest grade, close grained yellow Douglas Fir, finely machined to arc and radial lines, with longitudinal edge tongue and groove ("V" section tongue). Heavily galvanized steel wire is machine-wound under heavy tension on the stave cylinder, wire being spaced to take care of pressure head required. Ends of pipe are machined for: (a) mortise

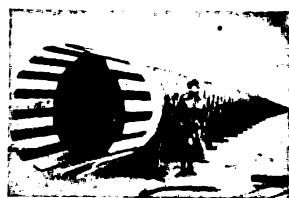


500-FT. HEAD MACHINE BANDED WOOD PIPE

and tenon coupling, or (b) collar coupling; latter is for all high pressure pipe. "American" preservative coating is applied on exterior of pipe, covering stave and wire. (For creosote treatment see below). We erect in field (see Quality and Service).

Continuous Stave Pipe.

This company manufactures, and contracts to erect at site, continuous stave pipe, sizes 2 to 14 ft. diameter. Staves of highest grade, close grained yellow Douglas Fir, faces and edges finely machined to arc and radial lines, butts finely milled with saw kerf or groove, and with metal tongue or spline for perfect watertight butt joint. Staves are erected in field on movable circular forms, joints staggered with round steel bands, with turn-buckle shoe, of size and spacing to requirements of pressure and pipe diameter. (For creosote treatment see below.)



60-IN. CONTINUOUS STAVE WOOD PIPE

Continuous Stave Flume, Cedar Casing, Wood Tanks.

Special literature on request covering these products.

Creosote Impregnation.

When scientifically impregnated with creosote oil the life of Douglas Fir is practically imperishable under all conditions. For many conditions of service, however, the inherent qualities of Douglas Fir, its natural high durability, etc., render this treatment wholly unnecessary for pipe, flumes and tanks. (See engineering department advisory service below.) It is interesting to note an official United States published statement that the life of Douglas Fir properly creosoted is indefinite; also, that exhaustive official tests prove that creosote has

no chemical affinity for water, does not dissolve in or wash out by it, and does not taint it in any degree. Staves are not warped or impaired in strength by the process. Under the "American" process staves are thoroughly dry-kilned, placed in treating retort and boiled in creosote oil under vacuum of 26 in.; pressure is then applied and the creosote oil forced into the wood; a vacuum is then drawn to remove excess oil; minimum retention of oil in the stave is 8 lbs. per cu. ft.

Uses.

American wood stave pipe is used for:

City Water Works—Because it is durable and costs less than any other pressure pipe. It has greater carrying capacity than any other pressure pipe. It delivers the water purer than any other pressure pipe.

Irrigation Systems—Because it can be constructed in any place, and of any size and length. It can be transported and built in place cheaper than any other pressure pipe. It can be transported and built in place of any size and length.

Mining and Power Plants—Because it is not corroded by sulphur or mineral waters. It does not chemically affect fluids passing through it. It has no inner exposure of metal.

Hydraulic Mining and Dredging—Because it is easily transported. It withstands erosion better than metal pipe. It is easily connected and disconnected.

Sewers—Because it is the only satisfactory high pressure sewer pipe known. It is preserved by water. It resists more chemical and mineral solutions than any other pressure pipe.

Electrical Conduits—Because it is a non-conductor of heat and cold. It is easily put in place. It resists electrolysis.

Quality and Service.

"American" quality is the logical result of an efficient organization working in all departments under men trained by years of experience to produce the best.

Engineering Department Service—The AMERICAN WOOD PIPE COMPANY's engineering staff is equipped to render the highest service to clients. Pipe line engineering is today a true science, and our experience has proved that its practice is little understood outside a certain personnel who have devoted a large part of their lives to it. Vital mistakes have been made in pipe line design and in field erection, yet the final consummation of a splendid wood pipe line is simple if properly directed from the beginning. Our staff is at your service. Let us help with, and safeguard the problems.

Field Erection—Experienced superintendents are essential for erection of lines of any importance. This company is prepared to contract complete for supply and expert erection of line or will be pleased to furnish expert superintendents.

Our engineering and sales departments and our branch offices are maintained for your convenience. Write or wire nearest office.

Catalogue.

Complete Wood Pipe Handbook supplied on request.

CONTINENTAL PIPE MANUFACTURING CO.

SUCCESSOR TO

PACIFIC COAST PIPE CO., SEATTLE
WASHINGTON PIPE & FOUNDRY CO.,
TACOMA

PORTLAND WOOD PIPE CO., PORTLAND
NATIONAL TANK & PIPE CO. (PIPE DEPT.),
PORTLAND

GENERAL EXECUTIVE OFFICES
SEATTLE, WASH.

SALES OFFICES

NEW YORK, N. Y., Woolworth Building
CHICAGO, ILL., Tower Building
DENVER, COLO., Jacobson Building

SPOKANE, WASH., Hyde Building
PORTLAND, ORE., Lewis Building
YAKIMA, WASH., Market Building

Products.

MACHINE BANDED WOOD PIPE; CONTINUOUS STAVE WOOD PIPE; CREOSOTED WOOD STAVE PIPE; SEMI-CIRCULAR CREO-WOOD FLUME; WOOD STEAM PIPE CASING; WOODEN TANKS.

Machine Banded Wood Pipe.

Machine banded wood pipe is carefully manufactured in sizes from 2 to 30 in. in diameter—in both types, *inserted joint* or *wood sleeve* as required—to withstand pressure due to any head from 50 to 400 ft.

The pipe is in convenient lengths, generally from 8 to 20 ft. The joints are carefully milled, insuring a proper fit. The staves are formed with great precision, giving a completed pipe with uniform internal diameter, thus preserving the fullest efficiency. Heavy galvanized wire is wound around the pipe under tension by a specially designed machine, the size of wire and spacing depending on the pressure to which the pipe is to be subjected. The pipe is dipped in a bath of hot preservative and then rolled in sawdust, giving it a coating which is an added protection to both staves and wire.

Continuous Stave Wood Pipe.

Continuous stave wood pipe is used in diameters from 16 in. up—the largest pipe yet constructed being 168 in. (14 ft.) inside diameter. The staves are so milled that when assembled they form the size of pipe desired. In building up the pipe, staves of different lengths are laid side by side so that all joints are broken. Each stave is butted against the one immediately preceding, while saw kerfs or slots at the ends receive a thin metal tongue, thus making the construction continuous and doing away with round-about joints of any type in the pipe. The smooth internal walls and the absence of joints in continuous stave wood pipe combine to make the carrying capacity of this pipe considerably greater than that of any other type. The staves are held firmly in place by steel rods or bands, solidly cinched or tightened until every stave is firmly seated. The pressure under which the pipe is to serve determines the diameter of the rods and spacing of the same.

Continuous stave wood pipe is used principally for penstocks, gravity supply lines and irrigation projects.

Creosoted Wood Stave Pipe.

Both *machine banded* and *continuous stave*.

Made from selected lumber, treated with pure coal tar creosote oil by a special process. The wood being thoroughly preserved, the pipe will last indefinitely, as the staves are immune to decay.

Creosoted wood pipe gives entire satisfaction when laid on the ground, in loose, gravelly soil, or in clay. It may be used for intermittent service or under low pressure, as no damage is done when the pipe is not in use or serving under conditions of partial saturation.

These properties of creosoted wood pipe are recognized as distinct advantages in water supply and irrigation work. They are equally important when creosoted wood pipe is used for drainage or sewerage purposes. For drainage purposes each length of pipe is bored with a certain number of holes to permit the ground water to flow readily into the pipe and be carried away. For outfall sewers, in either salt or fresh water, creosoted wood pipe has demonstrated its special advantages.

Semi-circular Creo-Wood Flume.

A recent "Continental" product—conceived and built solely by this company. Constructed on the continuous stave pipe principle with staves and other primary parts pressure-creosoted—a sound guarantee of permanency. Used for water supply, irrigation, and hydro-electric purposes.

Steam Pipe Casing.

Steam pipe casing is extensively used throughout the United States for the insulation of steam pipes radiating from central heating stations, industrial plants and public institutions. The heat energy thus saved has been shown to repay many times the cost of the original investment.

The casing is made of wood staves bound together with galvanized wire and the ends are headed to make a mortise and tenon joint. The outside is covered, like standard wood pipe, with a preservative coating and rolled in sawdust.

Wooden Tanks.

Wooden tanks are furnished for all purposes and the standard sizes are carried in stock. Tanks of special design can be furnished when required.

Inquiries for Pipe.

When asking for prices or information, please be as explicit as possible to avoid misunderstanding, delays and unnecessary correspondence. In order to give a satisfactory reply the following information, or as much of it as is available, should be given:

(1) Size of pipe. (2) Hydraulic head under which it is to serve, either in feet or pounds to the square inch. (3) Length of line. (4) Rail or water destination. (5) Purpose for which pipe is to be used. (6) Whether gravity or pumping system. (7) Total maximum discharge.

ESTIMATES—For estimates on continuous stave lines, it is necessary that a profile should be received, as the size and spacing of the bands are governed by the head and are different for every considerable change of the same.

Co-operation.

An engineering staff is maintained for the convenience of customers.

ESTABLISHED 1869

THE MICHIGAN PIPE CO.

BAY CITY, MICH.

REPRESENTATIVES

MONTREAL, 204 St. James Street
NEW YORK, 30 E. 42nd Street
CHICAGO, Insurance Exchange Bldg.OKLAHOMA CITY, 17 No. Dewey Street
PHILADELPHIA, 318 Widener Bldg.BOSTON, 93 Broad Street
CHATTANOOGA, James Bldg.
CLEVELAND, 919 Ulmer Bldg.**Products.**

"MICHIGAN" COMBINATION STEEL and WOOD WATER, GAS and ACID PIPE.

Also manufacturers of "Michigan" Tin Lined Wood Casings for insulating underground steam and hot water pipes.

"Michigan" Combination Steel and Wood Water Pipe.

Scope of Use—Recommended for use in conveying liquids of all kinds in all climates, as follows:

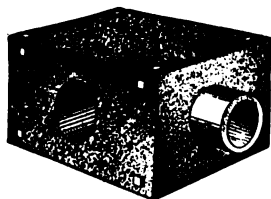
- (1) Municipal water supply and distribution systems.
- (2) Mines and railroads.
- (3) Flumes and irrigation systems.
- (4) Gravity and pressure feed water lines for mills and factories.
- (5) Hydro-electric plants.
- (6) Liquors in tanneries.
- (7) Hot slops from distilleries.
- (8) Acids and gases in chemical plants.
- (9) Pulp in paper mills.
- (10) Mineral waters for bottling purposes.
- (11) Heavy fluids containing grit.
- (12) Ventilating lines and stacks for gas and acid fumes.
- (13) Water and culm in mines.
- (14) Acidulous and sulphurous water.

Description—

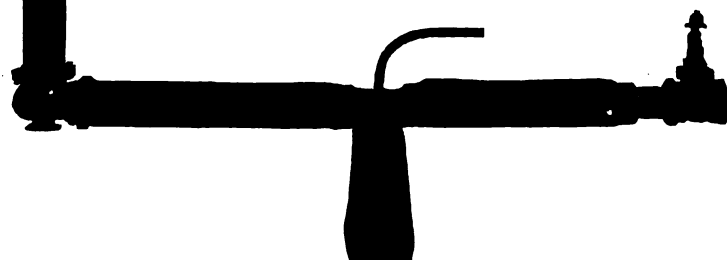
Made of thoroughly seasoned Canadian white pine, Douglas fir or "Michigan Tamarack" staves, machined on the sides forming double tongue and groove for interlocking. Constructed in sections up to 12 ft. in length, spirally banded under heavy tension with steel banding; each section with a mortise on one end and a tenon on the other.

Outside surface covered with thick double coating of special durable waterproof asphaltum and rolled in fine sawdust while hot.

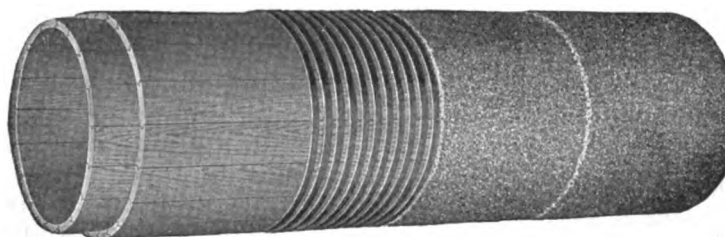
Sizes—"Michigan" pipe is made in stock sizes up to 48-in. diameter. Larger sizes made to order.



SPECIAL WOOD ELBOW



CAST IRON FITTINGS, HYDRANT AND VALVE CONNECTED TO "MICHIGAN" PIPE

**"MICHIGAN" COMBINATION STEEL AND WOOD WATER PIPE**
Steel for strength; wood for durability

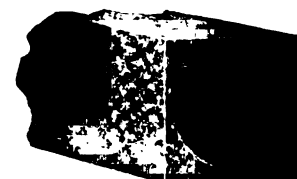
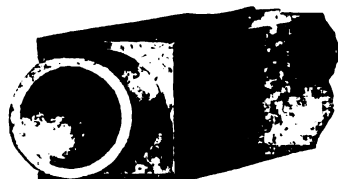
Fittings—Special cast iron fittings furnished in any description, carefully machined to accommodate "Michigan" pipe. For acid and chemical work, we furnish special wood fittings of any description as shown.

Reasons for Using "Michigan" Pipe—

- (1) Durability of wood.
- (2) Sanitation.
- (3) 20% more capacity than metal pipe.
- (4) Simplicity in handling.
- (5) Light weight.
- (6) Speed in laying.
- (7) Protection against freezing.
- (8) Not affected by electrolysis.
- (9) Rigid inspection at factory.
- (10) Efficient construction.
- (11) Great strength.
- (12) Asphaltum protection.
- (13) Can not burst.
- (14) Can be laid in wet trench.
- (15) Short curves without specials.
- (16) Low installation and maintenance.
- (17) 44 years of continued service.
- (18) Easy service connections.
- (19) Requires no skilled labor.
- (20) Responsibility of company.

Data Required When Making Inquiries—

When requesting quotations, give in detail specifications of work, such as whether the line is direct pumping or gravity flow, size of pipe, pressure to be maintained and for what purpose to be used.



SPECIAL SQUARE LIQUOR LOG FOR ACID OR CHEMICAL USE

Shipment—Immediate shipment can be made from stock.

"Michigan" Service.

This company has a field service department of six professional men.

The engineering department offers a free consulting service in connection with the construction of either direct pumping or gravity water works systems, and in solving problems of handling liquids in any form.

When laying large lines of pipe, or small lines under difficult circumstances, a field superintendent will be furnished at a nominal charge, who is capable of taking over the entire supervision of the installation of the line.

In the construction of large lines of "Michigan" pipe, the company furnishes free of charge one of its field superintendents to instruct the acting superintendent in charge regarding the laying and handling of "Michigan" pipe.

PACIFIC TANK & PIPE CO.

318 Market Street
SAN FRANCISCO, CAL.

BRANCHES

NEW YORK, N. Y., 2 Rector Street

CHICAGO, ILL.

LOS ANGELES, CAL., 910 Trust & Savings Building

AGENTS

SALT LAKE CITY, UTAH, BURTON LUMBER CO.

SANTIAGO, CHILE, BUCHANAN JONES & Co.

Products.

PACIFIC WOOD STAVE PIPE, made of Redwood, creosoted or plain Douglas Fir lumber.

PACIFIC WOOD TANKS, made of Redwood, Douglas Fir, and other special woods that may be desired, for all purposes.

Also manufacturers of Wood and Iron Towers for elevated tanks, and Pacific Silos.

Pacific Wood Stave Pipe.

Offers a reliable medium for carrying water at a minimum cost, with an assured long life and lowest possible friction loss.

Pacific Machine Banded Pipe.

Manufactured in sizes from 2 to 32 in. inside diameter. This type is shipped "set up" from factory in random lengths up to 24 ft., averaging approximately 13 ft.

The pipe is built of clear, well seasoned staves, milled from lumber that is carefully graded and thoroughly inspected for this purpose. Staves are held in place by heavily galvanized copper bearing steel wire wound around the pipe by specially constructed winding machines.



TYPICAL INSTALLATION OF PACIFIC MACHINE BANDED PIPE

Accurate, carefully turned tenons are milled on each end of pipe to fit couplings. Couplings of various kinds (inserted joint, wood couplings, cast iron couplings) so designed and constructed to withstand a greater pressure than the pipe is banded for, are

placed on the ends of the pipe. These couplings are carefully manufactured so as to make a true and accurate fit with the tenons.

Coating—After manufacture the exterior of Pacific machine banded pipe is dipped in a preservative asphalt bath, increasing the life of the banding against destruction by the elements and foreign matter in the soil.

Pressure—Pacific machine banded pipe is banded to withstand various pressures up to 400-ft. head and is furnished in increments of 50 ft. each.

Pacific Continuous Stave Pipe.

This pipe is made in sizes from 12 in. to 16 ft., the materials being shipped, knocked down, from point of manufacture to the nearest railroad or steamship point to the installation, transported along the side of the work, and then materials are constructed into pipe by skilled, trained foremen.

The pipe is built of clear, well seasoned staves, milled from lumber that is carefully graded and thoroughly inspected for this purpose. The staves are held together by round steel bands varying in size from $\frac{3}{8}$ to 1 in., depending on the diameter of the pipe.

The bands are connected by malleable iron shoes. The ends of the staves are connected by steel or patented quarter sawed oak tongues of such size as to seat into adjoining staves in all directions.

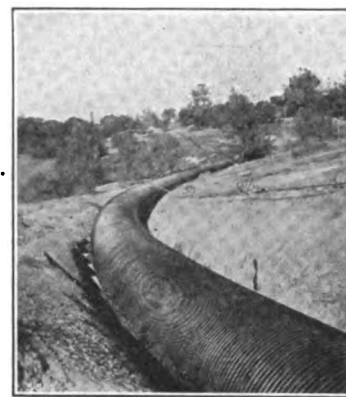
Construction—It is customary for us to quote prices on continuous stave pipe installed in place. All materials to be delivered to nearest railroad point of manufacture in knocked down form, and we to furnish all necessary labor to construct the materials into pipe. the purchaser to haul materials, provide trench or bench and to perform all other work.

Pacific Tanks.

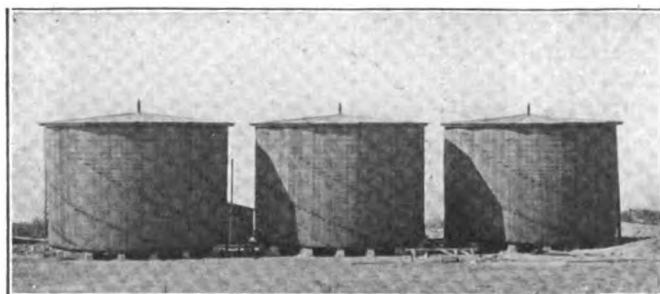
We are in position to supply Pacific tanks made of either California Redwood or Douglas Fir in various styles, either rectangular or round. We supply tanks for mining purposes and for holding oil. These tanks are made in various sizes from 500 to 500,000 gals. capacity, fitted with round hoops and malleable iron straight pull lugs.

We have supplied some of the largest mining, industrial, and chemical plants with our equipment, and have a long list of references.

Send for our 130-page descriptive catalogue on "Mining Tanks and Equipment."



PACIFIC CONTINUOUS STAVE PIPE



GIANT POWDER TANKS

REDWOOD MANUFACTURERS CO.

Manufacturers of Wood Pipe, Tanks and Flumes

Hobart Building
SAN FRANCISCO, CAL.

Products.

WOOD PIPE, Machine Banded, Continuous Stave and Bored; WOOD TANKS.
Also Wood Flumes.

Redwood—Superior for Pipe or Tank Construction.

Redwood contains no pitch or resinous matter, is difficult to ignite and is slow burning when dry. Contains an acid which makes it immune to insects, a fact that partly explains its long life. Strong solutions of



ONE OF FOUR 84-IN. REMCO REDWOOD PENSTOCKS FOR THE GREAT NORTHERN POWER CO., DULUTH, MINN.

acids do not affect it, and when saturated with water, it is impervious to decay. These inherent qualities make it a superior wood for pipe and tank construction.

Remco Redwood Pipe—Advantages.

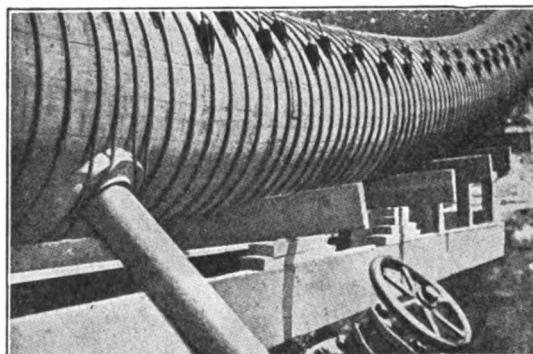
Remco Redwood pipe costs less than metal pipe; has a larger carrying capacity; costs less to freight, is not affected by electrolysis; will not conduct heat; has no expansion or contraction; is flexible; does not contaminate the liquid flowing through it and does not deteriorate with age.

Remco Machine Banded Pipe.

Made in random lengths, 4 to 20 ft.; 2 to 24 in. in diameter; and in pressures up to 400-ft. static head. Staves milled to true circular form from clear air-dried Redwood lumber; edges fitted with small tongue and groove. Staves then spirally wound with special heavily galvanized copper-bearing pipe winding wire, ends of which are held in place by pressed steel sherardized clips. Sections joined by machine banded collars. Ordinarily not coated. For special conditions dipped in asphalt.

Remco Continuous Stave Pipe.

Is composed of best quality air-dried Redwood staves banded with individual steel hoops, and built in diameters from 10 in. to 14 ft. and for pressures up to 350-ft. static head. Staves milled on edges to radial lines, and on sides to circular form. The bands are of round steel rods with head and thread and malleable iron shoe, and are spaced according to size of pipe and pressure.



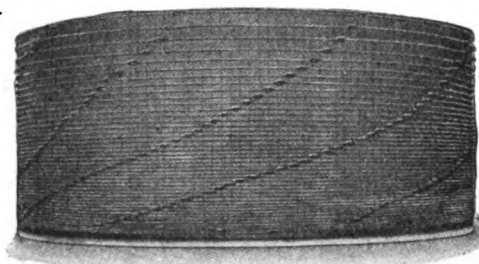
BLOW-OFF VALVE IN REMCO PIPE SIPHON

Remco Bored Pipe.

Remco bored pipe is made in diameters of 1½ to 6 in. Usually left square outside. Used where heavy acids or alkalis are to be conveyed.

Remco Redwood Tanks.

The company manufactures all standard sizes of Redwood tanks, from 3 to 60 ft. in diameter, for water, oils, acids and alkaline solutions. Special tanks made as desired.

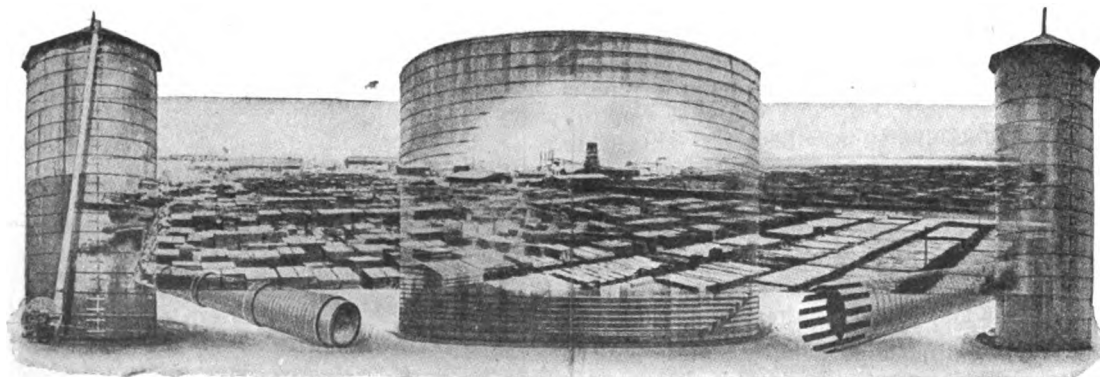


REDWOOD OIL TANK

Stocks.

Some idea of the tremendous stock of the company may be gained by a study of the illustration, showing over 40,000,000 ft. of lumber on hand.

Write for catalogue and price list.



PLANT OF REDWOOD MANUFACTURERS CO., PITTSBURG, CAL.

STANDARD WOOD PIPE COMPANY

Manufacturers of Wood Water Pipe and Steam Pipe Covering

WILLIAMSPORT, PA.

Products and Services.

MACHINE BANDED WOOD STAVE PIPE, SOLID BORED WOOD PIPE and STEAM PIPE COVERING for underground exposed steam and hot water pipe.

Also manufacturers of Continuous Wood Stave Pipe.

We build pipe for water works systems, power plants, municipalities, mill and manufacturing plants, mining and railroad water supplies, irrigation systems, mine culm, salt water mains, heavy fluids, acids, pulp, brine and sewage disposal, also steam pipe covering.

General.

We are endeavoring to describe our product briefly on this page as much as space will permit. The plates in this issue give descriptions of the various kinds of pipe we make. For full details write for our general catalogue, which gives valuable information concerning wood pipe and steam pipe covering.

Machine Banded Stave Pipe.

The staves are made from white pine lumber, Douglas fir, redwood or cypress. They are dressed and finished to a circle corresponding to the radius at both the inner and outer faces. The staves are double tongued and grooved. Each section in pipe is provided with a tenon and chamber 3 to 4 in. deep depending on the size. The pipe is spirally wound with steel bands or galvanized wire. Gauge and spacing of bands are determined by the pressure and size required. The pipe is rolled in a bath of hot asphaltum pitch and then rolled in sawdust. Machine banded pipe is made from 2 up to 48 in. in diameter. The thickness of wall is 1½ to 3 in. and heavier if desired, depending on the size of the pipe. The illustration, plate No. 16, shows in detail the construction of our wood stave pipe. Letter A, thickness of chamber and tenon; B, steel banding; C and D, thickness of shoulder, also shows tongues and grooves; E, protective coating.

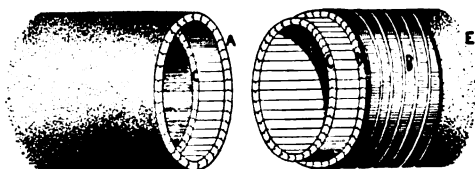


PLATE NO. 16. BANDED STAVE PIPE

Solid Bored Pipe.

Made from solid log up to 8 ft. in length and bored 1½ to 8 in., inclusive.

Outside turned off to a perfect diameter and reinforced with banding and coated on the outside the same manner as our stave pipe shown on plate No. 16. The description of the solid pipe is illustrated on plate No. 70. Letter A, banded pipe before it is coated; B, pipe completed with coating on.



PLATE NO. 70. BORED PIPE

Square Wood Pipe.

Especially built for tanneries and chemical works.



PLATE NO. 32. SQUARE WOOD PIPE

cal works. Made in lengths up to 8 ft. and bored from 1½-in. hole up to 8 in. in diameter and provided with tenon and socket joints, having a steel banding driven around the chamber end to protect the wood from splitting.

Steam Pipe Casing.

The casing we manufacture for covering steam pipe or hot water pipe is made of two grades as illustrated on plates Nos. 44 and 99. Casing on plate No. 44 is made of selected white pine staves 2, 3 and 4 in. thick. Each stave has a double tongue and groove on the same order as our machine banded wood pipe and joined together. It is wound with heavy galvanized wire and then coated with asphaltum pitch on the outside and rolled in sawdust. Plate No. 44 indicates the construction. A shows thickness of wall; B, galvanized wire; and C, protective coating.



PLATE NO. 44. SINGLE LAYER CASING

The other grade of casing manufactured is called double layer, which consists of two thicknesses of lumber as described on plate No. 99. A, inner shell 2 in. thick; B, asphaltum packing; C, dead air space; D, outer shell 1 in. thick; and E, protective coating. Either grade of casing is made tin lined and unlined.

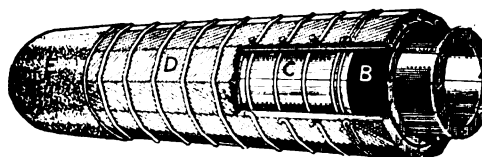


PLATE NO. 99. DOUBLE LAYER CASING

Wooden Specials.

In connection with our cast iron specials we make wood connections of any angle for various pressures. They are used in coal mines and chemical plants where iron fittings can not be used. In plate No. 21, A shows complete section of wood pipe; B, section of wood pipe with tenons on each end used in some instances to connect fittings; C, wood tee; and D, wood ell 45°. Boxes for steam pipe casing of any degree are made on the same order with the exception that they are split in two sections and reinforced with iron bolts, forming an adjustable connection made to correspond to the size of the pipe, so it may be put in its place after the casing and the iron pipe are installed.



PLATE NO. 21. WOODEN FITTINGS

ESTABLISHED 1855

A. WYCKOFF & SON CO.**Manufacturers of Machinemade Wood Water Pipe**

MAIN OFFICE AND FACTORY

ELMIRA, N. Y.

BRANCH OFFICES

PITTSBURGH, PA., JOHNSON-PETER Co., Pittsburgh Terminal Warehouse

SCRANTON, PA., VALLEY SUPPLY Co., Coal Exchange Building

ATLANTA, GA., H. H. WHITE, Fourth National Bank Building

Products.

Manufacturers of WOOD STAVE PIPE and SOLID BORED WOOD PIPE (machinemade), for water works systems, power plants, mill and manufacturing plants, mining and railroad water supplies.

For Waterproof Improved Steam Pipe Casing for underground and exposed steam and hot water pipe, see page 483.

Wyckoff Wood Stave Pipe.

Made from selected Canadian pine. All staves are double tongued and grooved, with faces planed, under close inspection. Winding machine so arranged that staves are banded together or wound with a steel band, at desired uniform tension (see illustration). Pipe is rendered *watertight* by tightly squeezing tongues into grooves. Maximum pipe lengths, 12 ft.; shorter sections permit pipe to be laid on curves, without iron fittings.

Advantages—The Wyckoff machinemade wood pipe has been and is being successfully used for conveying water to municipalities for domestic and fire purposes. For conveying mine water, both hot and cold; for mine culm, tan liquors, mineral spring waters, brine, heavy fluids and pulps in fertilizer works, paper mills or provision factories, and also for conveying diluted sulphuric, nitric, muriatic, acetic and tartaric acids. Its special advantages may be summed up as follows:

Under proper conditions it is as durable as cast iron, and more durable than wrought iron or steel.

It is cheaper than either cast iron, steel or wrought iron.

Its carrying capacity at all times is greater than iron or steel; by continued use its capacity does not decrease, whereas that of iron or steel does decrease yearly.

No skilled labor is needed in laying.

It can be laid with less width of excavation.

Because it is not so readily affected by frost as either iron or steel it can be laid at less depth.

Prevents electrolysis.

Saves freight.

Is not corroded by the fumes and acids of many fluids, and is not destroyed by sulphur or other impurities in minerals.

Does not taint water or contaminate fluids carried.

If frozen the elasticity of the wood retards bursting. Can be laid in the wettest kind of trench.

Special Features in Manufacture—The wood from which Wyckoff wood stave pipe is made is selected Canadian pine. As the staves are run through the finishing machine, which cuts the double groove and tongue and planes the faces to circular and radial lines, a competent inspector of many years' experience handles every stave just at the time when its defects can best be detected. This inspector culls out about 15% of the timber which comes to the factory and these culls are used for other purposes foreign to wood pipe. The winding machine used for banding the wood staves together is so arranged that the band can be wound at any desired tension, according to the set of the machine, which is regulated for each class of pipe according to diameter and pressures specified. The tension can be made great enough to crush the wood in the large size pipe. During the manufacture of one standard a uniform tension and spacing is absolutely assured.

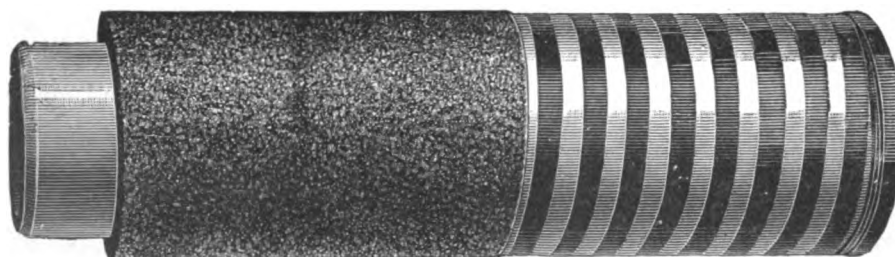
The chambers and tenons are necessarily cut uniformly by a machine, so that every joint between two pipes must fit as the knives and heads are set alike for each size pipe.

Montezuma Asphalt Coating—As previously stated, when wood pipe is laid under the proper conditions its life depends upon the life of its steel bands, and the life of these depends upon the absence of corrosion. If this can be prevented of course the steel will last a long time. This company has experimented for years to ascertain the best mixture for a protective coating. The qualities required are as follows: it must be durable, hard, tough, perfectly waterproof and strongly adhesive to the metal. It must show no tendency to flow under summer temperature and must not become brittle so as to crack or scale, under freezing temperature.

The origin of Montezuma asphalt is an asphaltic base oil found in the Panuco District of Mexico.

This oil is very rich in asphalt; it is very heavy, having a gravity of from 10° to 11.5° Baumé.

The coating is heated in tanks by steam to a temperature of between 250° and 300° Fahr., and applied to the steel bands as it is being wound around the wood, by running the band through the tank which stands upon the winding machine; this method insures a full and

**WYCKOFF WOOD STAVE PIPE FOR HIGH PRESSURE**

Protective coating omitted from one-half of pipe to show steel bands. Note double winding at end of pipe

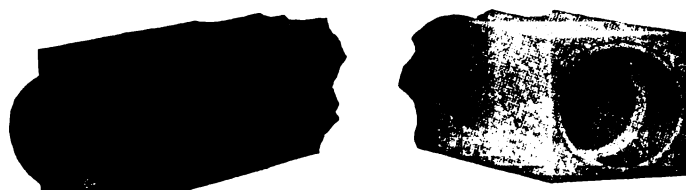
complete coating between the steel and the surface of the wood, thus preventing the moisture which may seep through to the outside of the wood from coming into direct contact with the steel bands.

After winding, the chambers and tenons are cut on the pipe, each being 4 in. in depth by one-half the total thickness of the shell of the pipe, which is usually $1\frac{7}{8}$ in. thick. After leaving the finishing machine the pipe is placed on the top of two grooved rollers, set parallel and horizontal, with one-half their diameters submerged in a tank of the hot asphalt, as before described. As these rollers revolve the pipe revolves, and the coating which adheres to the rollers is thus applied to the outside surface of the pipe, covering the bands and wood. After all is applied that the surface will hold, the pipe is rolled on to a table filled with sawdust. The sawdust adheres to the hot coating, and protects it from being knocked off or abraded in shipping or laying. When conditions require, the pipe is re-coated by running it a second time over the rollers and through the sawdust, thus getting a protective coating over the whole surface of the pipe from $\frac{1}{4}$ to $\frac{3}{8}$ in. thick.

Wyckoff Solid Bored Wood Pipe.

Wyckoff special plain square wood pipe is bored from the solid white pine log for use in tanneries and chemical plants.

We can also furnish round bored pipe strengthened the same as stave pipe, in sizes 8-in. and smaller.

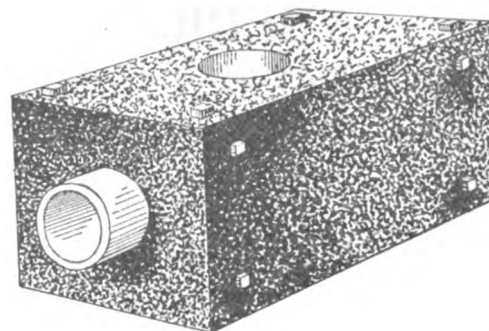


SQUARE BORED TYPE

Fittings for Wyckoff Wood Pipe.

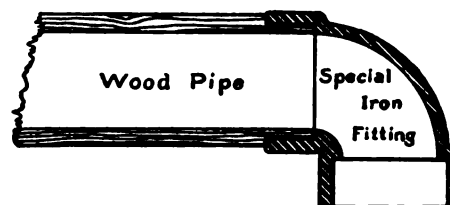
Wood Fittings—Wooden crosses, tees and ells are made by properly boring heavy blocks cut from square timbers. Tension bolts as shown prevent the block from splitting—the number and size of the bolts depending upon the pressure to be resisted. The openings are made of the same dimensions as standard chambers, the connections being effected by using, immediately preceding the fitting, a special section of wood pipe having a tenon on each end. This special section is first driven into the fitting and the combination then handled exactly like a regular section of pipe. Or, if especially desired, the fitting may be provided with regular tenon and chamber in the "run."

Wood fittings are recommended where the water carries chemicals injurious to iron, or where it is desirable to maintain extreme purity in the liquid conveyed. They are impractical in large sizes or for highest pressure.



WOOD FITTING, COATED

Special Cast Iron Fittings—More satisfactory for ordinary and general purposes are the special cast iron fittings. These are similar to regular cast iron fittings except that the bells are finished to the same dimensions as the chambers of wood pipe of the same diameter. This makes necessary a section of wood pipe with tenon on each end, as previously described. On account of the great convenience and universal satisfaction, several manufacturers of valves, fire hydrants, etc., are now furnishing these accessories chambered in the same manner for direct connection to wood pipe.



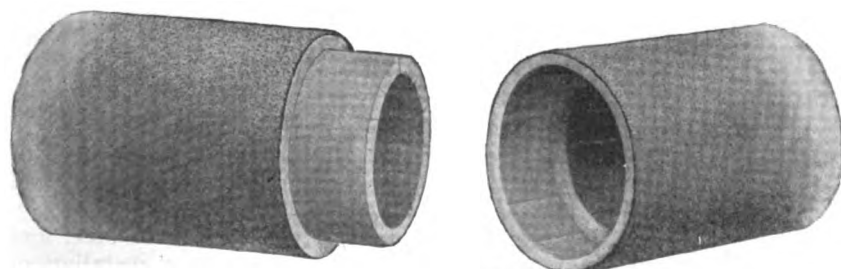
Bell to Fit Tenon

SPECIAL CAST IRON ELBOW FOR WOOD PIPE FITTING

Threadings—Threaded fittings and connections to threaded wrought pipe are provided for by supplying special sections of wood pipe in which a reamed end of proper diameter is substituted for regular chamber or tenon, as the case may require. The screw on the threaded nipple cuts the screw in the wood pipe as the junction is made, forming a tight and satisfactory connection. Especially in the smaller sizes, this style is very efficient and inexpensive.

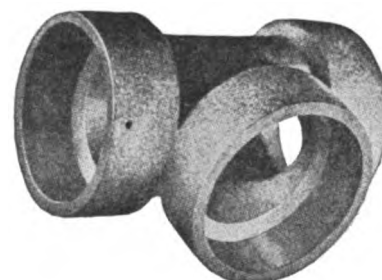
DIMENSIONS, DATA, ETC., FOR HANDLING WYCKOFF WOODEN PIPE

Size of pipe, in.	Outside diameter of pipe, in.	Weight per lin. ft. in lbs., 80 lbs. pres.	No. ft. in carload 40-ft. car	No. ft. 2-horse truck can haul	No. men used in laying, exclusive of foremen	No. ft. these men can lay in day of 10 hours
6	10 $\frac{1}{2}$	15	2700	344	4	2000
8	12 $\frac{1}{2}$	17	2300	272	4	1900
10	14 $\frac{1}{2}$	23	1800	216	4	1700
12	16 $\frac{1}{2}$	25	1500	192	6	1500
14	18 $\frac{1}{2}$	31	1100	152	6	1400
16	20 $\frac{1}{2}$	33	900	144	6	1200
18	22 $\frac{1}{2}$	38	750	128	6	1000
20	24 $\frac{1}{2}$	42	500	112	6	800
24	28 $\frac{1}{2}$	50	330	80	8	600
30	36 $\frac{1}{2}$	80	225	64	8	450
36	42 $\frac{1}{2}$	95	160	48	8	300
48	54 $\frac{1}{2}$	120	95	24	8	200



TWO ENDS OF WOOD PIPE

Showing tenon and socket joints of wood pipe that will stand a pressure of 160 lbs. per sq. in. by simply driving them together



SPECIAL CAST IRON TEE

AMERICAN SPIRAL PIPE WORKS

Manufacturers of Lap-welded Steel Pipe, Spiral Riveted Pipe, Steel Pipe Flanges and Hydraulic Supplies

GENERAL OFFICE AND WORKS
CHICAGO, ILL.

EASTERN OFFICE: 50 Church Street, NEW YORK

Products.

LAP-WELDED STEEL PIPE; TAYLOR'S SPIRAL RIVETED PRESSURE PIPE, Galvanized or Asphalted; FORGED STEEL FLANGES; FLANGED FITTINGS; SPECIAL PLATE STEEL FITTINGS; SEAMLESS BOILER NOZZLES; CORRUGATED FURNACES.

Also manufacturers of Gate, Straightway and Foot Valves; Exhaust Heads; Hydraulic Mining Giants, etc.

Scope of Use.

The products of this company are extensively used for the following purposes:

Spiral Riveted Pipe—For high pressure hydro-electric lines; exhaust steam and condenser piping for various plants; water supply lines, water works systems, pumping mains, distribution work; producer-gas lines, etc.

Lap-welded Pipe—For hydro-electric power plants; water supply and intake mains; gas work; shore pipe; dredging pipe; dredging spuds; welded pontoons; large diameter welded drums; tanks; cylinders and shells.

Forged Steel Flanges—For high pressure steam mains, superheated steam, and hydraulic work. Boiler and tank flanges bent to required circle.

Taylor's Spiral Riveted Pipe.

In manufacturing this pipe, a strip of sheet steel is wound into helical shape with one edge overlapping the other for riveting the seam; metal to metal contact at the spiral seam; steel stretched on outer lap slightly offset to insure smoothness on the inside; and riveting is done cold by compression or squeezing under enormous pressure (not by percussion or hammering), thus completely filling rivet holes with slight counter-sink. Hydraulic tests (for bursting pressure) have frequently shown the seam to be strongest part of the pipe.

Pipe comes from machines in a continuous piece and is cut to any desired length. Maximum lengths, galvanized, 20 ft.; asphalted, 40 ft.

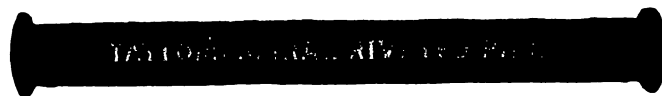


FIG. 1. SPIRAL RIVETED PRESSURE PIPE

Inside diameter, in.	Thickness, standard gauge	Weight per foot, lbs.	Approx. bursting strength in lbs. per sq. in.	Inside diameter, in.	Thickness, standard gauge	Weight per foot, lbs.	Approx. bursting strength in lbs. per sq. in.
3	20	1.9	1500	16	14	18.1	585
4	18	3.0	1500	18	14	19.9	520
5	18	3.7	1200	20	14	22.1	470
6	16	5.3	1250	22	12	33.7	595
7	16	6.2	1070	24	12	36.5	540
8	16	7.1	935	26	12	39.5	505
9	16	8.0	835	28	10	42.1	606
10	16	8.8	750	30	10	56.8	560
11	16	9.7	680	32	10	61.6	525
12	16	10.6	625	34	10	65.4	490
13	16	11.4	575	36	10	69.1	470
14	14	15.9	670	40	10	76.7	420
15	14	17.0	625	42	10	80.5	399

Lap-welded Steel Pipe.

Made from best quality open hearth steel, by forge welding process, giving most reliable and uniform weld. Thoroughly annealed after completion.

Sizes 12 to 72 in. in diameter; standard lengths, 20 ft.—furnished up to 60 ft. when required.

Installations, high pressure water mains, dredging work, exhaust steam condenser piping, shells for driers, oil stills, etc. (Fig. 2).



FIG. 2. LAP-WELDED STEEL PIPE
Used as high pressure hydro-electric and vacuum exhaust pipe, etc.

Inside diameter, in.	Minimum thickness, in.	Bursting stgth in lbs. per sq. in.	Maximum thickness, in.	Bursting stgth in lbs. per sq. in.	Inside diameter, in.	Minimum thickness, in.	Bursting stgth in lbs. per sq. in.	Maximum thickness, in.	Bursting stgth in lbs. per sq. in.
12	10 gauge	1172	1 1/2	4166	36	1 1/2	694	1 1/2	3472
14	10 gauge	1005	1 1/2	3568	38	1 1/2	658	1 1/2	3288
16	10 gauge	879	1 1/2	4686	40	1 1/2	625	1 1/2	3124
18	10 gauge	1041	1 1/2	4164	42	1 1/2	595	1 1/2	2976
20	10 gauge	937	1 1/2	3736	44	1 1/2	568	1 1/2	2840
22	10 gauge	852	1 1/2	4555	48	1 1/2	520	1 1/2	2604
24	10 gauge	781	1 1/2	5208	50	1 1/2	500	1 1/2	2500
26	10 gauge	721	1 1/2	4809	54	1 1/2	463	1 1/2	2315
28	10 gauge	669	1 1/2	4462	60	1 1/2	416	1 1/2	2080
30	10 gauge	833	1 1/2	4160	66	1 1/2	379	1 1/2	1892
32	10 gauge	781	1 1/2	3906	72	1 1/2	347	1 1/2	1736
34	10 gauge	735	1 1/2	3678					

In addition to the above list, all intermediate sizes and thicknesses are manufactured.

Forged Steel Bolted Joints.

For hydraulic purposes. Unbreakable in handling, transportation, or use. Joints allow slight deflection without leakage and take care of all expansion and contraction of pipe. Suitable for highest pressure. By using shorter lengths of pipe, long radius bends are possible (Fig. 3).



FIG. 3. FORGED STEEL BOLTED JOINT



FIG. 4. FORGED STEEL FLANGES FOR RIVETED PIPE

Forged Steel Flanges.

Being strictly forged steel permits them to be attached securely and rigidly to the pipe by use of power riveters, making an absolutely tight joint, and eliminating the possibility of a leak (Fig. 4).

They are forged from the best grade of steel and can not be cracked or broken in transit or installation. Furnished in either spiral pipe or the A. S. M. E. standard.

Flexible Ball Joints.

Used extensively on submerged pipe lines and on intake mains where pipe follows contour of surface. Deflection of 20° may be had in any direction. Note packing ring which may be tightened, or entire joint re-packed, without affecting clamping ring that prevents joint from pulling apart. Forged steel follower ring, for holding packing and clamping ring (Fig. 5).

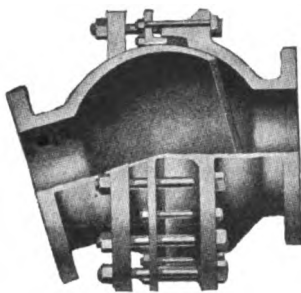


FIG. 5. FLEXIBLE BALL JOINT

Taylor Seamless Forged Steel Boiler Nozzle.

Forged from a single piece of open hearth steel, without a weld. It can not be affected by any possible strain which may arise through the piping system. This seamless nozzle has been proved to be the most reliable and safest connection between boiler drum and a high pressure piping system, and it eliminates all castings, making the boiler wrought steel throughout. Power riveters can be used for attaching the nozzle (Fig. 6).

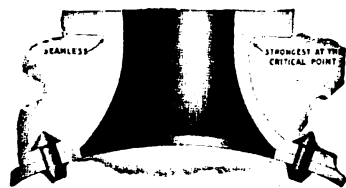


FIG. 6. SEAMLESS STEEL BOILER NOZZLE

Corrugated Boiler Furnaces.

For internally fired land and marine boilers and oil stills.

All sizes, plain or flanged ends.

Made in accordance with United States Steamboat Inspection, American Bureau, Lloyds Register of Shipping, Bureau Veritas or other specifications. Send details of the requirements (Fig. 7).



FIG. 7. A SINGLE ORDER OF CORRUGATED FURNACES READY FOR SHIPMENT

Pipe Connections and Fittings.

Several styles of connections (flange, welded flange, field riveted, bell and spigot, bolted socket, bolted joint, etc.) are all of forged steel. Particulars of pipe connections and fittings sent on request (Fig. 8).

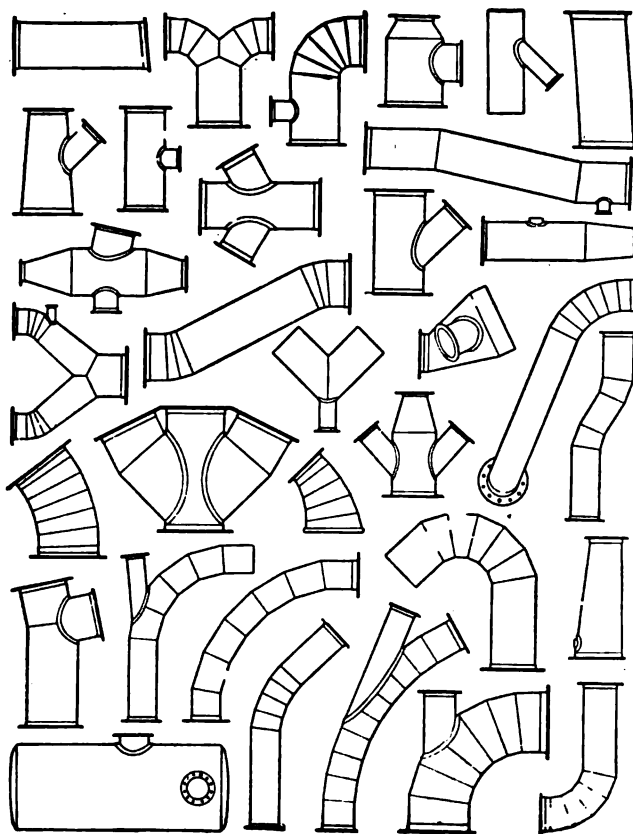


FIG. 8. SPECIAL STEEL PLATE FITTINGS



FIG. 9. ASPHALTED SPIRAL RIVETED PRESSURE PIPE DISCHARGING SAND AND GRAVEL 1/4 MILES FROM SUPPLY
Raising the level of the ground. Using 6,600 ft. of 12-in. No. 12 pipe

Estimates, or Prices Quoted.

Send us a field or shop sketch, showing layout of line or list of material required, and we will quote special net price and furnish the material cut to exact length with all necessary fittings and specials so immediate installation may be made upon the arrival of the material. Forged steel flanges used throughout. We carry a large stock on hand at all times and are in position to make prompt shipment on all orders. Every length subjected to a hydraulic test of 50% in excess of specified working pressure.

Catalogues or production book showing our entire line will be mailed on request.

EAST JERSEY PIPE COMPANY

OFFICES
50 Church Street
NEW YORK, N. Y.

WORKS
East 36th Street
PATERSON, N. J.

CANADIAN INCORPORATION
THE CANADIAN STEEL PIPE CO., LTD.

50 Church Street
NEW YORK, N. Y.

590 Union Avenue
MONTREAL, QUE.

Products.

LOCK-BAR STEEL PIPE.

Also manufacturers of Riveted Steel Pipe; Dredge Pipe; Pontoon Pipe; Shore Pipe; Tanks; Standpipes; Steel Linings; Plate Work; Tube Mills.

Advantages of Lock-bar Steel Pipe.

The relative advantages of different forms of pipe are determined by comparing their carrying capacities, strength, durability, and cost.

Lock-bar pipe has a carrying capacity 10% to 15% greater than riveted steel, and slightly greater than cast iron, because of its smooth interior unobstructed by rivets. It has a strength at the joint of 100%, or equal to the plate itself, as hereinafter shown.

Its durability and relatively small cost have been amply demonstrated by actual use for many years, as is evident by the installations given under "References."

Description of Lock-bar Steel Pipe.

"Lock-bar steel pipe is made by upsetting the edges of the plates and connecting them by a lock-bar in the shape of an H, going over the opposite edges and being forced down over them by hydraulic pressure. This takes the place of the riveting in the longitudinal joints. The circular joints may be made by riveting or otherwise, as for riveted pipe. While double riveting

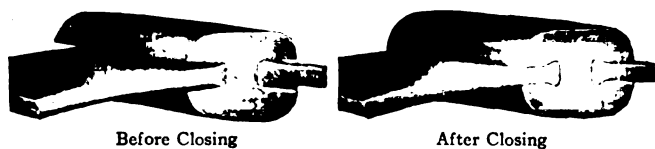


FIG. 1. LOCK-BAR JOINT

develops only about 72% of the strength of the steel plate, the lock-bar actually develops 100%."—*American Civil Engineers Pocket Book*, p. 959.

Strength of Joint.

The lock-bar joint is 100% efficient or equal to

the strength of the plate itself. It is therefore possible to use in many instances lock-bar pipe of a thickness of plate $\frac{1}{8}$ in. less than the thickness required in riveted or welded pipe where the joint efficiency is less than the strength of the plate.

Hydraulic Test on 42-inch Pipe.

On Jan. 2, 1909, official tests were conducted by the Robert W. Hunt Co. for the City of Springfield, Mass., on a 42-in. diameter, $\frac{7}{8}$ -in. plate lock-bar pipe under pressure of 1050 lbs. per sq. in. (Fig. 2). The metal of the plate was stretched over 4 in. in circumference without injury or leakage along the lock-bar joints. Higher pressure was not possible because of blowing out riveted pads at gage and inlet, as shown below. At this pressure, the pipe was actually exceeding by 765 lbs. per sq. in. its normal working pressure.

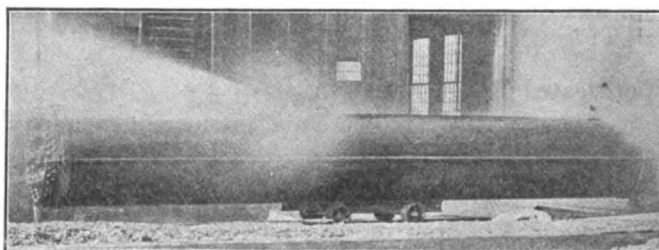


FIG. 2. HYDRAULIC TEST ON 42-INCH PIPE
Showing riveted pads blown out at gage and inlet; lock-bar joint remaining tight

Carrying Capacity.

By reason of its exceptionally smooth interior, lock-bar pipe has a slightly greater carrying capacity than cast iron pipe, and from 10% to 15% greater carrying capacity than riveted steel pipe, the interior of which is necessarily obstructed at frequent intervals by the projection of rings of rivets.—*See American Civil Engineers Pocket Book*, p. 959; *Fry's Civil Engineers Pocket Book*, pp. 1162-1163.

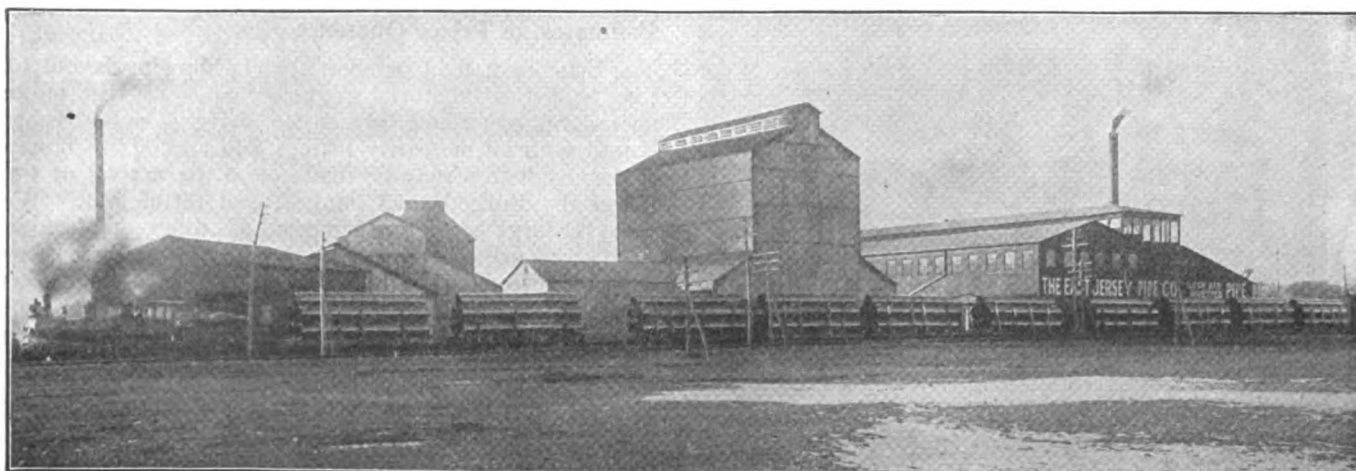
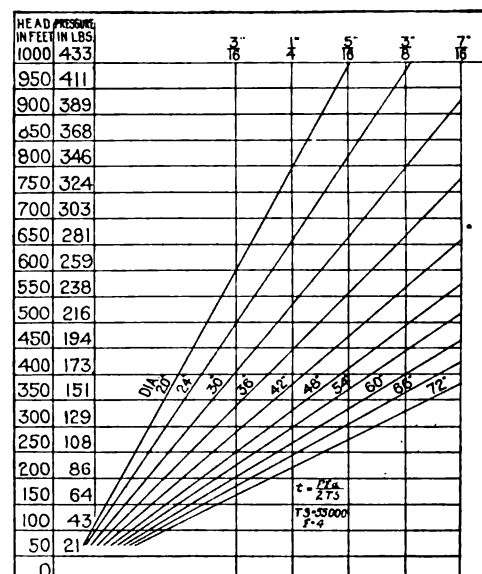
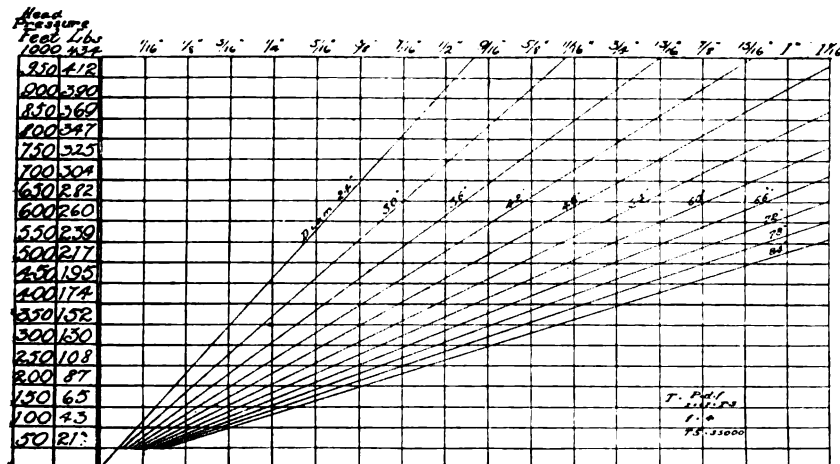


FIG. 3. NEW WORKS OF EAST JERSEY PIPE COMPANY, PATERSON, N. J.

Sizes.

Lock-bar pipe is made in diameters from 20 to 72 in., inclusive, and thicknesses of plate from $\frac{3}{16}$ to $\frac{1}{2}$ in., inclusive.



Double Riveted Pipe
COMPARATIVE CHARTS SHOWING SAFE WORKING PRESSURES FOR RIVETED AND LOCK-BAR PIPES BASED UPON
FORMULA $T = \frac{PFD}{2TS}$; T.S. = 55,000 LBS.; F = FACTOR OF SAFETY 4

Lengths.

Standard lengths, except where necessary to fit pipe to plan or profile of line, or where sizes of plates obtainable impose other limitations, are 30-ft. laying lengths, the most economical for handling and transporting.

Joints.

In all sizes above 24 in., where diameter is sufficient to permit inside rivet insertion and calking, patented riveted taper joints (Fig. 5) are employed. For this joint the pipe is made sufficiently tapered to permit insertion of one pipe in the slightly enlarged end of the contiguous pipe, the two pipes being connected in ordinary practice by one row of rivets, after which the joint is calked both inside and outside in a manner similar to the seams of a boiler.

In some instances buttstrap joints (Fig. 6) are employed.

Special attention is called to the new patented high pressure coupling (Fig. 7) and also the modification of this coupling for submarine work (Fig. 8). Lock-bar pipe with plain ends is furnished for use with these couplings, which can be furnished in all sizes 20 to 48 in. in diameter. The lock-bar on the outside of the pipe is cut down and the pipe welded and smoothed a sufficient distance from the end to permit the pipe to fit into the coupling.

Specifications for Lock-bar Pipe.

Planing and Up-setting—The longitudinal edges of plates shall be planed to proper dimension and edges up-set to a sufficient degree to form necessary shoulder for engaging lock-bar. The ends of the plates shall be bevel sheared.

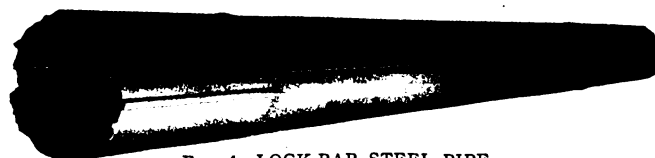


FIG. 4 LOCK-BAR STEEL PIPE

Crimping and Rolling—The longitudinal edges of plates shall be crimped to proper radius, so that when plates are rolled edges entering lock-bar shall not be damaged by rolling. After crimping, plates shall be cold rolled to diameter of cylinder of pipe.

Lock-bars—The lock-bars shall be made from a grade of steel and in accordance with certain specifications which experience has shown best designed for this usage.

Pressing—Plates and lock-bars shall be assembled and clamped together and lock-bars pressed down over up-set edges of the plates by a hydraulic press exerting a pressure of at least 350 tons per lin. ft. of pipe.

Finishing—After the bars have been pressed, ends of bars shall be trimmed to edge of plate to conform to bevel of edge of plate.

Testing—Each section of pipe shall be tested in a hydraulic testing machine to at least one and one-half times the working pressure, which pressure shall be maintained until inspection has been made of entire length of lock-bar joint, and any pipe showing any signs of leakage or weakness at any point shall be returned and repressed.

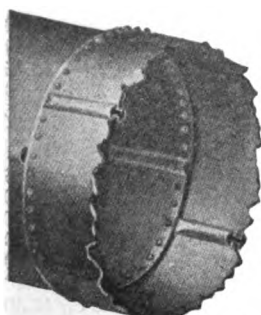
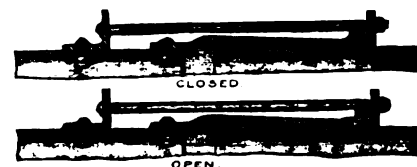
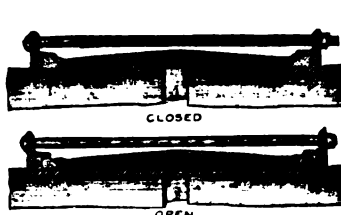


FIG. 5. RIVETED TAPER JOINT

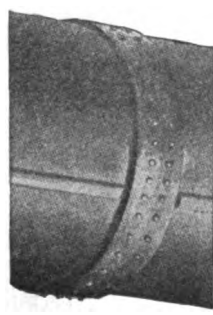


FIG. 6. BUTTSTRAP JOINT



FIG. 7. HIGH PRESSURE FLEXIBLE PIPE COUPLING

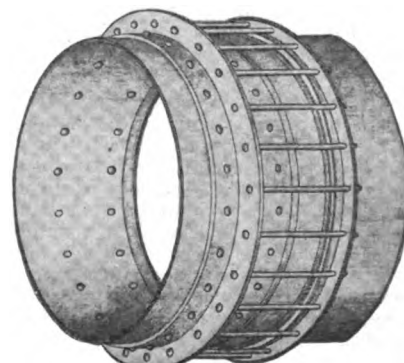


FIG. 8. SUBMARINE PIPE JOINT

General Specifications for All Pipe.

Material used and method of manufacture shall conform to the following detailed specifications, although slight variations from exact specifications may be permitted where, in the judgment of purchaser's inspector, such variations do not affect strength, durability or efficiency.

Inspection—All materials entering into manufacture of said pipe and manufacture of pipe itself shall be subject to inspection by purchaser or his duly authorized representative. All steel shall be inspected by purchaser's inspector at mill. Steel plates shall be lifted to a sufficient height or angle to permit proper inspection of both sides, and all plates showing scales, blisters, laminations, burns, or imperfection of any description shall be rejected.

Quality of Metal—Pipe, unless otherwise specified, shall be made of steel plates manufactured by open hearth process which conform to the following requirements:

TENSILE STRENGTH—Ultimate tensile strength of steel plates shall be between 55,000 and 65,000 lbs. per sq. in. Form of all test specimens, unless otherwise specified, shall be in accordance with "Standard Specifications for Structural Steel for Bridges" as adopted on August 16, 1909, by American Society for Testing Materials.

ELASTIC LIMIT—The elastic limit shall not be less than one-half ultimate tensile strength. The elongation shall not be less than 25% in 8 in. with a reduction in area of not less than 50%.

ROLLING—Material shall be rolled true, and billets from which said material is rolled shall be free from seams and cracks. For the purpose of excluding inferior material, there shall be sheared from top of ingot sufficient discard to obtain sound steel.

PUNCHING TEST—Specimens for punching test shall be $1\frac{3}{4}$ in. wide, and not less than 10 in. long; a row of not less than 8 holes $\frac{3}{4}$ in. in diameter, spaced $1\frac{1}{4}$ in. between centers, shall be punched while plate is cold, without causing any cracks.

DRIFTING TEST—Specimens for drifting tests shall be 3 in. wide and not less than 5 in. long; not less than 2 holes $\frac{3}{4}$ in. in diameter, spaced 2 in. between centers, and $1\frac{1}{2}$ in. from edges, shall be punched and then enlarged cold by blows from a sledge hammer upon a drifting pin until said holes are at least $1\frac{1}{4}$ in. in diameter, without causing any cracks.

BENDING TEST—The bending test specimens shall be cut lengthwise and crosswise from sheets, and shall not be less than 6 in. long and 1 in. wide. When cold they shall be bent 180° flat upon themselves without showing any signs of fracture on convex side of bent portion.

ADDITIONAL TESTS—Plates while cold must admit of hammering or scarfing to a fine edge without fracture. Test pieces must stand quenching, forging and other tests to prove fully their temper, soundness, and fitness for use in manufacture of pipe.

PERFECT PLATES—Plates shall be free from laminations, cinders and any other surface defects. They shall be fully up to required thickness at edges, and any plates which shall be found to be more than 5% short of the required thickness at any point shall be rejected. Not over 5% of plates shall be short of full required thickness at any point. Plates must be rolled flat and sheared as accurately as possible (in no case shall any plates be short of specified dimensions), and must in all respects be in good merchantable condition.

SPECIMENS AND REJECTIONS—General qualifications shall be determined from one set of tests from each heat or melt; but any plate which shows defect during the process of punching, bending or riveting shall be rejected notwithstanding previous satisfactory tests of test pieces. Failure of test pieces to conform to specifications shall cause rejection of entire heat or melt from which samples were obtained.

Before proceeding with manufacture of pipe, contractor will prepare and submit to purchaser for his approval shop drawings showing proposed layout.

PUNCHING—Rivet holes shall be punched with sharp clean punches and dies so as to cut holes clean and leave no burr on underside of plates.

Specifications for Coating—Material used for coating pipe shall be a specially prepared mineral rubber asphalt mixture.

Pipe section shall be heated in suitable oven to a temperature of not less than hereinafter specified for the bath. Pipe section shall then be dipped vertically in the bath of mineral rubber coating maintained at a temperature of 350° Fahr. or more and of sufficient depth to allow pipe to be entirely submerged, and it shall receive a coating of not less than $\frac{1}{2}$ in. in thickness. Coating must be free from blisters and bubbles; it must strongly adhere to pipe under all circumstances, and must not become soft enough to flow at a temperature of 150° Fahr., nor brittle enough to crack or scale off in freezing temperature. After pipe sections have been removed from bath, they shall be set in a vertical position while cooling.

Loading—After coating has become sufficiently hard, pipe shall be loaded on suitable cars provided with wood saddles, cut to proper radius for pipe to rest on. All saddles or bolsters, as well as all side stakes on cars which come in contact with pipe, shall be protected with pads of burlap or other suitable material of sufficient thickness to prevent rubbing or chafing of coating. Entire load to be blocked and wired on cars in best possible manner, to prevent, as far as possible, shifting in transit, and injury to coating.

Burlap Wrapping—After pipe has been dipped in mineral rubber coating and coating has sufficiently set to prevent flow in subsequent operations, it may, at the purchaser's option, be wrapped with 10-oz. Calcutta burlap or equal, which shall be cut into strips 18 in. wide and applied in accordance with the particular specifications of the EAST JERSEY PIPE COMPANY.

A Few Notable Pipe Lines Made by the East Jersey Pipe Company.

Year	Location	Kind	Size, In.	Length, Ft.
1891	Newark, N. J.	Riveted	48 and 36	142,000
1896	Newark, N. J.	Riveted	48 and 42	126,000
1897	Paterson, N. J.	Riveted	42	40,000
1899	Seattle, Wash.	Riveted	42	32,000
1899	Newark, N. J.	Riveted	51	47,500
1902	Jersey City, N. J.	Riveted	72	93,000
1903	Newark, N. J.	Riveted	60	39,300
1903	Troy, N. Y.	Riveted	33	35,300
1903	Schenectady, N. Y.	Riveted	36	24,000
1904	Astoria, L. I., N. Y.	Riveted	60	15,000
1905	Lynchburg, Va.	Lock-bar	30	15,000
1905	Wilmington, Del.	Lock-bar	48 and 43	20,000
1906	Brooklyn, N. Y.	Riveted	72	42,300
1906	Honolulu, T. H.	Lock-bar	30	8,000
1906	Philadelphia, Pa.	Lock-bar	48 and 36	55,300
1907	Gary, Ind.	Lock-bar	36	4,000
1907	Trenton, N. J.	Lock-bar	48	7,000
1907	Montreal, Que.	Lock-bar	36	11,000
1907	Lockport, N. Y.	Lock-bar	30	68,500
1907	Vancouver, B. C.	Lock-bar	22	5,000
1908	Michigan City, Ind.	Lock-bar	30	4,000
1908	Philadelphia, Pa.	Riveted	132	3,180
1908	Montreal, Que.	Lock-bar	36	25,000
1908	Springfield, Mass.	Lock-bar	54 and 42	63,500
1909	Brooklyn, N. Y.	Lock-bar	72	83,000
1909	Portland, Ore.	Lock-bar	48 to 24	9,600
1910	Brooklyn, N. Y.	Lock-bar	48	16,200
1910	Seattle, Wash.	Lock-bar	32	4,050
1910	Seattle, Wash.	Lock-bar	42 to 24	12,300
1910	Portland, Ore.	Lock-bar	52 and 44	128,000
1910	Catskill Aqueduct	Riveted	135, 117 and 114	33,000
1911	Catskill Aqueduct	Lock-bar and Riv	66	17,020
1911	Seattle, Wash.	Lock-bar	42, 40, 36 and 24	16,945
1911	Montreal, Que.	Lock-bar	48, 36 and 30	7,300
1911	Denver, Colo.	Lock-bar	60	1,200
1911	Marquette, Mich.	Lock-bar	66	8,000
1912	Union Bay, B. C.	Lock-bar	50	1,320
1912	Rochester, N. Y.	Lock-bar	66	9,254
1912	Ottawa, Ont.	Lock-bar	42	2,400
1912	Omaha, Nebr.	Lock-bar	48	10,550
1912	Akron, Ohio	Lock-bar	36	55,870
1912	Winnipeg, Man.	Lock-bar	36	42,500
1913	Minneapolis, Minn.	Lock-bar	54 and 50	39,725
1913	Montclair, N. J.	Lock-bar	24	8,000
1913	Utica, N. Y.	Lock-bar	36	1,000
1913	Wilkes-Barre, Pa.	Lock-bar	36	1,350
1913	Schenectady, N. Y.	Lock-bar	24	2,420
1914	Schenectady, N. Y.	Lock-bar	36	10,500
1914	Essex Junction, Vt.	Lock-bar and Riv	108 and 36	2,440
1914	Rutland, Vt.	Lock-bar and Riv	54	2,750
1914	Winnipeg, Man.	Lock-bar	36	24,000
1914	Brooklyn, N. Y.	Lock-bar	66	12,200
1914	Rochester, N. Y.	Lock-bar	66 and 48	1,120
1915	Ottawa, Ont.	Lock-bar	51	15,000
1916	Minneapolis, Minn.	Lock-bar and Riv	42 to 48	7,350
1916	Rochester, N. Y.	Lock-bar	37	50,763
1916	St. Louis, Mo.	Lock-bar	36	26,700
1916	Gary, Ind.	Lock-bar	36	1,865
1917	Eastman Kodak Co.	Lock-bar	42	7,910
1917	Rochester, N. Y.	Lock-bar	37	42,140
1917	Carnegie Nat. Gas Co.	Lock-bar	54, 40, 36 and 30	48,537
1918	Carnegie Nat. Gas Co.	Lock-bar	40	12,000
1918	Jersey City, N. J.	Riveted	72	3,200
1919	Akron, Ohio	Lock-bar	48	12,000
1919	Jersey City, N. J.	Lock-bar	72	88,000
1920	Elyria, Ohio	Lock-bar	36	24,500
1920	Paterson, N. J.	Lock-bar	30	12,300
1920	Akron, Ohio	Lock-bar	48	21,250
1920	Bayonne, N. J.	Lock-bar	48	44,000

READING IRON COMPANY

Manufacturers of Genuine Wrought Iron Pipe

READING, PA.

BRANCH OFFICES

BOSTON, MASS.
NEW YORK, N. Y.

PHILADELPHIA, PA.
PITTSBURGH, PA.

CHICAGO, ILL.
CINCINNATI, OHIO

FORT WORTH, TEX.
LOS ANGELES, CAL.

Products.

READING GENUINE WROUGHT IRON PIPE.

Also manufacturers of Casing, Line and Drive Pipe, Drill Pipe, Oil Well Tubing, Charcoal Iron Boiler Tubes; Heavy Marine, Engine, and General Forgings, Air Furnace Castings, Sugar Mill Machinery, and Cut Nails.

Specifications of Reading Genuine Wrought Iron Standard Welded Pipe.

The following specification embodies Reading mill practice which insures Reading Standard.

(1) **Material**—Lapweld and butt weld pipe are to be made of guaranteed quality genuine wrought iron made from No. 1 gray forge pig iron by the process of puddling, and no scrap or cuttings except crop ends from the sheet or crop ends of the pipe itself shall be used in the manufacture. The use of steel scrap will not be permitted to enter into any part of the process of manufacture of the iron.

(2) **Process of Manufacture**—All pipe must be made either by the lapweld or butt weld process. Sizes $1\frac{1}{2}$ in. and smaller, standard and special sizes, are butt weld. All 2 in. and larger standard and special sizes, are made lapweld. $1\frac{1}{4}$ and $1\frac{1}{2}$ in. are made lapweld when specified. All in accordance with the best methods and practice.

(3) **Surface Inspection**—All pipe must be reasonably straight and free from blisters, cracks, or other injurious defects. Liquor marks incidental to manufacture of the pipe will not be considered as surface defects. The pipe shall not vary more than 1% either way from being perfectly round or true to size, outside diameter, except on the small sizes where a variation of $\frac{1}{8}$ in. will be accepted. The pipe must not vary more than $2\frac{1}{2}\%$ below or 5% above standard weight.

(4) **Threading and Reaming**—All pipe must have a good Briggs' standard thread which will make a tight joint when tested by hydrostatic pressure at mill (see Tests). The thread must not vary more than one and one-half turns either way when tested with a Pratt & Whitney standard gauge.

(5) **Internal Pressure Test**—The following hydrostatic test pressures must be applied to the respective sizes of standard butt weld and lapweld pipe as indicated in table following:

NOMINAL SIZE	METHOD OF MANUFACTURE	TEST PRESSURE, LBS.
$\frac{1}{8}$ to $1\frac{1}{2}$ in., inclusive	Butt weld	750
$1\frac{1}{2}$ to 8 in.	Lapweld	1000
9 and 10 in.	Lapweld	900
11 and 12 in.	Lapweld	800
13 and 14 in.	Lapweld	700
15 in. outside diameter	Lapweld	600
17, 18, and 20 in. outside diameter	Lapweld	550

All specials, or weights, other than standards, to be tested specially.

(6) **Testing of Materials**—The iron from which the pipe is made must show the following physical properties:

Tensile strength.....	45,000 to 55,000 lbs.
Elastic limit.....	25,000 to 35,000 lbs.
Elongation, 8 in.....	12% to 25%
Reduction of area.....	17% to 25%

(7) **Couplings**—The material is to be made from No. 1 gray forge pig iron by the process of puddling, and no scrap or cuttings, except crop ends from the sheet or crop ends from the pipe itself, shall be used in the manufacture. The material must be sound and free from injurious defects for standard pipe couplings. Threads must be clean cut, tapped straight through, and of such pitch diameter as will make tight joint; the ends must be countersunk. Couplings for oil country goods must be made from double refined wrought iron. All standard pipe couplings larger than 4 in., and all oil country couplings must be full taper-tapped on each end, faced and recessed.

(8) **Thread Protection**—Full length tapped rings or split couplings must be provided as thread protectors on all sizes 4 in. in diameter or larger. Protectors must be provided for small sizes when specifically called for on order. On all oil country goods, the threads must be protected with heavy rings or split couplings.

(9) **Tests**—All tests shall be made at the mill.



FACSIMILE OF READING PIPE

Every piece of Reading Genuine Wrought Iron Pipe has the word READING rolled in the iron as shown on above illustration, except redrawn pipe, which has the letters depressed

Guarantee.

This company guarantees that all Reading Wrought Iron Pipe is made strictly from puddled pig iron without the admixture of any foreign scrap, and that each individual length has passed the required testing and is full weight with a variation of not more than $2\frac{1}{2}\%$ below card weight.

Fabricating Qualities.

In the installation of a piping system, the consumer, plumber, or heating contractor must consider not only the initial cost of the materials but also time and labor. The last item is very important owing to the almost daily increasing labor charges. The softness of the metal, its toughness and freedom from hard spots, as well as reliable welds, not only make Reading Wrought Iron Pipe easy to cut, but save time and tools. In threading, clean, unbroken threads are easily obtained, insuring permanently tight, leakproof joints.

Galvanizing.

Reading Wrought Iron Pipe is galvanized only by the superior hot metal process—only the highest grade of prime western spelter being used.

The purchaser obtains in galvanized Reading Pipe a base metal having an average life at least twice as long as that of steel and in addition a coating that is far more enduring, because the spelter will stick better to the rougher surface of wrought iron and in thicker layers.

Wrought Iron and Steel Compared.

Many claims have been advanced in an effort to prove that steel pipe is the equal of wrought iron pipe, in spite of the unquestionable proof to the contrary offered by countless instances of actual service under identical conditions.

The claims that are made by the exponents of steel pipe may be stated briefly as follows:

(First) Greater strength of steel pipe. Answered by paragraph A.

(Second) That steel is homogeneous while wrought iron is heterogeneous. Answered by paragraph B.

(Third) That wrought iron pipe is as distinctly crystalline as steel and that the fibrous structure attributed to the former is mythical. Answered by paragraph C.

(Fourth) That the slag contained in wrought iron acts as an accelerator of corrosion rather than a protector. Answered by paragraph D.

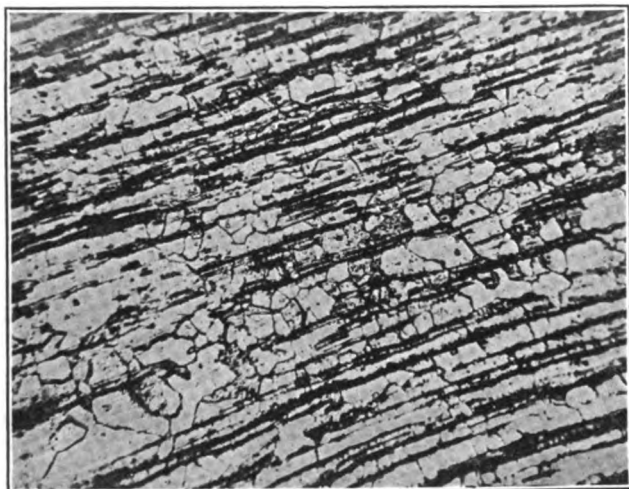
A moment's thoughtful reflection will show that all these claims are apparently quite technical in character. However, they are not only illogical but can easily be refuted in language and terms that can be easily understood by all.

(A) Wrought iron pipe has been used for over 100 years for every purpose where resistance to corrosion has been the principal factor, and in each case experi-

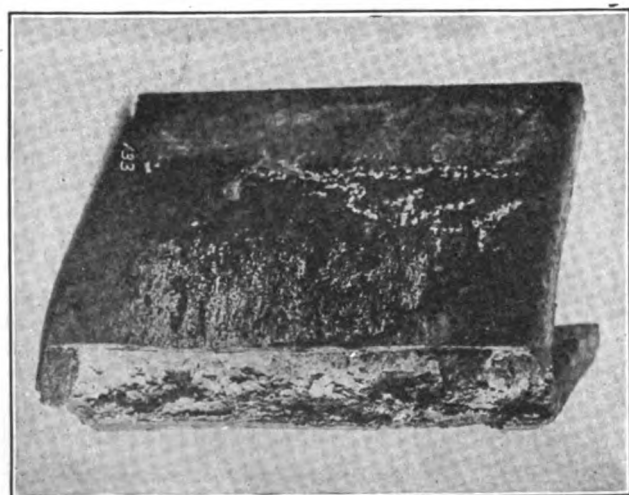
ence has shown that it has considerably more strength than is required to meet the severest demands of such service. Wrought iron has an ultimate tensile strength of 50,000 lbs. per sq. in. and an elongation of 25%. Hence, there is no logical reason for using steel solely on the basis of excess strength for which there is no need and so sacrifice the most vital properties of resistance to corrosion and greater resistance to fatigue.

(B) By homogeneity in metals is meant uniformity or sameness within the metallic matrix or portion of any metal. With this definition in mind, despite any statements to the contrary, it is easily seen that wrought iron is homogeneous and steel is not, for, whereas steel has two distinct metallic constituents, ferrite (carbonless iron) and pearlite (iron containing carbon), wrought iron has but one—ferrite, and even that is far purer in wrought iron than in steel owing to the absence of manganese, which is an accelerator of corrosion.

It may be stated that wrought iron does not display the tendency to segregate which characterizes steel. Made in units of about 1200 lbs. and worked continually until it passes to the solid state, wrought iron can not segregate. Steel, on the other hand, is produced in large units of 50 to 200 tons, and therefore does not



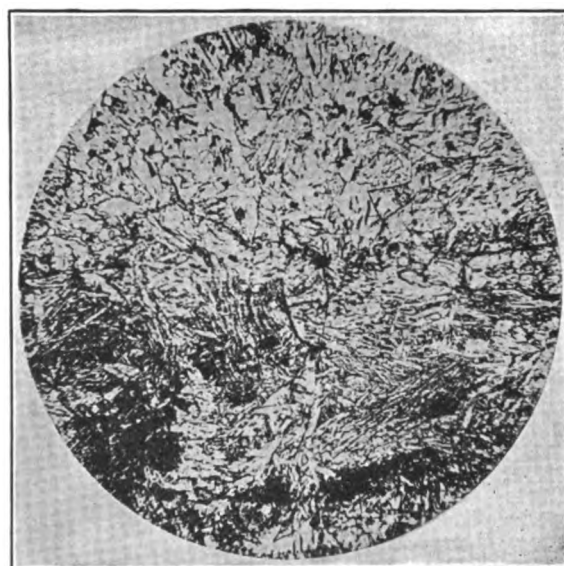
Microphotograph No. 1. Magnified 100 Diameters



Fractured Muck Bar Showing Fibrous Structure of Wrought Iron



Microphotograph No. 4. Magnified 100 Diameters



Microphotograph No. 5. Magnified 50 Diameters

ILLUSTRATING THE STRUCTURE OF WROUGHT IRON PIPE AS COMPARED WITH THE STRUCTURE OF STEEL PIPE
The structure of steel as shown in microphotographs 4 and 5 consists of a solid or uninterrupted mass of metallic grains composed of grains of ferrite (carbonless iron) and pearlite (iron containing carbon). The ferrite are the light grains and the pearlite are the dark ones. The metallic portion of wrought iron (microphotograph 1) consists entirely of grains of ferrite of much greater purity than the ferrite in steel and, in comparison with steel, is conspicuous by its freedom from pearlite

offer the same ease of control. Moreover, the liquid steel is allowed to cool undisturbed, and naturally tends to reject its impurities in unequal proportions toward the center of the solidified mass. This condition is common to all grades of steel including pipe and boiler tube steel. It must be remembered that slag is associated only mechanically with the metallic portion of wrought iron and since it is only the metallic portion of any metal which is subject to corrosion, it is apparent that the only portion of wrought iron which should be considered on the basis of homogeneity would be the metallic portion itself. In view of the absence of segregation in wrought iron and the fact that it is made up of but one metallic constituent, while steel has two constituents which are effected by this tendency to segregate, it will be evident to any fair-minded critic that the term homogeneity should be applied to wrought iron and heterogeneity to steel.

(C) Since the slag is distributed in fibers throughout the metallic matrix, thus dividing the grains into numerous clusters, this slag necessarily imparts its own characteristics to the wrought iron as a whole, and makes it decidedly fibrous. Steel has no such slag and therefore remains crystalline.

(D) If slag acts as an accelerator of corrosion rather than a protector, then the 1½% to 2% of slag contained in wrought iron should cause its rapid destruction. At least, it should corrode much faster than steel, which contains no slag at all. In other words, wrought iron could in no single instance outlast steel if

DATA, READING X STRONG AND XX STRONG GENUINE WROUGHT IRON PIPE

Size, in.	List price per ft.	Diameters, in.		Thickness, in.	Weight per ft., plain ends, lbs.	Hydro- static test, lbs.	
		External	Internal				
EXTRA STRONG, BLACK AND GALVANIZED							
Buttweld	1/8	\$0.12	.405	.210	.098	.314	750
	1/4	.07 1/2	.540	.295	.122	.535	750
	3/8	.07 1/2	.675	.417	.129	.738	750
	1/2	.11	.840	.539	.151	1.087	750
	3/4	.15	1.050	.735	.157	1.473	750
	1	.22	1.315	.949	.183	2.171	750
	1 1/4	.30	1.660	1.269	.195	2.996	1500
1 1/2	.36 1/2	1.900	1.491	.204	3.631	1500	
Lapweld	1 1/2	.36 1/2	1.900	1.491	.204	3.631	2500
	2	.50 1/2	2.375	1.929	.223	5.022	2500
	2 1/2	.77	2.875	2.311	.282	7.661	2000
	3	1.03	3.500	2.887	.306	10.252	2000
	3 1/2	1.25	4.000	3.350	.325	12.505	2000
	4	1.50	4.500	3.811	.344	14.983	2000
	4 1/2	1.80	5.000	4.275	.363	17.611	1800
	5	2.08	5.563	4.797	.383	20.778	1800
	6	2.86	6.625	5.743	.441	28.573	1800
	7	3.81	7.625	6.603	.511	38.048	1500
	8	4.34	8.625	7.604	.510	43.388	1500
	9	4.90	9.625	8.604	.510	48.728	1500
10	5.48	10.750	9.729	.510	54.735	1200	
11	6.10	11.750	10.729	.510	60.075	1100	
12	6.55	12.750	11.729	.510	65.415	1100	
DOUBLE EXTRA STRONG, BLACK AND GALVANIZED							
1/8	\$0.32	.840	.226	.307	1.714	750	
1/4	.35	1.050	.413	.318	2.440	750	
1	.37	1.315	.576	.369	3.659	750	
1 1/4	.52 1/2	1.660	.874	.393	5.214	2200	
1 1/2	.65	1.900	1.078	.411	6.408	2200	
2	.91	2.375	1.480	.447	9.029	3000	
2 1/2	1.37	2.875	1.742	.567	13.695	3000	
3	1.86	3.500	2.270	.615	18.583	3000	
3 1/2	2.30	4.000	2.697	.651	22.850	2500	
4	2.76	4.500	3.119	.690	27.541	2500	
4 1/2	3.26	5.000	3.546	.727	32.530	2000	
5	3.86	5.563	4.028	.768	38.552	2000	
6	5.32	6.625	4.857	.884	53.160	2000	
7	6.35	7.625	5.835	.895	63.079	2000	
8	7.25	8.625	6.835	.895	72.424	2000	

Extra strong and double extra strong pipe will be shipped in random length and with plain ends unless otherwise ordered.

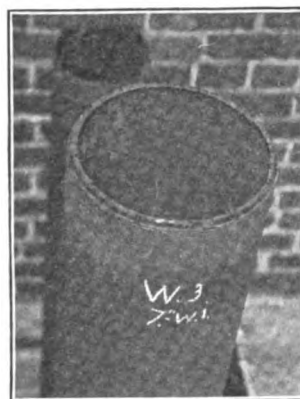
All weights and dimensions are nominal.

Random lengths extra strong and double extra strong pipe are considered to be 12 to 20 ft.

If fitted with threads and couplings, an extra charge will be made above regular. When extra strong and double extra strong pipe is ordered with threads and couplings, regular line pipe couplings will be furnished, unless otherwise specified.

For cut lengths, an extra charge will be made above random lengths. For galvanized or tar coated pipe, an extra charge will be made above black.

All Double X Strong Pipe made from a solid sheet—not telescoped.



Front Pipe is Black Wrought Iron, Installed 1907; Good as New. Rear Pipe is Black Steel, Installed 1907; Sealing Badly and About 50% Gone



Black Steel Pipe Installed 1907; Sealing Badly and About 75% Gone

UNRETOUCHED ILLUSTRATIONS OF VENT PIPES ON JOHN WANAMAKER STORE, PHILADELPHIA, PA.
Photos taken during 1920

there were a single atom of truth in the statement that slag accelerates corrosion.

Thus, in view of the unique reputation enjoyed by wrought iron in regard to its well-known resistance to corrosion, and the evident fallacy of the statement claiming that slag accelerates corrosion, it is apparent that again it must be admitted that theory does not in this case square with facts and practice. The real fact, which practice proves in this case, is that slag must be virtually a non-conductor of electricity and therefore can in no way aid in setting up electrolysis and so destroy wrought iron by corrosion.

DATA, READING STANDARD GENUINE WROUGHT IRON PIPE BLACK AND GALVANIZED

Size, in.	List price per ft.	Diameters, in.		Thick- ness, in.	Weight per ft. lbs.		Thds per in.	Lgth. of thread, in.	Taper per foot, in.	Hydro- static test, lbs.	
		Ex- ternal	In- ternal		Plain ends	Thds. and couplings					
Buttweld	$\frac{1}{8}$	\$0.05 $\frac{1}{2}$	.405	.266	.070	.244	.245	27	$\frac{1}{2}$	$\frac{3}{4}$	750
	$\frac{1}{4}$	.06	.540	.360	.090	.424	.425	18	$\frac{1}{2}$	$\frac{3}{4}$	750
	$\frac{3}{8}$	.06	.675	.489	.093	.567	.568	18	$\frac{1}{2}$	$\frac{3}{4}$	750
	$\frac{1}{2}$	.08 $\frac{1}{2}$	.840	.617	.111	.850	.852	14	$\frac{1}{2}$	$\frac{3}{4}$	750
	$\frac{3}{4}$	.11 $\frac{1}{2}$	1.050	.819	.115	1.130	1.134	14	$\frac{1}{2}$	$\frac{3}{4}$	750
	1	.17	1.315	1.043	.136	1.678	1.684	11 $\frac{1}{2}$	1	$\frac{3}{4}$	750
	1 $\frac{1}{4}$	.23	1.660	1.374	.143	2.272	2.281	11 $\frac{1}{2}$	1	$\frac{3}{4}$	750
	1 $\frac{1}{2}$	.27 $\frac{1}{2}$	1.900	1.604	.148	2.717	2.731	11 $\frac{1}{2}$	1	$\frac{3}{4}$	750
Lapweld	1 $\frac{1}{2}$	.27 $\frac{1}{2}$	1.900	1.604	.148	2.717	2.731	11 $\frac{1}{2}$	1	$\frac{3}{4}$	1000
	2	.37	2.375	2.060	.158	3.652	3.678	11 $\frac{1}{2}$	1	$\frac{3}{4}$	1000
	2 $\frac{1}{2}$	.58 $\frac{1}{2}$	2.875	2.460	.208	5.793	5.819	8	1 $\frac{1}{2}$	$\frac{3}{4}$	1000
	3	.76 $\frac{1}{2}$	3.500	3.059	.221	7.575	7.616	8	1 $\frac{1}{2}$	$\frac{3}{4}$	1000
	3 $\frac{1}{2}$	.92	4.000	3.538	.231	9.109	9.202	8	1 $\frac{1}{2}$	$\frac{3}{4}$	1000
	4	1.09	4.500	4.016	.242	10.790	10.889	8	1 $\frac{1}{2}$	$\frac{3}{4}$	1000
	4 $\frac{1}{2}$	1.27	5.000	4.496	.252	12.538	12.642	8	1 $\frac{1}{2}$	$\frac{3}{4}$	1000
	5	1.48	5.563	5.036	.263	14.617	14.810	8	1 $\frac{1}{2}$	$\frac{3}{4}$	1000
	6	1.92	6.625	6.053	.286	18.974	19.185	8	1 $\frac{1}{2}$	$\frac{3}{4}$	1000
	7	2.38	7.625	7.010	.307	23.544	23.769	8	1 $\frac{1}{2}$	$\frac{3}{4}$	1000
	8	2.50	8.625	8.059	.283	24.696	25.000	8	1 $\frac{1}{2}$	$\frac{3}{4}$	800
	8	2.88	8.625	8.067	.329	28.554	28.809	8	1 $\frac{1}{2}$	$\frac{3}{4}$	1000
	9	3.45	9.625	8.927	.349	33.907	34.188	8	2 $\frac{1}{2}$	$\frac{3}{4}$	900
	10	3.20	10.750	10.181	.284	31.201	32.000	8	2 $\frac{1}{2}$	$\frac{3}{4}$	600
	10	3.50	10.750	10.124	.313	34.240	35.060	8	2 $\frac{1}{2}$	$\frac{3}{4}$	800
11	4.12	10.750	10.005	.372	40.483	41.132	8	2 $\frac{1}{2}$	$\frac{3}{4}$	900	
11	4.63	11.750	10.985	.382	45.557	46.247	8	2 $\frac{1}{2}$	$\frac{3}{4}$	800	
12	4.50	12.750	12.077	.336	43.773	45.000	8	2 $\frac{1}{2}$	$\frac{3}{4}$	600	
12	5.07	12.750	11.985	.382	49.562	50.706	8	2 $\frac{1}{2}$	$\frac{3}{4}$	800	
13	5.60	14.000	13.250	.375	53.510	55.824	8	3	$\frac{3}{4}$	700	
14	6.10	15.000	14.250	.375	57.437	60.375	8	3	$\frac{3}{4}$	700	
15	6.50	16.000	15.250	.375	61.364	64.500	8	3	$\frac{3}{4}$	600	

All sizes 2 in. and larger are lapwelded. 1 1/2 in. is furnished lapweld when specially ordered.

Furnished with threads and couplings and in random lengths unless otherwise ordered.

All weights and dimensions are nominal.

Weight per foot of pipe with threads and couplings is based on a length of 20 ft., including the coupling, but shipping lengths of small sizes will usually average less than 20 ft.

Permissible variation in weight is 2 1/2% below and 5% above weights given in tables.

All weights are figured on the basis of 1 cu. in. of wrought iron weighing .2778 lb.

All pipe threaded to Briggs' standard gauges as made by Pratt & Whitney Co., Hartford, Conn.

For cut lengths, an extra charge will be made above random lengths.

For pipe smoothed on the inside (known as plugged and reamed) an extra charge will be made above standard pipe.

For galvanized or coated pipe an extra charge will be made above black.

When ordering sizes 8 to 12 in., please state weight of pipe wanted.

THE YOUNGSTOWN SHEET & TUBE COMPANY

GENERAL OFFICES AND WORKS
YOUNGSTOWN, OHIO

SALES OFFICES

NEW YORK, N. Y., 30 Church Street
PHILADELPHIA, PA., 1615 Pennsylvania Building
ATLANTA, GA., 1514 Healy Building
PITTSBURGH, PA., 1626 Oliver Building
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CLEVELAND, OHIO, Leader-News Building
BOSTON, MASS., 120 Franklin Street

DENVER, COLO., First National Bank Building
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DALLAS, TEX., Dallas County State Bank Building
SEATTLE, WASH., Central Building
ST. LOUIS, MO., Third National Bank Building
DETROIT, MICH., Dime Savings Bank Building

EXPORT SALES AGENT: CONSOLIDATED STEEL CORPORATION, 165 Broadway, NEW YORK, N. Y.

Products.

"YOUNGSTOWN" STEAM, GAS and WATER PIPE: "YOUNGSTOWN" STEEL, $\frac{1}{8}$ -in. up to and including 20-in. outside diameter; "YOUNGSTOWN" STAR BRAND IRON (Genuine Wrought Iron), $\frac{3}{8}$ -in. up to and including 12-in. nominal inside diameter, black and galvanized; EXTRA STRONG and DOUBLE EXTRA STRONG "YOUNGSTOWN" STEEL and "YOUNGSTOWN STAR BRAND" IRON PIPE, which includes:

Line Pipe for oil and gas, fitted with recessed extra heavy taper sockets; Tubing and Drive Pipe; Rotary Drill Pipe; Casing; Screw and Socket and Inserted Joint.

Dry-kiln Pipe; Signal Pipe; Ammonia Pipe; and pipe for various other purposes, such as Pipe Water Lines fitted with flanges, etc.; Asphalted Pipe.

ELECTRICAL CONDUITS, "BUCKEYE" RIGID, Galvanized and Enameled; "REALFLEX" FLEXIBLE STEEL ARMORED CABLES.

Also, Pig Iron; Bessemer and Open Hearth Steel Billets, Slabs and Sheet Bar; Puddled Iron Muck Bar; Double Refined Puddled Iron Sheet Bars; Iron and Steel Plates and Skelp.

Bars and Shapes: Rounds and squares, $\frac{1}{4}$ in. to 2 in.; flats up to $4\frac{1}{2}$ in. wide; angles up to 3 in. wide.

"Youngstown" Sheared Plates, $\frac{1}{8}$ in. to 1 in. thick, maximum width 72 in.

"Youngstown" Iron and Steel Sheets, black and "New Process" galvanized.

"Youngstown" Iron and Steel Roofing, painted and "New Process" galvanized (corrugated, V-crimp, roll and standing seam).

Barbed Wire, painted and galvanized; Wire Rods; Plain Wire, black and galvanized; Wire Nails, Staples and Hoops; "Youngstown" and "Buckeye" Woven Wire Field Fence.

"Youngstown" Pipe.

Half a million tons of tubular products are made by us each year. This includes both "Youngstown" steel and "Youngstown Star Brand" genuine hand puddled iron pipe, both of which meet every demand of architect and engineer for high grade tubular products.

"Youngstown" pipe is made with either standard English or standard American threads, as may be ordered.

All couplings furnished with "Youngstown" steel pipe are forged from genuine wrought iron, which insures easier installation and tighter joints than where steel couplings are used.

Specifications for "Youngstown" Steel Pipe.

For the convenience of architects and engineers the following specifications for steel pipe are submitted:

Material—All "Youngstown" steel pipe shall be made of soft weldable steel of uniformly good quality. This steel to be particularly adaptable to the requirements for wrought pipe,

and sufficient crop shall be cut from the top of each ingot to secure solid metal in the skelp.

Properties—The steel from which the pipe is made shall have approximately the following physical properties:

Tensile strength, not less than 50,000 lbs.
Elastic limit, not less than one-half tensile.
Elongation in 8 in., not less than 20%.
Reduction in area, not less than 50%.

Test Specimens—Test specimens for determining physical properties shall be cut from skelp or finished pipe.

Crushing Test—When required, cross sections cut from any pipe shall stand crushing down until the inside walls are three times the thickness of the wall from each other without showing cracks on the outside of the bend; except that, in the case of butt-welded pipe, any fracture at the weld must give evidence of having been firmly welded.

Bend Test—When required, a test specimen cut lengthwise from skelp or finished pipe and filed smooth on the edges shall bend through an angle of 180°, with an inner diameter equal to the thickness of the material, without fracture.

Hydrostatic Test—All sizes shall be tested at mill to an internal pressure, as shown in the following table:

$\frac{1}{8}$ to 2 in., butt-weld, 700 lbs.
2½ and 3 in., butt-weld, 800 lbs.
Up to 8 in., lap-weld, 1000 lbs.
9 and 10 in., lap-weld, 900 lbs.
11 and 12 in., lap-weld, 800 lbs.

On the 8-in., 10-in. and 12-in. sizes, which have more than one weight as standard, we have shown the test pressure for the heaviest weight.

Lengths—Unless otherwise specified, standard pipe will be furnished in random lengths with threads and couplings; extra strong pipe will be furnished plain ends.

Threading—Pipe and couplings shall be threaded and tapped according to Briggs' Standard. Thread must be a good commercial thread and must not leak under the specified pressure (paragraph 5). The thread must not vary more than one and one-half turns, either way, when tested with a Pratt and Whitney Briggs' Standard Gauge. All burrs at the ends shall be removed.

Couplings—Chamfered or slightly beveled couplings will be furnished on all steam pipe, and shall be of soft puddled iron, thoroughly welded and free from all blisters, pits or other defects that would break the continuity of the thread.

Tolerance—The pipe shall not vary more than 1% either way from being perfectly round and true to the standard outside diameter, and shall not vary more than 5% either way from weight as listed.

Tests—All tests shall be made at the mill.

Marking of Steel Pipe.

"Youngstown" steel pipe is distinguished by the word "Youngstown" in raised letters on every length of pipe. See illustration.



"YOUNGSTOWN" STEEL PIPE

"Youngstown Star Brand" Pipe.

We manufacture pipe in all standard sizes up to

Continued on next page

and including 12 in. outside diameter, from genuine, hand puddled wrought iron, produced in our puddle furnaces. This is an honestly made, full weight product that will give satisfaction. It is known as "Youngstown Star Brand" iron pipe.

Marking—All "Youngstown Star Brand" iron pipe is marked with the word "Youngstown" in raised letters followed by a star. In butt-weld sizes the star is rolled in the iron; in lap-weld sizes it is stencilled on the pipe.

"Realflex" Armored Cable.

"Realflex" armored electrical cable has attained extensive popularity through its excellent features, a number of which are due to its peculiar construction. It is armored with hot galvanized steel wire, so wound that it forms a very flexible shell which gives about the same protection as solid steel of the same thickness. "Realflex" is rustproof, ratproof, and practically nail-proof. It is extremely flexible and is for that reason particularly useful for wiring old buildings, machinery, and in all places where rigid conduit can not be used to advantage. It makes a handsome job and does not become disfigured with rust under ordinary conditions.

"Realflex" is made in a number of sizes and with a varying number of conducting wires, as may be required for different uses. It is also furnished with lead lining for use under conditions subjecting it to acids, etc. It fits standard connections.

"Buckeye" Conduit.

"Buckeye" electrical conduit is made from special mild steel tubing furnished by our tube mills for this particular purpose. Every operation in finishing into conduit is performed with scrupulous care, special attention being given to the accuracy and preservation in good condition of its threads.

"Buckeye" conduit is furnished in all standard sizes up to and including 6-in. diameter, and in two finishes—black enamel and electro-galvanized. Both finishes meet the severest tests satisfactorily. All "Buckeye" conduit is regularly inspected and certified by the Underwriters' Laboratories, Inc. "Buckeye" conduit is distinctly a quality product and the most widely used rigid steel conduit in America.



"BUCKEYE" CONDUIT

Youngstown Products are Standard.

All "Youngstown" products are made to standard specifications, but they can be furnished to meet special requirements within reasonable limits at the desire of customers.

Information.

We will be glad to furnish further information concerning our products on application direct, or through our sales offices listed above.

"YOUNGSTOWN" STEEL AND "YOUNGSTOWN STAR BRAND" IRON PIPE

FULL STANDARD WEIGHT—BLACK AND GALVANIZED All Weights and Dimensions Are Nominal

Size, in.	List price per foot	Diameters, in.		Thickness, in.	Weight per foot, lbs.		Threads per in.
		External	Internal		Plain ends	Threads and couplings	
1/4	\$.05 1/4	.405	.269	.068	.244	.245	27
1/2	.06	.540	.364	.088	.424	.425	18
3/4	.06	.675	.493	.091	.567	.568	18
1	.08 1/4	.840	.622	.109	.850	.852	14
1 1/4	.11 1/4	1.050	.824	.113	1.130	1.134	14
1 1/2	.17	1.315	1.049	.133	1.678	1.684	11 1/2
2	.23	1.660	1.380	.140	2.272	2.281	11 1/2
2 1/2	.27 1/4	1.900	1.610	.145	2.717	2.731	11 1/2
3	.37	2.375	2.067	.154	3.652	3.678	11 1/2
3 1/2	.58 1/4	2.875	2.469	.203	5.793	5.819	8
4	.76 1/4	3.500	3.068	.216	7.575	7.616	8
4 1/2	.92	4.000	3.548	.226	9.109	9.202	8
5	1.09	4.500	4.026	.237	10.790	10.889	8
5 1/2	1.27	5.000	4.506	.247	12.538	12.642	8
6	1.48	5.563	5.047	.258	14.617	14.810	8
6 1/2	1.92	6.625	6.065	.280	18.974	19.185	8
7	2.38	7.625	7.023	.301	23.544	23.769	8
8	2.50	8.625	8.071	.327	24.696	25.000	8
8 1/2	2.88	8.625	7.981	.322	28.554	28.809	8
9	3.45	9.625	8.941	.342	33.907	34.188	8
10	3.20	10.750	10.192	.279	31.201	32.000	8
10 1/2	3.50	10.750	10.136	.307	34.240	35.000	8
11	4.12	10.750	10.020	.365	40.483	41.132	8
11 1/2	4.63	11.750	11.000	.375	45.557	46.247	8
12	4.50	12.750	12.090	.330	43.773	45.000	8
12 1/2	5.07	12.750	12.000	.375	49.562	50.706	8
13	5.60	14.000	13.250	.375	54.568	55.824	8
14	6.10	15.000	14.250	.375	58.573	60.375	8
15	6.50	16.000	15.250	.375	62.579	64.500	8

The permissible variation in weight is 5% above and 5% below.
Furnished with threads and couplings and in random lengths unless otherwise ordered.

For cut lengths, an extra charge will be made above random lengths.
For pipe smoothed on the inside, known as reamed and drifted, an extra charge will be made above standard pipe.
For galvanized or coated pipe, an extra charge will be made above black.

EXTRA STRONG PIPE—BLACK AND GALVANIZED All Weights and Dimensions Are Nominal

Size, in.	List price per foot	Diameters, in.		Thickness, in.	Weight per foot, lbs. plain ends
		External	Internal		
1/4	\$.12	.405	.215	.095	.314
1/2	.07 1/4	.540	.302	.119	.535
3/4	.07 1/4	.675	.423	.126	.738
1	.11	.840	.546	.147	1.087
1 1/4	.15	1.050	.742	.154	1.473
1 1/2	.22	1.315	.957	.179	2.171
2	.30	1.660	1.278	.191	2.996
2 1/2	.36 1/4	1.900	1.500	.200	3.631
3	.50 1/4	2.375	1.939	.218	5.022
3 1/2	.77	2.875	2.323	.276	7.661
4	1.03	3.500	2.900	.300	10.252
4 1/2	1.25	4.000	3.364	.318	12.505
5	1.50	4.500	3.826	.337	14.983
5 1/2	1.80	5.000	4.290	.355	17.611
6	2.08	5.563	4.813	.375	20.778
6 1/2	2.86	6.625	5.761	.432	28.573
7	3.81	7.625	6.625	.500	38.048
8	4.34	8.625	7.625	.500	43.388
9	4.90	9.625	8.625	.500	48.728
10	5.48	10.750	9.750	.500	54.735
11	6.10	11.750	10.750	.500	60.075
12	6.55	12.750	11.750	.500	65.415

The permissible variation in weight is 5% above and 5% below.

DOUBLE EXTRA STRONG PIPE—BLACK AND GALVANIZED All Weights and Dimensions Are Nominal

Size, in.	List price per foot	Diameters, in.		Thickness, in.	Weight per foot, lbs. plain ends
		External	Internal		
1/4	\$.32	.840	.252	.294	1.714
1/2	.35	1.050	.434	.308	2.440
3/4	.37	1.315	.599	.358	3.659
1	.52 1/4	1.660	.896	.382	5.214
1 1/4	.65	1.900	1.100	.400	6.408
1 1/2	.91	2.375	1.503	.436	9.029
2	1.37	2.875	1.771	.552	13.695
2 1/2	1.86	3.500	2.300	.600	18.583
3	2.30	4.000	2.728	.636	22.850
3 1/2	2.76	4.500	3.152	.674	27.541
4	3.26	5.000	3.580	.710	32.530
4 1/2	3.86	5.563	4.063	.750	38.552
5	5.32	6.625	4.897	.864	53.160
6	6.35	7.625	5.875	.875	63.079
8	7.25	8.625	6.875	.875	72.424

The permissible variation in weight is 10% above and 10% below.

The following notes apply to both tables:

Furnished with plain ends and in random lengths, unless otherwise ordered.
Random length of extra strong and double extra strong pipe is considered to be 12 to 22 ft.; we to have the privilege, however, of supplying not exceeding 5% of total order in lengths of from 6 to 12 ft.
For pipe fitted with threads and couplings, an extra charge will be made above plain ends.

For cut lengths, an extra charge will be made above random.

For galvanized or coated pipe, an extra charge will be made above black.

ROBERTSON BROS. MFG. COMPANY

Lock-seam Pipe and Sheet Metal Products

TELEPHONE:
REPUBLIC 101

5401 South Western Boulevard
CHICAGO, ILL.

Products.

LOCK-SEAM SPIRAL PIPE, STRAIGHT LOCK-SEAM PIPE, ONE-PIECE BLOWPIPE ELBOWS (Patented), made of Black or Galvanized Sheet Steel.

Also manufacturers of Riveted Pipe, Ensilage Filler Pipe, Blowpipe, Sheet Metal Tubing, Steel Tanks, Smokestacks and Breechings, Elevator Legs.

Lock-seam Spiral Pipe.

Made from No. 10-U. S. standard and lighter gage sheet steel in any diameter from 6 to 24 in. inclusive.

This pipe is made from one continuous strip of sheet steel; is absolutely smooth inside, minutely true to diameter and perfectly round in section.



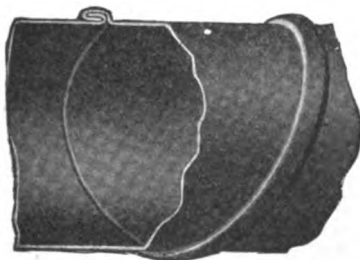
STANDARD UNIT, LOCK-SEAM SPIRAL PRESSURE PIPE

This pipe can be furnished in any length desired and is recommended for use in the following fields: water supply lines, dredging and sluicing, brine circu-



STANDARD UNIT, LOCK-SEAM SPIRAL PRESSURE PIPE WITH COMPANION FLANGES

lation, paper and pulp mill installation, exhaust steam, blow and blast pipe, filtration plants, cotton gin and grain elevator installations. This company is also furnishing a great deal of the pipe for by-products recovery.



SECTIONAL VIEW OF LOCK-SEAM

Straight Lock-seam Pipe.

Made for slip joint or light steel flange connections. This style pipe used for exhaust and blowing, ventilating, gravity, drainage, well casing and surface irrigation.

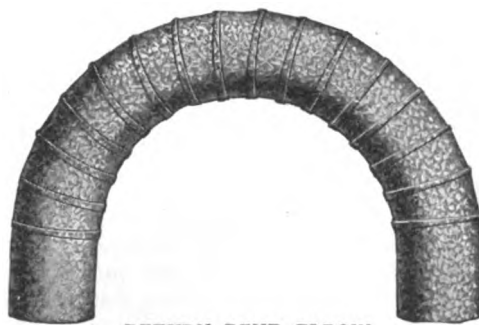
Standard lengths 10 ft. without cross seam; 20-ft. sections supplied at extra cost by joining two 10-ft. lengths. Made of No. 16-gage sheet steel and lighter.

To avoid damage to lock-seam through rough handling, a rivet is placed through seam at each end of pipe. This company's special seaming process does not disturb the galvanized coating. When pipe is used under pressure seams should be soldered.

One-piece Blowpipe Elbows (Patented).

Made of black or galvanized steel, No. 16-gage and lighter, and are machinemade.

In presenting these one-piece sheet metal elbows, this company wishes to emphasize that the close formed outside laps strengthen the elbows and give a *smooth interior finish*.



RETURN BEND ELBOW



45°



90°

ONE-PIECE BLOWPIPE ELBOWS

Catalogue.

Catalogue giving sizes, dimensions, and prices of the different products sent on request.



STRAIGHT LOCK-SEAM PIPE

UNITED STATES CAST IRON PIPE AND FOUNDRY CO.

GENERAL OFFICES

BURLINGTON, N. J.

SALES OFFICES

PHILADELPHIA, PA., Morris Building
NEW YORK, N. Y., 71 Broadway
PITTSBURGH, PA., Henry W. Oliver Building
CHICAGO, ILL., Peoples Gas Building
CLEVELAND, OHIO, 1150 East 22nd Street

DALLAS, TEX., Scollard Building

BIRMINGHAM, ALA., American Trust Building
ST. LOUIS, MO., Security Building
SAN FRANCISCO, CAL., Monadnock Building
MINNEAPOLIS, MINN., Plymouth Building
BUFFALO, N. Y., 957 East Ferry Street

Products.

CAST IRON BELL and SPIGOT and FLANGED PIPE for Water, Gas, Steam and Chemicals; FITTINGS; BAROMETRIC COUNTER-CURRENT CONDENSERS.

Also manufacturers of Flexible Joint Pipe for submerged lines; High Pressure Lug Pipe and Fittings for fire protection lines; Plain End and Threaded Cast Iron Pipe; Keystone Columns; Foundry Products including Tanks, Sluice Gates, Screw Piles, Coal Chutes and Bunkers, and large Castings for all purposes made to purchasers' designs.

Cast Iron Water Pipe.

Cast iron pipe has been used for the carrying of water for generations and is today considered the standard pipe for water. Cast iron water lines laid in 1664 are still in service. A cast iron line laid in this country in 1817 was disconnected after 98 years and then only because the demand for water exceeded its capacity.

Specifications for Cast Iron Water Pipe.

Following is an extract from the specifications of the American Water Works Association, adopted as our manufacturing standard for water pipe.

We are equipped to make standard pipe in all regular sizes from 2 to 84 in.

Description of Pipe—SECTION 1—The pipe shall be made with hub and spigot joints and shall accurately conform to the dimensions given in Tables Nos. 1 and 2. They shall be straight and shall be true circles in section, with their inner and outer surfaces concentric, and shall be of the specified dimensions in outside diameter. They shall be at least 12 ft. in length, exclusive of socket.

For pipe 4-in. to 12-in. inclusive, one class of special castings shall be furnished, made from Class D pattern. Those having spigot ends shall have outside diameters of spigot ends

midway between the two standards of outside diameter as shown by Table No. 1, and shall be tapered back for a distance of 6 in. For pipe from 14-in. to 24-in. inclusive, two classes of special castings shall be furnished: Class B special castings with Classes A and B pipe, and Class D special castings with Classes C and D pipe. For pipe 30-in. to 60-in. inclusive, four classes of special castings shall be furnished, one for each class of pipe.

Allowable Variation in Thickness—SECTION 3—For pipe whose standard thickness is less than 1 in., the thickness of metal in the body of the pipe shall not be more than .08 of an inch less than the standard thickness; and for pipe whose standard thickness is 1 in. or more, the variation shall not exceed .10 of an inch, except that for spaces not exceeding 8 in. in length in any direction, variations from the standard thickness of .02 in. in excess of the allowance above given shall be permitted. For special castings of standard patterns a variation of 50% greater than allowed for straight pipe shall be permitted.

Allowable Percentage of Variation in Weight—SECTION 7—No pipe shall be accepted the weight of which shall be less than the standard weight by more than 5% for pipe 16 in. or less in diameter, and 4% for pipe more than 16 in. in diameter, and no excess above the standard weight of more than the given percentage for the several sizes shall be paid for. The total weight to be paid for shall not exceed for each size and class of pipe received the sum of the standard weights of the same number of pieces of the given size and class by more than 2%. No special casting shall be accepted the weight of which shall be less than the standard weight by more than 10% for pipe 12 in. or less in diameter, and 8% for larger sizes, except that curves, Y-pieces and breeches pipe may be 12% below the standard weight, and no excess above the standard weight of more than the above percentages for the several sizes will be paid for. These variations apply only to castings made from the standard patterns.

Tests of Material—SECTION 9—Specimen bars of the metal used, each being 26 in. long by 2 in. wide and 1 in. thick, shall be made without charge as often as the engineer may direct; and in default of definite instructions, the contractor shall make and test at least 1 bar from each heat or run of metal. The bars when placed flatwise upon supports 24 in. apart, and loaded in the center, shall support a load of 2000 lbs. and show a deflection of not less than .30 of an inch before breaking; or if preferred, tensile bars shall be made which will show a breaking point of not less than 20,000 lbs. per sq. in.

TABLE NO. 2. STANDARD THICKNESS AND WEIGHTS OF BELL AND SPIGOT CAST IRON WATER PIPE.

Nominal inside diam., in.	CLASS A 100-ft. head 43 lbs. pressure			CLASS B 200-ft. head 86 lbs. pressure			CLASS C 300-ft. head 130 lbs. pressure			CLASS D 400-ft. head 173 lbs. pressure			Nominal inside diam., in.
	Thickness, in.	Weight, lbs. per		Thickness, in.	Weight, lbs. per		Thickness, in.	Weight, lbs. per		Thickness, in.	Weight, lbs. per		
		ft.	length		ft.	length		ft.	length		ft.	length	
4	.42	20.0	240	.45	21.7	260	.48	23.3	280	.52	25.0	300	4
6	.44	30.8	370	.48	33.3	400	.51	35.8	430	.55	38.3	460	6
8	.46	42.9	515	.51	47.5	570	.56	52.1	625	.60	55.8	670	8
10	.50	57.1	685	.57	63.8	765	.62	70.8	850	.68	76.7	920	10
12	.54	72.5	870	.62	82.1	985	.68	91.7	1100	.75	100.0	1200	12
14	.57	89.6	1075	.66	102.5	1230	.74	116.7	1400	.82	129.2	1550	14
16	.60	108.3	1300	.70	125.0	1500	.80	143.8	1725	.89	158.3	1900	16
18	.64	129.2	1550	.75	150.0	1800	.87	175.0	2100	.96	191.7	2300	18
20	.67	150.0	1800	.80	175.0	2100	.92	208.3	2500	1.03	229.2	2750	20
24	.76	204.2	2450	.89	233.3	2800	1.04	279.2	3350	1.16	306.7	3680	24
30	.88	291.7	3500	1.03	333.3	4000	1.20	400.0	4800	1.37	450.0	5400	30
36	.99	391.7	4700	1.15	454.2	5450	1.36	545.8	6550	1.58	625.0	7500	36
42	1.10	512.5	6150	1.28	591.7	7100	1.54	716.7	8600	1.78	825.0	9900	42
48	1.26	666.7	8000	1.42	750.0	9000	1.71	908.3	10900	1.96	1050.0	12600	48
54	1.35	800.0	9600	1.55	933.3	11200	1.90	1141.7	13700	2.23	1341.7	16100	54
60	1.39	916.7	11000	1.67	1104.2	13250	2.00	1341.7	16100	2.38	1583.3	19000	60
72	1.62	1281.9	15380	1.95	1547.3	18570	2.39	1904.3	22850	....	....	....	72
84	1.72	1635.8	19630	2.22	2104.1	25250	....	....	....	....	....	....	84

The above weights are per length to lay 12 ft., including standard sockets; proportionate allowance to be made for any variation.
Note—Table numbers throughout this presentation of pipe and fittings conform to those of general U. S. Catalogue.

Coating—SECTION 13—Every pipe and special casting shall be coated inside and out with coal tar pitch varnish. The varnish shall be made from coal tar. To this material sufficient oil shall be added to make a smooth coating, tough and tenacious when cold, and not brittle nor with any tendency to scale off.

Each casting shall be heated to a temperature of 300° Fahr. immediately before it is dipped, and shall possess not less than this temperature at the time it is put in vat. The ovens in which the pipe are heated shall be so arranged that all portions of the pipe shall be heated to an even temperature. Each casting shall remain in the bath at least 5 minutes.

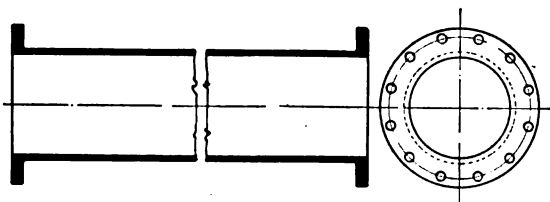
Hydrostatic Test—SECTION 14—When the coating has become hard, the straight pipe shall be subjected to a proof by hydrostatic pressure, and, if required by the engineer, they shall also be subjected to a hammer test under this pressure.

The pressure to which the different sizes and classes of pipe shall be subjected are as follows:

	20-in. diam. and larger, lbs. per sq. in.	Less than 20-in. diam., lbs. per sq. in.
Class A Pipe.	150	300
Class B Pipe.	200	300
Class C Pipe.	250	300
Class D Pipe.	300	300

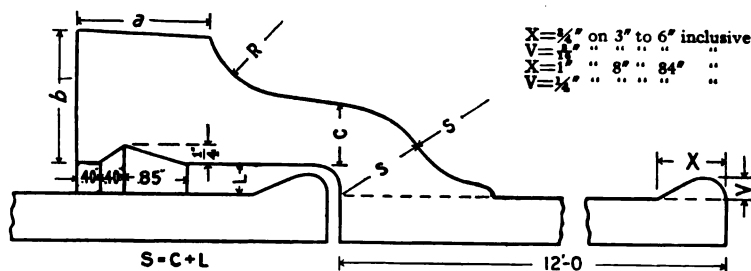
Flanged Pipe.

In recent years, the tightness and strength of the flanged joint have become of value for many special purposes. Flanged pipe is very generally used in power stations and similar buildings, where pipe lines are well supported. The dimensions of flanges, drilling, etc., adopted as standard for all flanged pipe except that for gas, are those recently adopted by the Committee of Manufacturers and the American Society of Mechanical Engineers, and known as the "American 1914 Standard."



STANDARD FLANGED PIPE FOR WATER

TABLE NO. 1. STANDARD DIMENSIONS OF BELL AND SPIGOT PIPE



Nominal inside diam., in.	Classes	Actual outside diam., in.	Diam. of sockets		Depth of sockets		A	B	C
			Pipe, in.	Special castings, in.	Pipe, in.	Special castings, in.			
4	A	4.80	5.60	5.70	3.50	4.00	1.5	1.30	.65
4	B-C-D	5.00	5.80	5.70	3.50	4.00	1.5	1.30	.65
6	A	6.90	7.70	7.80	3.50	4.00	1.5	1.40	.70
6	B-C-D	7.10	7.90	7.80	3.50	4.00	1.5	1.40	.70
8	A-B	9.05	9.85	10.00	4.00	4.00	1.5	1.50	.75
8	C-D	9.30	10.10	10.00	4.00	4.00	1.5	1.50	.75
10	A-B	11.10	11.90	12.10	4.00	4.00	1.5	1.50	.75
10	C-D	11.40	12.20	12.10	4.00	4.00	1.5	1.60	.80
12	A-B	13.20	14.00	14.20	4.00	4.00	1.5	1.60	.80
12	C-D	13.50	14.30	14.20	4.00	4.00	1.5	1.70	.85
14	A-B	15.30	16.10	16.10	4.00	4.00	1.5	1.70	.85
14	C-D	15.65	16.45	16.45	4.00	4.00	1.5	1.80	.90
16	A-B	17.40	18.40	18.40	4.00	4.00	1.75	1.80	.90
16	C-D	17.80	18.80	18.80	4.00	4.00	1.75	1.90	1.00
18	A-B	19.50	20.50	20.50	4.00	4.00	1.75	1.90	.95
18	C-D	19.92	20.92	20.92	4.00	4.00	1.75	2.10	1.05
20	A-B	21.60	22.60	22.60	4.00	4.00	1.75	2.00	1.00
20	C-D	22.06	23.06	23.06	4.00	4.00	1.75	2.30	1.15
24	A-B	25.80	26.80	26.80	4.00	4.00	2.00	2.10	1.05
24	C-D	26.32	27.32	27.32	4.00	4.00	2.00	2.50	1.25
30	A	31.74	32.74	32.74	4.50	4.50	2.00	2.30	1.15
30	B	32.00	33.00	33.00	4.50	4.50	2.00	2.30	1.15
30	C	32.40	33.40	33.40	4.50	4.50	2.00	2.60	1.32
30	D	32.74	33.74	33.74	4.50	4.50	2.00	3.00	1.50
36	A	37.96	38.96	38.96	4.50	4.50	2.00	2.50	1.25
36	B	38.30	39.30	39.30	4.50	4.50	2.00	2.80	1.40
36	C	38.70	39.70	39.70	4.50	4.50	2.00	3.10	1.60
36	D	39.16	40.16	40.16	4.50	4.50	2.00	3.40	1.80
42	A	44.20	45.20	45.20	5.00	5.00	2.00	2.80	1.40
42	B	44.50	45.50	45.50	5.00	5.00	2.00	3.00	1.50
42	C	45.10	46.10	46.10	5.00	5.00	2.00	3.40	1.75
42	D	45.58	46.58	46.58	5.00	5.00	2.00	3.80	1.95
48	A	50.50	51.50	51.50	5.00	5.00	2.00	3.00	1.50
48	B	50.80	51.80	51.80	5.00	5.00	2.00	3.30	1.65
48	C	51.40	52.40	52.40	5.00	5.00	2.00	3.80	1.95
48	D	51.98	52.98	52.98	5.00	5.00	2.00	4.20	2.20
54	A	56.66	57.66	57.66	5.50	5.50	2.25	3.20	1.60
54	B	57.10	58.10	58.10	5.50	5.50	2.25	3.60	1.80
54	C	57.80	58.80	58.80	5.50	5.50	2.25	4.00	2.15
54	D	58.40	59.40	59.40	5.50	5.50	2.25	4.40	2.45
60	A	62.80	63.80	63.80	5.50	5.50	2.25	3.40	1.70
60	B	63.40	64.40	64.40	5.50	5.50	2.25	3.70	1.90
60	C	64.20	65.20	65.20	5.50	5.50	2.25	4.20	2.25
60	D	64.82	65.82	65.82	5.50	5.50	2.25	4.70	2.60

TABLE NO. 33. STANDARD FLANGED WATER PIPE

Nominal diam., in.	Diam. flange, in.	Diam. bolt circle, in.	Number of bolts	Diam. bolts, in.	Thick-ness of flange, in.	CLASS A 100-ft. head 43 lbs. pressure			CLASS B 200-ft. head 86 lbs. pressure			CLASS C 300-ft. head 130 lbs. pressure			CLASS D 400-ft. head 173 lbs. pressure		
						Thick-ness, in.	Weight, lbs. per		Thick-ness, in.	Weight, lbs. per		Thick-ness, in.	Weight, lbs. per		Thick-ness, in.	Weight, lbs. per	
							ft.	length		ft.	length		ft.	length		ft.	length
3	7.50	6.00	4	5/8	.75	.39	13.0	169	6.4	.42	14.6	188	6.2	.45	15.5	198	6.2
4	9.00	7.50	8	5/8	.94	.42	18.0	238	11.1	.45	20.1	263	10.7	.48	21.3	277	10.7
6	11.00	9.50	8	3/4	1	.44	27.9	365	15.0	.48	31.1	402	14.4	.51	32.9	424	14.4
8	13.50	11.75	8	3/4	1.13	.46	38.7	511	23.1	.51	42.7	559	23.1	.56	48.0	620	22.0
10	16.00	14.25	12	7/8	1.19	.50	51.9	687	32.2	.57	58.8	770	32.2	.62	65.5	847	30.6
12	19.00	17.00	12	7/8	1.25	.54	67.0	899	47.7	.62	76.4	1012	47.7	.68	85.4	1116	45.6
14	21.00	18.75	12	1	1.38	.57	82.3	1104	58.1	.66	94.7	1253	58.1	.74	108.1	1407	55.1
16	23.50	21.25	16	1	1.44	.60	98.8	1332	73.2	.70	114.6	1522	73.2	.80	133.3	1738	69.1
18	25.00	22.75	16	1 1/4	1.56	.64	118.3	1576	78.1	.75	137.8	1810	78.1	.87	162.4	2094	72.8
20	27.50	25.00	20	1 1/4	1.69	.67	137.4	1848	99.8	.80	163.1	2157	99.8	.92	190.6	2473	92.9
24	32.00	29.50	20	1 1/2	1.88	.76	186.5	2512	137.2	.89	217.3	2882	137.2	1.04	257.6	3345	126.8
30	38.75	36.00	28	1 1/2	2.13	.88	266.1	3622	214.4	1.03	312.6	4166	207.2	1.20	366.9	4795	196.0
36	46.00	42.75	32	1 1/2	2.38	.99	358.7	4950	327.4	1.15	418.7	5654	314.8	1.36	497.7	6572	299.9
40	50.75	47.25	36	1 3/4	2.5	1.06	427.2	5940	406.6	1.23	497.0	6753	394.5	1.48	601.6	7965	372.7
42	53.00	49.50	36	1 3/4	2.63	1.10	464.6	6492	458.5	1.28	542.2	7395	444.2	1.54	657.4	8720	415.4
48	59.50	56.00	44	1 3/4	2.75	1.26	608.0	8408	555.9	1.42	687.2	9324	538.9	1.71	832.7	11001	504.4

Note—Flanges drilled to "American 1914 Standard" templates; send template if other drilling is required. Bolt holes drilled 1/8 in. larger than bolts. All dimensions in inches. Pipe made in 12-ft. lengths and faced 1/4 in. short for gaskets; special short lengths made to order. Above are neat finished weights. Allowance must be made for variation and finish. All weights are approximate.

TABLE NO. 80. STANDARD FLANGED FITTINGS, 125 LBS. WORKING PRESSURE

Size.....	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48
A-A, f. to f., in.	11	13	16	18	22	24	28	30	33	36	44	50	56	62	68
A. c. to f., in.	5½	6½	8	9	11	12	14	15	16½	18	22	25	28	31	34
B. c. to f., long rad. ells, in.	7½	9	11½	14	16½	19	21½	24	26½	29	34	41½	49	56½	64
C. c. to f., 45° ells, in.	3	4	5	5½	6½	7½	8	8½	9½	11	15	18	21	24	28
D. f. to f., laterals, in.	13	15	18	22	25½	30	33	36½	39	43	49½	59	68	78	88
E. c. to f., laterals, in.	10	12	14½	17½	20½	24½	27	30	32	35	40½	49	58	67	76
F. c. to f., laterals, in.	3	3	3½	4½	5	5½	6	6½	7	8	9	10	11	12	13
G. f. to f., reducers, in.	6	7	9	11	12	14	16	18	19	20	24	30	36	42	48
Diam. flanges, in.	7½	9	11	13½	16	19	21	23½	25	27½	32	38½	46	53	59½
Thickness, flanges, in.	¾	1	1	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½
Min. metal thick., body, in.	¾	1	1	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½
Bolt circle, in.	6	7½	9½	11½	14½	17	18½	21½	22½	25	29½	36	42½	49½	56
Number of bolts.	4	8	8	8	12	12	12	16	16	20	28	32	36	44	44
Size of bolts, in.	¾	¾	¾	¾	¾	¾	¾	1	1	1½	1½	1½	1½	1½	1½

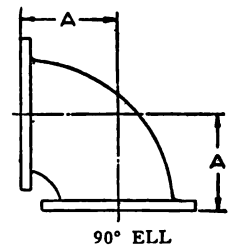
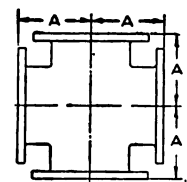
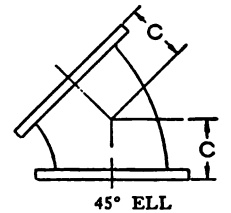


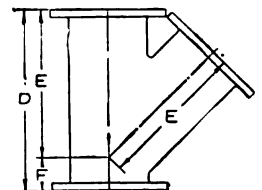
TABLE NO. 83. "EXTRA HEAVY" FLANGED FITTINGS, 250 LBS. WORKING PRESSURE

Size.....	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48
A-A, f. to f., in.	12	14	17	20	23	26	30	33	36	39	45	55	65	74	84
A. c. to f., in.	6	7	8½	10	11½	13	15	16½	18	19½	22½	27½	32½	37	42
B. c. to f., long rad. ells, in.	7½	9	11½	14	16½	19	21½	24	26½	29	34	41½	49	56½	64
C. c. to f., 45° ells, in.	3½	4½	5½	6	7	8	8½	9½	10	10½	12	15	18	21	24
D. f. to f., laterals, in.	14	16½	21½	25½	29½	33½	37½	42	45½	49	57½	68	79	90	101
E. c. to f., laterals, in.	3	3	4	5	5½	6	6½	7½	8	8½	10	11	12	13	14
F. c. to f., laterals, in.	11	13½	17½	20½	24	27½	31	34½	37½	40½	47½	57	67	77	87
G. f. to f., reducers, in.	6	7	9	11	12	14	16	18	19	20	24	30	36	42	48
Diam. flanges, in.	8½	10	12½	15	17½	20½	23	25½	28	30½	36	43	50	57	65
Thickness flanges, in.	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½
Min. metal thick., body, in.	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½
Bolt circle, in.	8	9½	11½	13½	15½	17½	20½	22½	24½	27	32	39½	46	52½	60½
Number of bolts.	8	8	12	12	16	16	20	20	24	24	28	32	36	40	44
Size of bolts, in.	¾	¾	¾	¾	¾	¾	1	1	1½	1½	1½	1½	1½	1½	1½



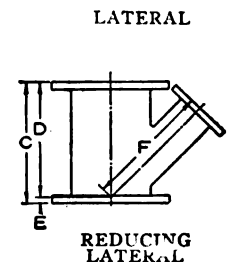
SHORT BODY PATTERN, REDUCING TEES AND CROSSES

TABLE NO. 81, 125 LBS. WORKING PRESSURE								TABLE NO. 84, 250 LBS. WORKING PRESSURE							
Size.....	18	20	24	30	36	42	48	18	20	24	30	36	42	48	
Size of outlet and smaller, in.	12	14	16	20	24	28	32	12	14	16	20	24	28	32	
A-A, f. to f., run, in.	26	28	30	36	40	46	52	28	31	34	41	47	53	58	
A. c. to f., run, in.	13	14	15	18	20	23	26	14	15½	17	20½	23½	26½	29	
B. c. to f., outlet, in.	15½	17	19	23	26	30	34	17	18½	21½	25½	29½	33½	37½	



SHORT BODY PATTERN, REDUCING LATERALS

TABLE NO. 82, 125 LBS. WORKING PRESSURE					TABLE NO. 85, 250 LBS. WORKING PRESSURE				
Size.....	18	20	24	30	18	20	24	30	36
Size of branch and smaller, in.	9	10	12	15	9	10	12	15	18
C. f. to f., run, in.	26	28	32	39	34	37	44	53	62
D. c. to f., run, in.	25	27	31½	39	31	34	41	49	57
E. c. to f., run, in.	1	1	0	0	3	3	3	3	3
F. c. to f., branch, in.	27½	29½	34½	42	32½	36	43	52	61

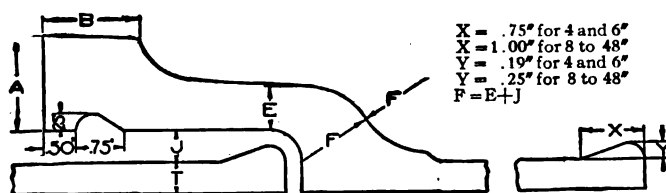


Note.—Larger and irregular sizes to order. Flange diameters and drillings same as for straight pipe. Bolt holes to be ¼ in. larger in diameter than bolts. Bolt holes to straddle center lines. Tees, crosses and laterals 16 in. and smaller reducing on the branch use the same dimensions as straight sizes of the larger opening. Sizes 18 in. and up reducing on the branch are made in two lengths depending on the size of the outlet.

Cast Iron Gas Pipe.

Cast iron gas pipe possesses a power of resistance against corrosion or other factors causing deterioration inherent in the material itself and not dependent solely upon addition of coatings or other artificial aids.

The specifications and tables adopted as standard by the American Gas Institute at their eighth annual meeting, which was held in Richmond, Va., in 1913, have been accepted as standard for gas pipe and specials.



DIMENSION DIAGRAM CAST IRON GAS PIPE

TABLE NO. 86. STANDARD BELL AND SPIGOT GAS PIPE

Nominal diam., in.	Thickness, in.	Diam. sockets, in.		Depth sockets, in.		Weight, lbs., per	
		Pipe	Special castings	Pipe	Special castings	Ft.	Length
4	.40	5.80	5.80	4.00	4.00	19.33	232
6	.43	7.90	7.90	4.00	4.00	30.25	363
8	.45	10.05	10.05	4.00	4.00	42.08	505
10	.49	12.10	12.10	4.00	4.00	55.91	671
12	.54	14.20	14.20	4.50	4.50	73.83	886
16	.62	18.40	18.40	4.50	4.50	112.58	1351
20	.68	22.85	22.85	4.50	4.50	153.83	1846
24	.76	27.05	27.05	5.00	5.00	206.41	2477
30	.85	32.99	32.99	5.00	5.00	284.00	3408
36	.95	39.21	39.21	5.00	5.00	379.25	4551
42	1.07	45.45	45.45	5.00	5.00	497.66	5972
48	1.26	51.75	51.75	5.00	5.00	663.50	7962

Barometric Condensers.

The patented features of our barometric condenser make it especially adaptable to evaporation processes where the absolute pressure in the evaporating chamber should be constant, and where the degree of vacuum should be maximum for the amount of cooling water consumed.

ESTABLISHED 1878

JAMES B. CLOW & SONSManufacturers of Cast Iron Pipe, Plumbing and Heating Supplies;
Cast Iron ColumnsTELEPHONE:
WABASH 2789534-546 South Franklin Street
CHICAGO, ILL.

SALES OFFICES

NEW YORK, N. Y.
ST. LOUIS, MO.MILWAUKEE, WIS.
PITTSBURGH, PA.DETROIT, MICH.
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WORKS

CHICAGO, ILL.

NEWCOMERSTOWN, OHIO

COSHOCTON, OHIO

Products.

PIPE and FITTINGS.

CLOW "GASTEAM" RADIATORS.

ULTRA-VIOLET RAY WATER STERILIZERS.

PLUMBING SUPPLIES, including DRINKING FOUNTAINS, AUTOMATIC WATER CLOSETS, LAVATORIES, SINKS, etc.

Also Cast Iron Columns, Bases and Caps.

In Chicago, JAMES B. CLOW & SONS carry a complete line of the following material:

Steam Supplies, including Steel and Wrought Iron Pipe; Cast Iron and Malleable Fittings; Low, Standard and Extra Heavy Valves with Screwed, Flanged, Hub and Spigot Connections—Straightway, Angle, Check, Flap, etc.

Water Works Supplies, including Cast Iron Bell and Spigot, Flanged and Threaded Pipe and Fittings, Lead, Oakum, Tools, etc.

They also manufacture in Chicago Marble Products for all purposes and all brass work for their plumbing business, including Faucets, Bibbs, Traps, Supplies, Showers, etc.

At their Ohio plants, which specialize on making cast iron pipe and fittings, a complete line of Cast Iron Specialties is also produced, including:

Manholes, Lamp Posts, Fountains; Special Castings for Coke Ovens, Filtration Plants, Sugar Refineries, Chemical Companies, Oil Refineries, etc.; Radiators, Boilers; Plumbing Specialties such as Bell Traps, Drum Traps, Gratings, etc.

Steel or Wrought Iron Threaded Pipe.

Can furnish random lengths of steel or wrought iron pipe in all standard sizes, either black or galvanized. Cut lengths to order.



STEEL OR WROUGHT IRON THREADED PIPE

Cast Iron Hub and Spigot Pipe.

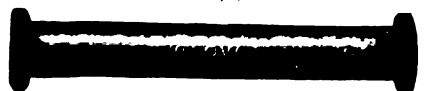
Carried in stock in sizes from 3 to 48 in. 12-ft. lengths are regular; shorter lengths will be cut to order. This pipe is made in all classes for all pressures.



CAST IRON HUB AND SPIGOT PIPE

Cast Iron Flanged Pipe.

Made in all sizes from 1¼ to 48 in. and in all classes



CAST IRON FLANGED PIPE

for all pressures. 12-ft. lengths are regular; shorter lengths will be cut to order.

Cast Iron Threaded Pipe.

This pipe is made in all sizes from 1¼ to 16 in., inclusive. It is threaded at both ends the same as steel or wrought iron pipe. 12-ft. lengths are regular.



CAST IRON THREADED PIPE

Cast Iron or Malleable Screwed Fittings.

A very large stock of screwed fittings in both cast iron and malleable iron, black or galvanized, straight and reducing.



CAST IRON AND MALLEABLE FITTINGS

Cast Iron Hub and Spigot Fittings.

Water and gas fittings are carried in stock in all sizes from 3 to 48 in., in straight and reducing sizes. Also cutting-in specials of all kinds.



CAST IRON HUB AND SPIGOT FITTINGS

Cast Iron Flanged Fittings.

A very large stock of flanged cast iron fittings in all standard sizes for low, standard and extra heavy pressures, both straight and reducing.



CAST IRON FLANGED FITTINGS

Cast Iron Threaded Fittings.

A complete line of cast iron threaded fittings for use with our threaded cast iron pipe. In both straight and reducing sizes.



CAST IRON THREADED FITTINGS

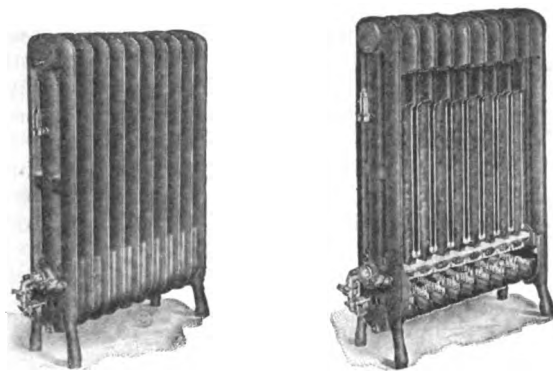
Stock of Pipe and Fittings.

All pipe and fittings carried in stock for all pressures. Castings for special purposes made to order.

Clow "Gasteam" Radiators.

These radiators provide steam heat without the expense of a boiler, piping and chimney, when and where it is wanted. They also eliminate the disagreeable firing of a coal boiler and do away with the coal bin, dust, dirt, ashes and smoke.

"Gasteam" heating is adaptable to new or old commercial buildings, factories, stores, churches, schools, theaters and residences. In fact it is a practical and efficient heating system for every purpose.



Ten-section Three-column
"GASTEAM" RADIATOR. Sectional View

Description of "Gasteam" Heating System.

In appearance Clow "Gasteam" radiators resemble any other cast iron steam radiator. In place of a boiler, however, each radiator is connected to a gas pipe and a Bunsen burner is placed under the radiator, entirely enclosed in a cast iron combustion box. Directly above the burner is the water chamber (see sectional view). An automatic regulator governs the gas supply, guaranteeing the minimum consumption of gas and the maximum heat.

Operation of "Gasteam" Heating System.

When heat is required in any room, a match is all that is necessary. By turning the gas cock and applying the match, as to an ordinary gaslight, the burner is lighted, the steam is formed in the water chamber and inside of 30 minutes there is a 5-lb. pressure and a good warm room.

Advantages of "Gasteam."

- (1) It gives steam heat when and where it is wanted.
- (2) It eliminates the boiler, the chimney, the coal bin, the piping necessary in a central heating system.
- (3) There is no dirt, no ashes, no dust, no smoke, no firing of the furnace, no janitor when "Gasteam" radiators are used.
- (4) When heat is required it can be had anywhere in the building by simply lighting a match and turning a gas cock—the "Gasteam" radiator does the rest.
- (5) "Gasteam" radiators are furnished in several sizes and heights to meet requirements.

Ultra-Violet Ray Sterilizer.

The advantages of sterilization of water by ultra-violet rays, as compared with other methods of water sterilization, are as follows:

- (1) Its action is direct and positive, and results in a complete sterilization of the water. It is a system which has an efficiency of 100%, 100% of the time.
- (2) The treatment results in absolutely no chemical change in the water treated. It generates no odor, no

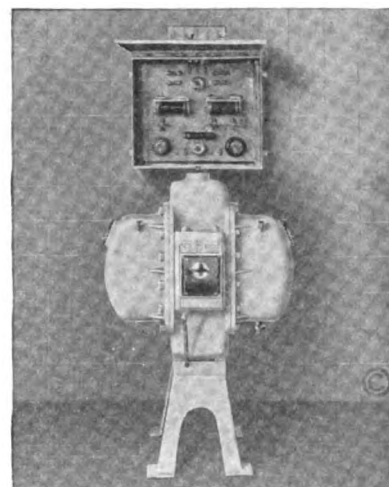
taste, no heat, nor any physical change in the water treated.

(3) It does away to the utmost possible extent, with the human element. No attention or care is required, except that of starting the lamps.

(4) The apparatus is so simple in its construction that there is nothing about it that requires adjustment or repairs. With the exception of the lamps, which of course, eventually will have to be renewed, the depreciation on the apparatus is practically nothing:

(5) Its initial cost and the cost of operation are only a fraction of those involved in any other system of water sterilization.

(6) Its cost of operation, in electrical energy consumed, is nominal.



TYPE H-2 R.U.V. WATER STERILIZER

Industrial Plant Plumbing.**Madden's Patent Closets**

—The operating valve is strongly built; the operation is absolutely automatic. There are no chains to be lost. The woodwork is especially designed to withstand hard usage; the tank of galvanized iron can not leak or get out of order.

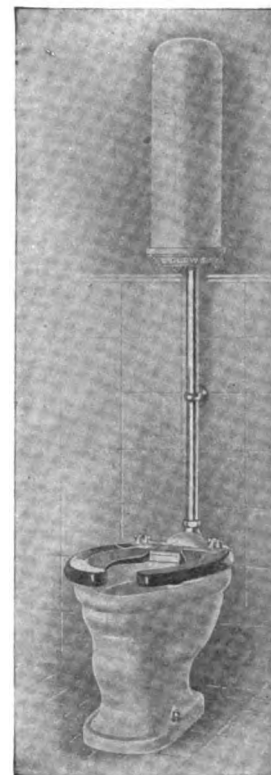
Drinking Fountains—

We have many designs of drinking fountains to answer the many different demands.

Send for circulars illustrating complete line of drinking fountains.

Factory Wash Sinks—

Washing facilities have always been a great question with the employer. Many new features are today considered as essential. A careful study of the subject by our Engineering Department brings forth many improvements for industrial work.



THE "JETRIC" CLOSET,
MADDEN'S PATENT

Catalogues.

Complete catalogues gladly sent on request. The following will aid in the selection of the catalogue suited to the requirements:

- Plumbing, Catalogue "M."
- Drinking Fountains, Fountain Catalogue.
- Heating, Special Catalogue.
- Cast Iron Pipe, Fittings and Foundry Products—Pipe Economy.
- Steam and Water Work Supplies, Catalogue "A."
- Water Sterilization, R.U.V. Catalogue.

ESTABLISHED 1841

E. B. BADGER & SONS CO.

Manufacturers of Expansion Joints for High and Low Pressure

63-75 Pitts Street
BOSTON, MASS.

SALES OFFICE: NEW YORK, N. Y., 101 Park Avenue

Products.

BADGER SINGLE and SELF-EQUALIZING CORRUGATED COPPER EXPANSION JOINTS.

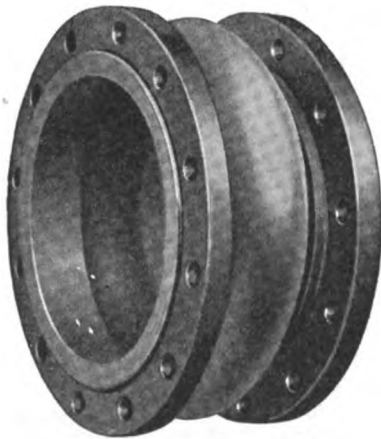
For Water Cooling Systems and Air Washers, see page 1088.

Badger Single Corrugation Expansion Joints.

Badger single corrugation expansion joints are made for connection between turbines and condensers and designed for any special requirements, particularly to take care of vibration and a very slight amount of expansion.

A great many joints of this type have been made in all sizes up to 84 in.

The company has facilities for manufacturing any joint of this type that may be required, whether its shape is round, oval or rectangular.



BADGER SINGLE CORRUGATION EXPANSION JOINT
FACE TO FACE DIMENSIONS IN INCHES

Size	Single corrugation	Size	Single corrugation
4	7	26	16
6	7	28	16
8	9	30	16
10	10	36	16
12	10	42	16
14	10	48	16
16	12	54	18
18	12	60	18
20	12	66	18
22	12	72	18
24	12	84	18

Badger Self-equalizing Expansion Joints.

The Badger self-equalizing expansion joints are made of seamless copper tubes, of the best quality Lake copper, which is known to be the most ductile metal used in commercial engineering work. They are properly designed and rolled, with deep corrugations; and with the aid of the cast iron or steel equalizing rings, conforming to the shape of the corrugations, they take care of the changes in length in the pipe line, due to temperature changes, in a most efficient and economical manner: first, because they are a one-piece joint and never require packing, and, second, because the corrugations are designed and rolled to stand repeated

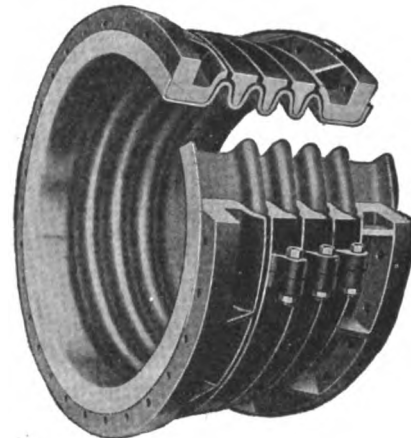


changes of shape, and to care for a required amount of expansion on each corrugation.

The external equalizing rings equally distribute the expansion over each corrugation, thus eliminating the possibility of a fracture in the copper, due to the fact that one or two corrugations take care of the total amount of expansion.

They also give the added strength to the copper to resist pressure.

Self-equalizing expansion joints are made with: 2 corrugations to care for 1-in. expansion; 4 corrugations to care for 2-in. expansion.



BADGER SELF-EQUALIZING EXPANSION JOINT
FACE TO FACE DIMENSIONS IN INCHES

Size	Two corrugations	Four corrugations
6	12 $\frac{1}{4}$	19
8	12 $\frac{1}{2}$	19
10	12 $\frac{1}{2}$	19
12	13	20
14	13 $\frac{1}{4}$	20
16	13 $\frac{1}{2}$	20
18	14	21
20	15	21 $\frac{1}{2}$
22	15	21 $\frac{1}{2}$
24	15 $\frac{1}{2}$	22

Special Features of Badger Joints.

Badger expansion joints are:

Simple—There are no complicated parts.

Durable—Made of best quality copper.

Safe—Given a hydraulic test on every joint.

Convenient—Installed as easily as any pipe fitting.

Compact—Greatest diameter usually less than flange.

Efficient—They require no packing.

When Ordering Badger Joints.

State (1) size of pipe; (2) whether steam, water, gas or air line; (3) working pressure; (4) length and material of pipe; (5) face to face dimensions; (6) range of temperature; (7) how often heat is turned on or off; (8) whether subject to superheat; (9) outside diameter of flanges, diameter of bolt circle, number of bolts, diameter of bolt hole.

Catalogue.

Write for catalogue No. 13.

GRINNELL COMPANY, INC.

Heating, Industrial and Power Plant Piping

EXECUTIVE OFFICES
PROVIDENCE, R. I.

For Branch Offices, see page 472

Products and Services.

Complete ENGINEERING and CONSTRUCTION SERVICE on POWER PLANT, HEATING, and INDUSTRIAL PIPING, including the furnishing of DESIGNS, ESTIMATES, and MATERIALS; INSTALLATION; and the PERSONAL SUPERVISION of all work.

CONSTANT LEVEL SIZE CIRCULATING SYSTEMS; SPRAY COOLING SYSTEMS; HUMIDIFYING SYSTEMS; COMPRESSED AIR CLEANING SYSTEMS.

Also Piping for Acids, Alkalis, and other special materials; Pipe Bending and Fabricating; Threading and Welding.

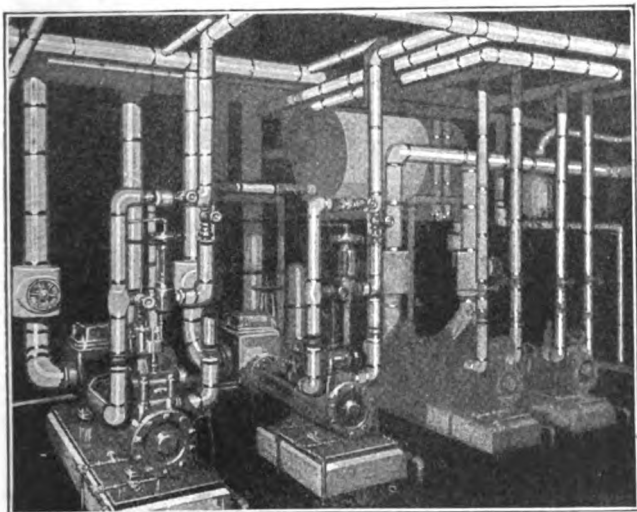
For Automatic Sprinkler Systems, see page 472.

Evils of Poorly Designed Piping.

Present high costs of coal and other supplies necessary to the operation of all kinds of power and heating plants, and the great advance in wages, make efficient and economical performance absolutely necessary. Plant owners must positively stop costly waste, hitherto regarded as unavoidable, and see to it that every unit is producing its maximum capacity at minimum cost.

High grade machinery, if served by poorly designed and indifferently installed piping, does not produce the expected results. This condition is frequently brought about either by too small a pipe line, producing a great drop in pressure at the discharge end; by lines with too many short turns; by headers and other steam lines so large that the low velocity of flow induces excessive condensation and heat loss; or by too many parallel lines serving the same or similar purposes.

Lack of Flexibility—Too frequently an otherwise good arrangement is spoiled by insufficient flexibility, resulting in overstrained joints due to expansion and contraction. This condition inevitably means great expense for maintaining pipe joints and keeping the line in good repair, and imposes a great injustice on the operative who must spend his Sundays or leisure hours doing a job which proper design would have rendered unnecessary.



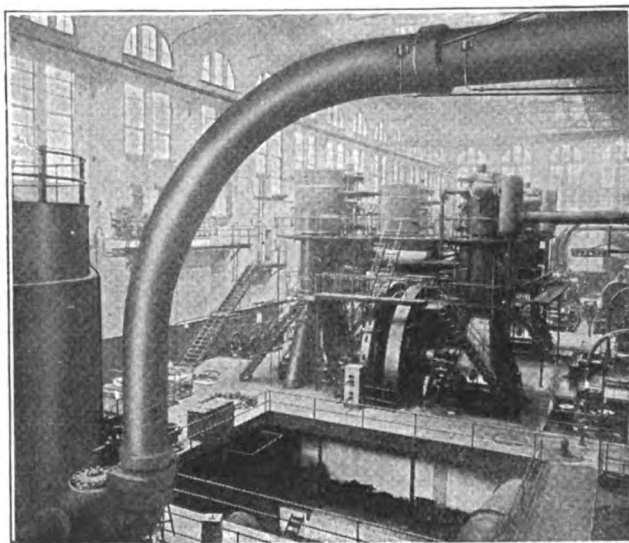
A TYPICAL GRINNELL PIPING INSTALLATION

Poor Drainage—Considerable annoyance and expense is caused by piping which becomes pocketed, due to poorly designed hangers or indifferent workmanship, preventing proper drainage. Where low points in steam or exhaust piping systems are necessary, great care should be taken to provide proper means of automatically draining these points without depending on draining by hand.

Insulation—The question of the advisability of the use of insulation as a means of preventing heat loss is necessarily one to be determined by the engineers designing the piping. Great waste may be avoided by the installation of the proper type of insulating materials, applied to lines where the heat loss can not be used to good advantage for heating purposes. Too often pipe lines and other hot surfaces are not properly insulated. In many cases, however, insulation is used to correct faulty design of pipe sizes, whereas, if proper circulation could have been maintained by properly equalizing the pipe sizes, the bare surface of the pipe could be used as a very efficient heating surface in place of an equal or greater amount of radiation.

Improvements Effected by Grinnell Piping System.

Correct Pipe Sizes—The size of pipe to be used in the designing of all Grinnell piping systems is determined by weighing carefully the two prime factors of *first cost* and *frictional resistance*. There is obviously a correct size of pipe to be used in the case of every pipe line, and this size will be the economical size, both from the standpoint of first cost and the standpoint of frictional resistance caused. The frictional resistance means the power consumed in the transmission of the liquid or vapor. In Grinnell designed systems these resistances are carefully calculated to give equalization of flow to all apparatus. In the calculation of these resistances, our engineers determine where it is advisable to use long radius bends and necessarily guard against the use of globe type valves where resistance is an important factor.



A GOOD EXAMPLE OF GRINNELL PIPE BENDING

Long Radius Bends—Short turn screwed fittings and ordinary globe cut-out valves, used in important pipe lines in many plants, cause great loss of pressure due to the sharp turns which result. Globe valves for cut-out purposes should be displaced by straightway gate valves and long radius bends used in place of short turn elbows. These bends offer no more resistance to the flow than an equal length of straight pipe, and the distance is actually less than when straight pipe is used with elbows. Long radius bends are almost invariably employed in Grinnell piping systems where it is necessary to provide for expansion and contraction of piping. They are also used in lines where resistance is a prime factor, to cut down the friction caused by ordinary fittings.

Automatic Non-return Valves—These should be used in the steam branches from boilers to the header in every installation of two or more boilers. This type offers a greater protection to the boiler and to the employee than any other form of valve.

Elimination of Overloads—Many overloaded reciprocating engines are now "wire drawing" and straining at their tasks because of long, small pipe lines. They could easily carry the load if large receiver type separators were placed on the throttles. This permits the receiver to become filled with steam at boiler pressure while the engine admission valve is closed, and provides a great volume of full pressure steam ready to enter the cylinder the instant the valve opens.

Utilization of Waste Hot Water—Incalculable loss is incurred every day by permitting hot water waste from heating systems, slushers, drying machines, dry kilns and other steam consuming machines. Both the water and the valuable heat it contains should be recovered and returned directly to the boiler.

Savings Under Grinnell Systems.

The installation of modern piping systems and appliances produces an immediate saving in coal consumption. In many cases such savings have paid the entire cost of the improvements in a few years.

Many years of experience in widely varying types of plants have qualified us to undertake these improvements with an efficiently organized corps of engineers, all specialists in one or another of the several branches. We will cheerfully send an expert to any plant to survey and estimate the cost of such changes.

Flexibility and Simplicity of Grinnell Systems.

The necessity for flexibility in power plant design cannot be too strongly emphasized. The piping systems must be laid out, and the valves so arranged that the operating engineer can, at will, cut out one or more boilers, engines, or other steam-using machines, for repairs or renewals, replacing them with standby machines which, unless the piping system is properly planned, may be found useless in time of need.

While it is desirable that an adequate number of valves, etc., be provided, it is equally necessary that they be kept down to the least number commensurate with efficiency and safety. Long circuitous lines should be made as direct as practicable and proper expansion bends provided on rigid lines to allow for the absorption of expansion and contraction.

Simplicity in piping design is of the utmost importance in order to keep first cost within reasonable limits, to insure economical operation and reduce upkeep.

Piping for Chemical Plants and Other Special Purposes.

Not only is GRINNELL COMPANY, INC., skilled in designing efficient steam or water lines for ordinary purposes, but we furnish and install all piping required in processing plants, or plants which involve the use or treatment of acids and alkalis.

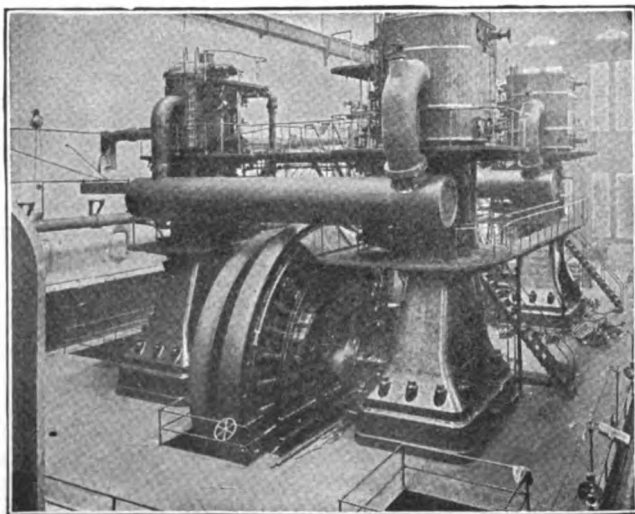
We furnish pipe made of steel, cast iron, genuine wrought iron, and spiral riveted pipe, black or galvanized. We also furnish brass, copper, and aluminum pipe; pipe that is lined with various metals or alloys; and specially treated acid resisting pipes, with suitable valves and fittings for all the above classes of materials.

Gaskets, packings, and specially designed joints will be provided as each specific condition requires.

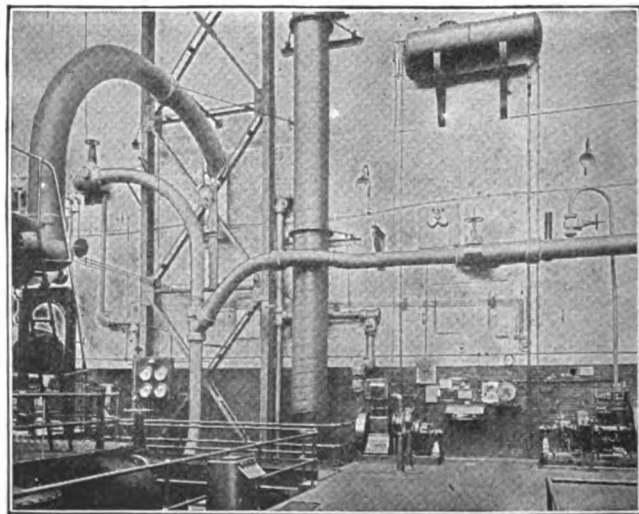
Acting under the direction of the chemical engineer, or some other qualified attache of the plant, GRINNELL Co., Inc., will cheerfully submit proposals for piping equipment for pulp and paper mills, sugar refineries, soap factories, fertilizer works, bleacheries, dyeing plants, phosphate works, cement mills, gas plants, oil refineries, cotton oil mills, etc.

Constant Level Circulating Size System.

This system is simple in design and operation, economical in cost and manipulation, and it satisfactorily maintains circulation, uniform temperature and level. It is splendidly adapted to the conditioning of the finest or coarsest yarns, and improves the quality and increases



CROSS-COMPOUND PIPING INSTALLED BY GRINNELL COMPANY



GRINNELL HIGH PRESSURE PIPING IN A CENTRAL STATION

the output of any textile factory. We are prepared to furnish and install complete outfits of design and material best suited to individual needs and conditions.

Spray Cooling Systems.

Where only a limited quantity of water is available for cooling purposes, a spray system can be arranged over any small reservoir or pond and the warm condensing water, quickly cooled to a temperature several degrees below that of the atmosphere, can be used and cooled over and over again at low cost.

When the plant does not possess a pond of water, a suitable reservoir may be built or a shallow tank constructed on the roof of a building and the system installed there. Such a system is simple in design, inexpensive in cost and economically replaces the unsightly, inefficient cooling tower.

Humidifying Systems.

Through our affiliations with American Moistening Company, we are in a position to design and install complete humidifying systems, using devices long standard in this work. An especially reliable and sensitive control is a feature of all American Moistening Company equipments, which include sectional, fan type, high duty, and ventilating humidifiers; atomizer or compressed air systems; air conditioning room equipment, etc.

Compressed Air Cleaning Systems.

All textile mills suffer from the accumulation of lint and dust on inaccessible parts of the machinery. The installation of a small air compressor, with a simple piping system with hose connections conveniently located, permits the thorough cleaning of all machinery.

Each air hose, 50 to 60 ft. in length, is provided with a lever valve nozzle at one end and a quick motion coupling at the other end. The patented quick motion coupling with which the hose and every station is equipped makes possible very quick changes from station to station. A few operators can quickly and thoroughly clean an entire mill.

Grinnell Heating Systems.

Many complaints of inefficient heating arise from improperly designed or unsuitable heating systems. The whole subject of economical heating should be approached from a purely scientific standpoint, covering not only the cubic contents of the building but also its

structural details and the suitability of one or another heating system to the particular building under consideration.

It is by careful pre-consideration of all these elements that Grinnell heating engineers are able to install a system that not only produces the required degrees of heat but does so on a minimum coal consumption.

For many mills and other industrial plants the Grinnell system of semi-automatic temperature control will provide ample heat, graduated to meet internal conditions, and regardless of outdoor temperatures, at a far lower cost per unit than any other system.

Remodeling Old Heating Plants.

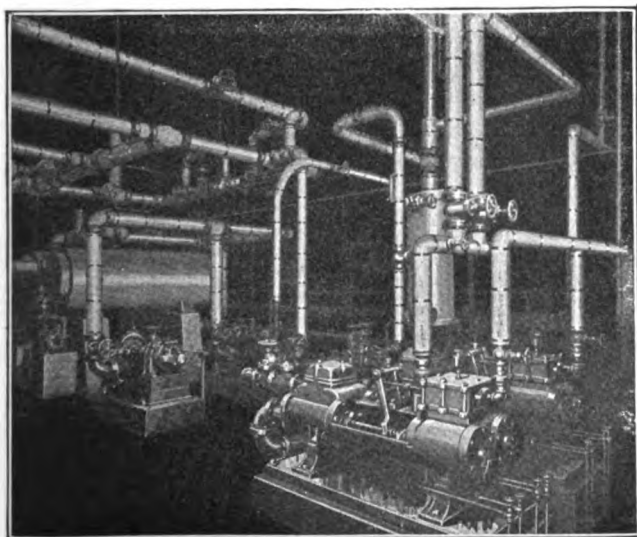
Heating plants often give unsatisfactory results due to poor design or repeated radiation additions without proper increase in the capacity of the piping. Natural deterioration of the system also causes low efficiency. We are in an excellent position to remodel such plants and put them in perfect working condition.

When factory buildings are increased in length a change in the method of heating is often made necessary. A careful study and analysis of every such case will be made by an expert heating engineer. Old systems, apparently obsolete and practically worthless, may be brought up to a state of high efficiency under such skilled remodeling, thereby saving many thousands of dollars.

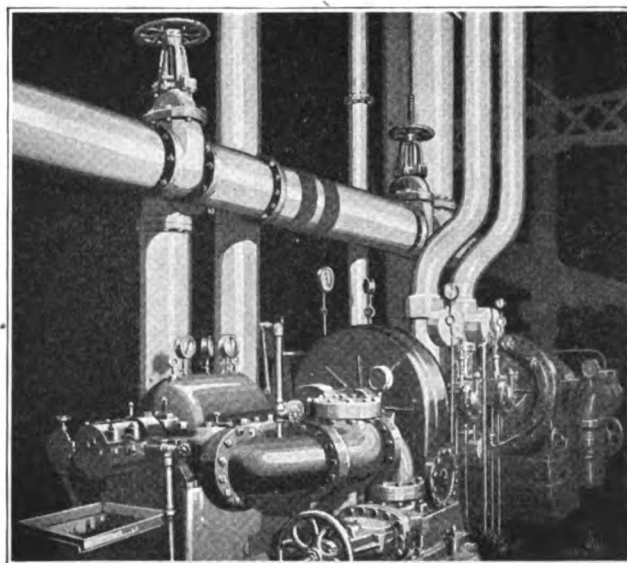
The highly trained corps of specialized piping engineers maintained by GRINNELL COMPANY, INC., and its experienced construction department, insure proper design as well as satisfactory installation and operation. The plant owner or his designing engineer will receive capable and ready co-operation from these experts in the development of his plant.

Steam Power Plants.

Our Engineering Department is fully qualified to design complete piping systems for power plants serving textile mills, electric lighting plants, electric power plants, water works, steel rolling mills, blast furnaces, copper mines, saw mills, oil mills, pulp and paper mills, tanneries, bleacheries, dyeing plants, water filter plants, phosphate mines, fertilizer factories, or any others of similar nature. We are prepared to furnish or fabricate in our shops all equipment and material required, erecting same in the most approved manner.



FEED PIPING INSTALLATION BY GRINNELL COMPANY



GRINNELL HIGH PRESSURE POWER PIPING IN POWERHOUSE OF THE RHODE ISLAND COMPANY

NATIONAL VALVE & MANUFACTURING COMPANY

Manufacturers, Contractors, Power Pipe Materials

CABLE ADDRESS: "Navco"
Western Union Code

GENERAL OFFICE AND WORKS
PITTSBURGH, PA.

CLEVELAND

CHICAGO

BRANCH OFFICES
INDIANAPOLIS

ATLANTA

NEW YORK

Products and Services.

IRON and STEEL GATE VALVES, FITTINGS and FLANGES; PIPE BENDS; WELDED HEADER LINES and FABRICATED PIPE WORK.

INSTALLATION of all classes of PIPING SYSTEMS.

Personal attention and supervision of all work; supplying of special charts showing engineering data on saturated and superheated steam; curves giving sizes for steam headers and boiler connections for 200 h. p. to 10,000 h. p., gage pressures 125 lbs. to 300 lbs., velocities 3,000 ft. to 12,000 ft. per minute.

Welded Headers.

Illustration (Fig. 2) shows a 24-in. header with welded nozzles of extra heavy pipe, instead of flanged tees. Companion flanges are attached by means of National square lap joints. In this header 13 joints are eliminated.

Types of Header Connections.

The most approved methods of connecting boilers to header and of attaching flanges to pipe are illustrated

in Fig. 1. The National square lap joint is recommended; it gives the best gasket surface, a loose or swivel flange and minimum chances for leaks.

Many power plants have leaks in the various pipe connections equivalent to an opening $\frac{1}{8}$ in. in diameter, which, at 175 lbs. pressure, would cause a loss of \$578.00 per year, which is about 6% on an investment of \$10,000.00. (See table accompanying.)

APPROXIMATE LOSS FROM STEAM PIPE LEAKS EQUIVALENT TO GIVEN CIRCULAR OPENINGS UNDER AVERAGE CONDITIONS

Basis: Cost of 1 h.p. per year of 300 days and 24 hrs. per day is \$38.40.

GAGE PRESSURE OF STEAM IN POUNDS

Diam. of opening, ins.	125 lbs.	150 lbs.	175 lbs.	200 lbs.	250 lbs.
$\frac{1}{8}$	\$ 47.00	\$ 55.30	\$ 63.60	\$ 72.60	\$ 89.30
$\frac{1}{4}$	186.00	221.00	255.00	286.00	356.00
$\frac{3}{8}$	423.00	500.00	578.00	648.00	800.00
$\frac{1}{2}$	756.00	880.00	1,020.00	1,140.00	1,420.00
$\frac{3}{4}$	1,175.00	1,395.00	1,600.00	1,755.00	2,220.00
$\frac{7}{8}$	1,550.00	1,980.00	2,280.00	2,580.00	3,190.00
1	2,300.00	2,725.00	3,150.00	3,520.00	4,360.00
$1\frac{1}{8}$	3,000.00	3,530.00	4,080.00	5,020.00	5,660.00
$1\frac{1}{4}$	4,680.00	5,520.00	6,360.00	7,200.00	8,950.00
$1\frac{3}{4}$	6,770.00	7,970.00	9,250.00	10,330.00	12,840.00
2	12,050.00	14,200.00	16,320.00	17,300.00	22,800.00

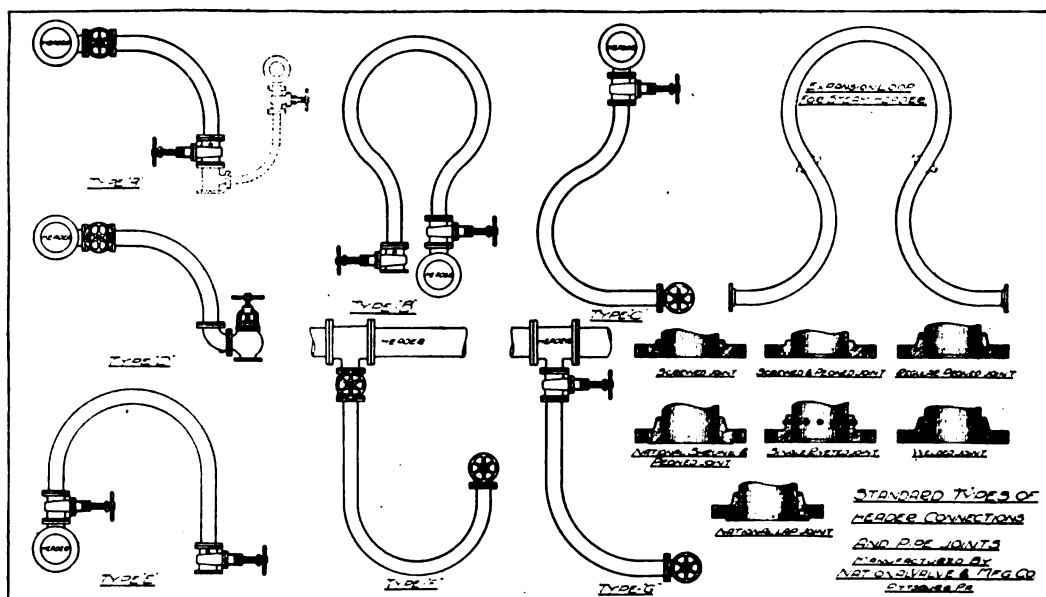


FIG. 1. STANDARD TYPES OF HEADER CONNECTIONS AND PIPE JOINTS

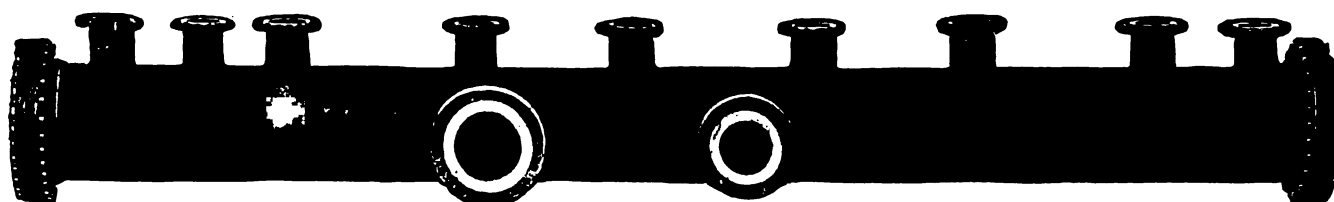


FIG. 2. 24-INCH HEADER, NINE 8-INCH NOZZLES, ONE 10-INCH NOZZLE AND ONE 12-INCH NOZZLE

PITTSBURGH PIPING AND EQUIPMENT CO.

Manufacturers of and Contractors for Fabricated Piping Systems

GENERAL OFFICE AND WORKS
PITTSBURGH, PA.

BRANCH OFFICES

NEW YORK, N. Y., 220 Broadway
CLEVELAND, OHIO, American Trust Building
BIRMINGHAM, ALA., American Trust Building

CHICAGO, ILL., Peoples Gas Building
INDIANAPOLIS, IND., Traction Terminal Building
SAN FRANCISCO, CAL., Monadnock Building

Products and Services.

PIPING and FITTINGS, including Valves; Flanged Fittings and Flanges; Special Cast Iron and Cast Steel Flanged Fittings; Pipe Bends and Fabricated Piping; Van Stone and Sargol-weld Pipe Joints, Slip and Copper Expansion Joints; Welded Headers; Steam Separators; Piping Systems; complete, ready for installation or delivered and erected.

Complete PIPING EQUIPMENTS are furnished and installed in power plants of all kinds, including electric light, street railway, blast furnaces, steel works, and industrial plants of any and every description. The pipe is fabricated in this company's shops and erected with its skilled labor. Complete piping installations are furnished ready for erection, if the owners prefer to install same. Any make of valve, separator, trap or any steam or water specialty, that may be desired, can be supplied.

Piping Equipment.

The installation of piping equipment is made a specialty. The officers of the company give personal attention to the supervision of contract work. Experts are in charge of every contract, which insures correct installations and satisfactory service.

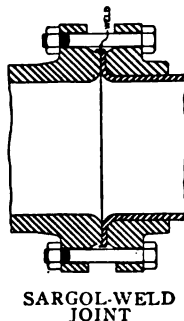
Pipe Bends.

Modern practice demands that pipe bends should be used when possible. They prevent leakage by allowing for expansion and contraction, reduce friction and loss of pressure. The cost is no more than that of the fittings displaced by their use. Table of standard bends on request.

Sargol-weld Joint.

For high pressure superheated steam lines the Sargol-weld joint, eliminating the use of gaskets, is the last word.

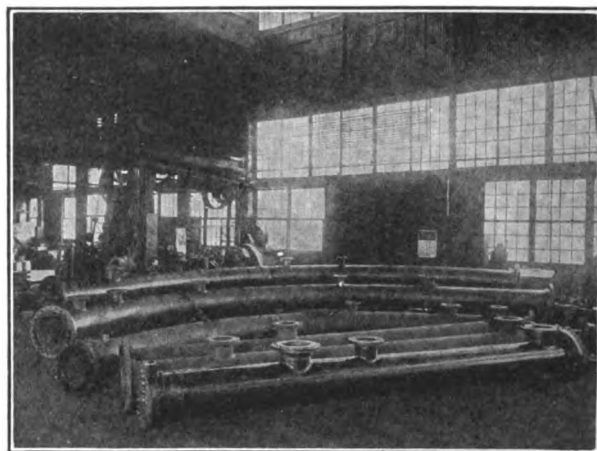
Write for particulars.



Welded Headers.

Wrought steel headers with welded-in nozzles for

modern requirements of high pressures and temperatures. These headers are used where lightness and strength are desired. All wrought steel headers are made with Van Stone flanges.



18-INCH PIPES AND PIPE BENDS WITH WELDED OUTLETS

Construction.

The material manufactured and fabricated is prepared in this company's shops by skilled labor with special machinery and appliances. It is designed for the service required, so that whether it is to be used for hydraulic pressures, superheated steam or exhaust steam, it is made of proper material and sufficient strength to make it absolutely safe.

The machinshop, bending, forging and welding departments, lack nothing in equipment for handling the most intricate detail that enters into power plant piping construction.

Iron and steel foundries are equipped with the most modern tools and appliances, and with its skilled workmen, the PITTSBURGH PIPING AND EQUIPMENT CO. is able to produce the best there is in cast piping equipment.

Contracts for Piping Installation.

This company is prepared to contract for piping installations at any place in the United States and Canada and for any service, including the highest pressure of superheated steam and hydraulic working pressures up to 5000 lbs.

JOHN SIMMONS CO.

Piping, Mill and Factory Supplies

GENERAL OFFICES
102-110 Centre Street
NEW YORK, N. Y.

Products.

PIPE: Genuine Wrought Iron and Steel; Cast Iron Flanged; Cast Iron Water; Cast Iron Soil; Brass and Copper; Lead Lined and Tin Lined; Spiral Riveted.

SECTIONAL CONCRETE PILE CASING.

FITTINGS: Cast Iron, Malleable Iron, Steel and Brass, for steam, water, gas, air and ammonia; Standard, Medium, Extra Heavy and Hydraulic; Simmons Unions.

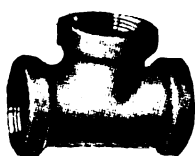
VALVES: Iron, Steel, Brass, Gate, Globe, Angle and Check; Standard, Medium and Extra Heavy, for steam, water, gas, air and ammonia; Blow-off, Elevator, Radiator, Regulating, Relief, Tank and Vacuum Valves; Foot Valves.

Also Steam Traps; Automatic Gravity Scales; Pressure Tanks; Steam, Hand and Power Pumps; Injectors; Pipe Machines; Vises, Stocks and Dies, Wrenches, Drills, etc.; Expansion, Oil and Storage Tanks; Brass, Lead and Iron Traps; Red Seal Metallic Packing or Gaskets; Pipe Joint Compounds.

Exclusive agency for Wm. Powell Co. line of valves, lubricators, etc., in New York territory.

For Plumbing Supplies, see page 467.

Drop Forged Steel Fittings and Valves.



DROP FORGED
STEEL FITTINGS

The "Simmons" line of drop forged steel fittings has been put on the market in answer to the increased demand for fittings free from flaws or airholes liable to be found in all cast fittings, whether gray iron, malleable or cast steel. Fittings are bored out of solid forgings.

Prices quoted on fittings for all pressures up to 10,000 lbs. per sq. in. Drop forged steel valves for the same service are also offered.

In inquiring for prices please state conditions, and quantity.

Locknut Floor Plates.



STANDARD
LOCKNUT FLOOR
PLATE



LOCKNUT FLOOR
PLATE WITH EX-
TENDED SLEEVE

Efficient, durable and dependable for high grade work. Made of cast iron or bronze. The extended sleeve makes an absolutely watertight joint and prevents water from dripping to floor below when concrete flooring is flushed. Protect wood flooring from superheated steam or hot water pipes. Pipe sleeve can be made from any pipe by simply threading at both ends. Also adapted to sidewalls in gas, water or steam installations.

Pipe.

A large stock of genuine wrought iron, cast iron and steel pipe, also soil, brass, copper, lead and tin lined and spiral riveted pipe carried on hand for immediate delivery.

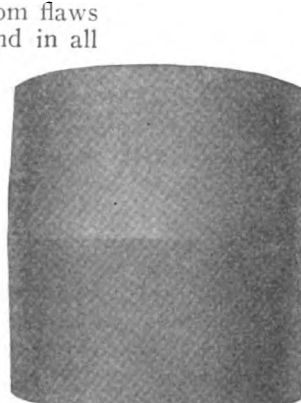


STEEL AND IRON PIPE, BLACK AND GALVANIZED

Simmons Sectional Concrete Pile Casing.

With Simmons patented sleeves, practically any problem in foundation and underpinning work can be solved and concrete piles of any ultimate length built up during process of driving. A 12-in. pile, 5 sections, jacked down in sand strata 33 ft. to bedrock and filled with concrete, supported 135 tons dead weight without deflection or any change whatever; depression $\frac{1}{8}$ in.

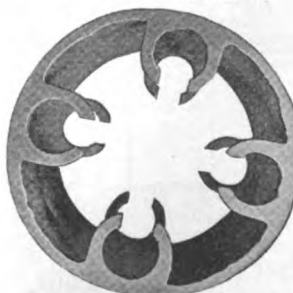
Over 400,000 lin. ft. of these piles are supporting structures in New York City.



Sleeve for Pile Casing Pipe to
Pipe, Forming Continuous
Smooth Outside Surface



Sleeve for Pile Casing. Pipe Sets
Against Collar Forming Continuous
Outside Surface



Same as Above, but Arranged to
Take Reinforcing Rods



Pile With
Point Attached



Same as Above, but Arranged to
Take Reinforcing Rods

SIMMONS SECTIONAL CONCRETE PILE CASING

SIMMONS PIPE BENDING WORKS

40 Mechanic Street
NEWARK, N. J.

Products.

PIPE BENDS.
PIPE COILS.
WELDED HEADERS.
CAST IRON FITTINGS.
VAN STONE JOINTS.
VALVES.
STEAM SPECIALTIES.

Pipe Bends.

Made in all shapes and sizes from $\frac{1}{8}$ to 30 in. Full card weight or extra heavy pipe manufactured for the purpose used. Furnished with screwed or Van Stone flanges in cast iron and rolled steel both standard and extra heavy.



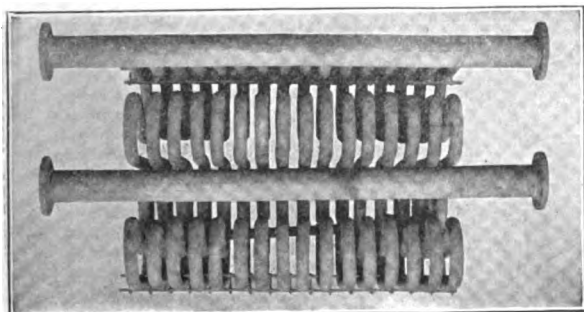
PIPE BEND

Cast Iron Fittings.

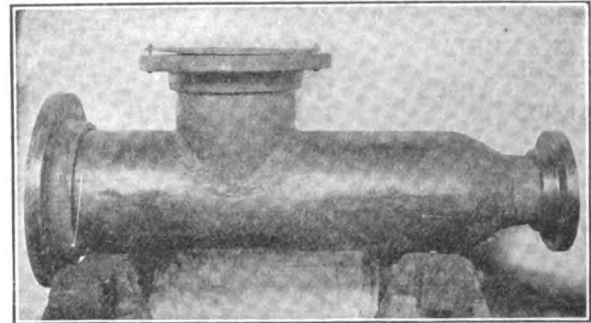
Complete line of standard and extra heavy cast iron flanged or screwed fittings. Special fittings made to specifications.

Coils.

Continuous welded construction spiral, basket, zig zag, taper, miter wall and box return bend coils made to specifications in black or galvanized from iron or steel pipe. Also made from seamless steel tubing, brass or copper pipe.



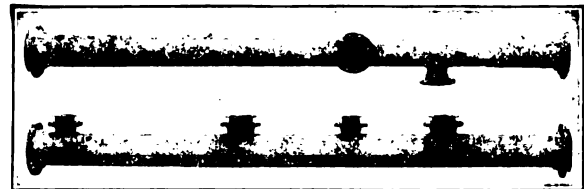
PIPE COIL



WELDED HEADER WITH SWAGED END

Welded Headers.

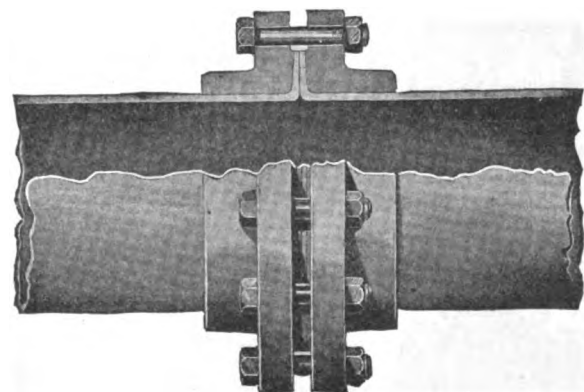
Made with any number of welded nozzles in lengths limited only by means of transportation. Light unit construction eliminates leaky joints and lowers shipping and erection costs. Furnished with screwed or Van Stone flanges.



WROUGHT STEEL WELDED HEADERS

Van Stone Joints.

Produced by improved machinery in sizes from 4 to 30 in. with high hub cast iron or rolled steel flanges in standard or extra heavy.



VAN STONE JOINT

Valves and Steam Specialties.

All standard makes furnished ready for installation.

WALWORTH MANUFACTURING COMPANY

Valves, Fittings and Tools for Steam, Water, Oil, Gas and Air

BOSTON, MASS.

BRANCH HOUSES
 BOSTON, MASS. CHICAGO, ILL. NEW YORK, N. Y. PHILADELPHIA, PA. SEATTLE, WASH.
 PORTLAND, ORE., WALWORTH COMPANY OF OREGON
 WESTERN DIVISION

OFFICE: CHICAGO, ILL. WORKS: KEWANEE, ILL.
 EXPORT SALES AGENTS: WALWORTH INTERNATIONAL COMPANY, NEW YORK, N. Y.

ALEXANDRIA
 BRUSSELS
 BUENOS AIRES
 CALCUTTA

CARACAS
 COPENHAGEN
 HAVANA
 JOHANNESBURG

FOREIGN SALES OFFICES
 LONDON
 MEXICO CITY
 MILAN
 PARIS

SAN FRANCISCO, CAL., U. S. A.
 SANTIAGO DE CHILE
 SAO PAULO
 SHANGHAI
 SURABAYA
 SYDNEY
 TOKIO

Products.

PIPE FITTINGS: Brass, Cast and Malleable Iron and Steel; COCKS: Brass and Iron; VALVES: Brass, Iron Body and Steel; POWER PLANT PIPING; PIPE BENDS; PIPE TOOLS.

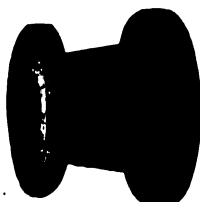
Catalogue.

Walworth Catalogue No. 78, containing over 600 pages, describes in detail the materials, pressures, purposes, etc., of the entire Walworth line.

This catalogue will be sent to interested persons on request, without charge.



CAST IRON ELBOW



EXTRA HEAVY
 STEEL FLANGED
 TAPER REDUCER



IRON COCK



EXTRA HEAVY CAST IRON
 FLANGED DOUBLE SWEEP
 TEE



CAST IRON FLANGED
 DOUBLE SWEEP TEE



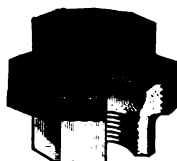
STEEL OR
 IRON DRIP
 POCKET



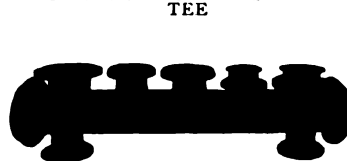
BRASS SERVICE ELBOW



PLAIN
 MALLEABLE
 IRON ELBOW



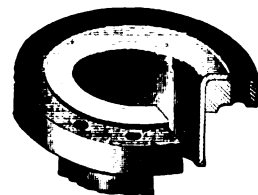
OCTAGONAL
 PATTERN KE-
 WANEE UNION



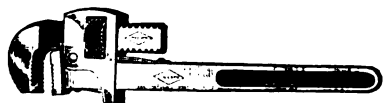
STEEL HEADER WITH WELDED-
 IN NOZZLES AND WALMANCO
 FLANGES



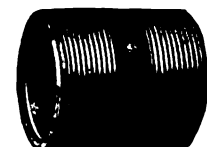
MALLEABLE IRON
 SERVICE TEE



WALMANCO FLANGE



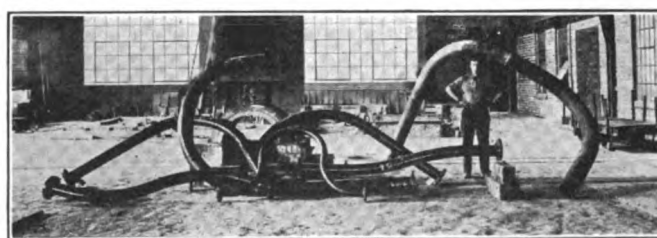
14- TO 24-IN. STEEL HANDLE GEN-
 UINE WALWORTH STILLSON
 WRENCH



SPACE NIPPLE



REVERSIBLE BOSTONG



ONE ORDER OF WALWORTH PIPE BENDS



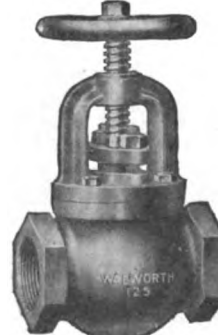
BRASS STEAM COCK



KEWANEE REGRIND-
 ING VALVE



FEDERAL BRASS
 GATE VALVE



IRON BODY GLOBE
 VALVE



IRON BODY GATE
 VALVE

SWEET'S CATALOGUE

AMERICAN WATER SOFTENER CO.

Mechanical Filtration and Water Softening Plants

PHILADELPHIA, PA.

Products and Services.

WATER SOFTENING PLANTS of both Sodium Zeolite (Decalso) and Lime and Soda Types; complete FILTRATION SYSTEMS; PRESSURE and GRAVITY FILTERS.

Plants for removing iron from well and other waters, for neutralizing acidity, for elimination of tastes and odors and for removal of organic matter and discolorations; Water Sterilizing Apparatus; Mechanical Filter Equipment and Appurtenances; Subsidence Basins and Plants for applying coagulants and reagents to waters which are to be clarified, purified or softened.

This company will make a Scientific Investigation of any Water Supply and will Recommend and Install Plants particularly designed to meet local conditions and guaranteed to give satisfactory results.

All plants installed by this company are guaranteed to be free from infringement of patents.

Decalso (Sodium Zeolite) Water Softeners.

Especially adapted to those cases where water *absolutely free from hardness* is essential. Made in both the closed pressure and open gravity types.

Decalso is a water softening material used in filter shells in place of the ordinary filtering medium through which the hard water is passed in the quantity and for the period of time for which the particular plant is designed, the salts of lime and magnesia in the hard water being absorbed and replaced by sodium from the Decalso. When the available sodium is given up, Decalso is exhausted and is then regenerated or recharged with sodium by washing with a solution of common salt.

Regeneration is accomplished by breaking up the Decalso bed by reversal of current of water or with air or both in combination, followed by the salt solution and finally rinsing with water to remove the salt.

In appearance and general scheme of operation, Decalso water softeners are practically identical with standard filters described elsewhere on this page.

Distinctive Features—No sludge is produced.

Can be regenerated and washed within 1 hour.

No manipulation or adjustment of chemical valves.

Minimum salt and wash water required for regeneration. Activity retained for a long time; frequent renewals not required.

Softens water very rapidly, thus meeting peak loads and fluctuations with minimum size plant. Automatic and natural compensation for variations in the hardness of the raw water.

Lime and Soda Water Softeners.

Designed for the removal of scale-forming mineral matter from boiler feed waters and for softening very hard waters where 3 to 5 grains of hardness per gallon in the treated water is permissible. It does not form scale.

Constructed of steel, concrete or wood and equipped with excelsior or sand filters according to conditions.

Full information on request.

Pressure Filters.

Vertical or horizontal, both equipped for simple reverse current wash, for sectional washing or for mechanical or air agitation. Will sustain any desired test or working pressure. Water may be applied by gravity

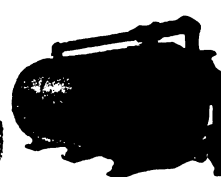
or pumped directly through them into piping systems, tanks, reservoirs or standpipes. Any number of pressure filters may be connected together in battery form. Filtering sand will last from 5 to 7 years without changing. Made of steel or cast iron.

Gravity Filters.

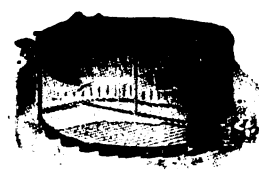
Built round or rectangular, of wood, steel, concrete or masonry and equipped for washing with or without mechanical or air agitation or for sectional washing. Similar in operation to pressure type.



VERTICAL
PRESSURE
FILTER OR
DECALSO
SOFTENER



HORIZONTAL PRES-
SURE FILTER



OPEN GRAVITY FILTER
OR DECALSO SOFTENER

SIZES AND CAPACITIES OF VERTICAL PRESSURE FILTERS OR DECALSO SOFTENERS

Diam., in.	Inlet and outlet pipes, in.	Waste pipe, in.	Capacity per hour, U. S. gals.		Approximate ship- ping weight, lbs.			Effective filter- ing area, sq. ft.	Test pressure are made to stand 125 lbs. test. Filters to stand 150 or 200 lbs. test are special.
			X	Y	Case	Parts	Filtering material		
24	1½	2	360-540	850	300	1200	3.14	Stock filters are made to stand 125 lbs. test. Filters to stand 150 or 200 lbs. test are special.	
30	1½	2	600-900	1500	300	1650	4.90		
36	1½	2	840-1260	1575	425	2800	7.06		
40	2	2½	1120-1560	1625	650	3400	8.72		
42	2	2½	1140-1740	1700	700	3848	9.62		
48	2½	3	1500-2220	2025	850	5450	12.56		
50	2½	3	1620-2460	2350	875	5700	13.63	Stock filters are made to stand 100 lbs. test. Filters to stand 150 or 200 lbs. test are special.	
60	2½	3	2340-3540	3300	950	7800	19.63		
72	3	4	3360-5040	4000	1300	10000	28.27		
78	3	4	3960-5940	5000	1300	12000	33.18		
84	4	5	4680-6900	5700	2000	13600	38.48		
96	4	5	6000-9000	9350	2000	17700	50.26		

X and Y filter capacities according to water; Y is Decalso capacity. Above capacities are conservative. Use minimum capacities for muddy waters. Where maximum capacities are exceeded, resistance will increase, filter will require washing more frequently, and filtered water will not be of as good quality.

SIZES AND CAPACITIES OF HORIZONTAL PRESSURE FILTERS

Diam., ft.	Length over all, ft.	Inlet and outlet pipes, in.	Waste pipe, in.	Capacity per hour, U. S. gals.	Approximate ship- ping weight, lbs.			Test pressure per sq. in.
					Case	Parts	Filtering material	
8	10	6	8	9600-14400	9000	3500	33000	Stock filters, 100 lbs.
8	12	6	8	11400-17400	10800	4000	39600	
8	14	6	8	13500-20100	12600	4500	46200	
8	20	8	10	19200-28800	18000	6500	66000	
8	25	8	10	24000-36000	22500	7000	82500	
8	30	8	10	28800-43200	27000	7500	99000	

Minimum capacities are recommended for turbid waters.

SIZES AND CAPACITIES OF OPEN GRAVITY FILTERS OR DECALSO SOFTENERS

Diam., ft.	Height, ft.	Inlet and outlet pipes, in.	Waste pipes, in.	Capacity per hour, U. S. gals.	Approximate ship- ping weight, lbs.			Area, sq. ft.
					Tank	Parts	Filter bed	
6	7	3	6	3420	1350	1200	11300	28.27
8	7	4	6	6120	1750	2250	20000	50.26
10	7	4	8	9600	2250	3300	31200	78.54
12	7	5	10	13800	2800	5500	45200	113.10
14	7	6	10	18840	3450	6500	61200	153.94
15	7	6	10	21600	4000	8300	70400	176.71
17	7	8	12	27780	4600	11000	90400	226.98

Capacities given are minimum for turbid waters and will be exceeded from 50% to 100% in filtering waters carrying small quantities of sediment. Softener capacities 50% greater than above shown.

GRAVER CORPORATION

Water Softening and Purifying Equipment

EAST CHICAGO, IND.

BRANCH OFFICES

NEW YORK, N. Y., 280 Broadway
TOLEDO, OHIO, Nicholas Building
CHICAGO, ILL., Steger Building

PITTSBURGH, PA., Conestoga Building
CINCINNATI, OHIO, Gwynne Building
KANSAS CITY, MO., Gloyd Building
SAN FRANCISCO, CAL., Balboa Building

Products.

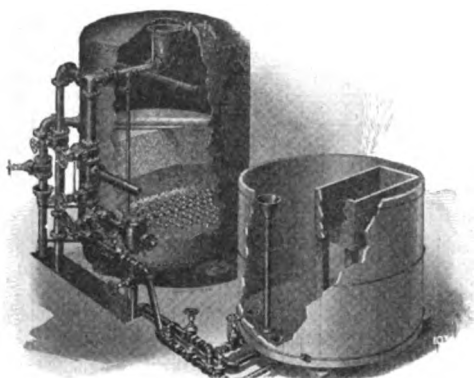
Designers and builders of WATER SOFTENING, PURIFYING, STERILIZING and FILTRATION EQUIPMENT for municipal, industrial and domestic use.

For General Steel Plate Construction, see page 1111.

Graver Zeolite Water Softener.

The Graver zeolite softener consists of essentially two parts, the softener itself, which consists of a steel shell acting as a container for the zeolite mineral, and a salt regenerating solution tank.

All trace of hardness is removed from water in the softener by simple filtration through a bed of Graver zeolite. The zeolite rests upon fine gravel which is sup-



GRAVER ZEOLITE WATER SOFTENER

ported upon a concrete base within the softener, in which is embedded a manifold system of pipes and strainers, as shown in the illustration.

When the capacity of the softener is reached as indicated by meter the zeolite is regenerated by soaking it in a strong solution of common salt which is run into the softener from a tank in which it has been previously prepared. The Graver zeolite softener is made in different sizes for industrial use and household use.

Graver Hot Process Water Softener.

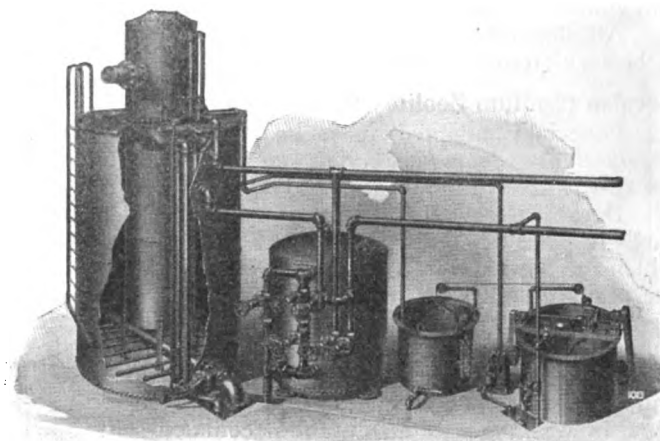
This softener, pictured herewith, has a wide field of usefulness, but is pre-eminently adapted to the stationary steam boiler plant in connection with feed water troubles. It combines two distinct methods in the process of softening water, viz:

(1) Chemical action by which the injurious ingredients in the water are precipitated in such form that they can be readily removed by sedimentation and filtration. (2) Thermal action, by using heat to hasten the chemical reaction and reducing the power of water to hold certain salts in solution in accordance with fundamental chemical laws.



TRADE-MARK

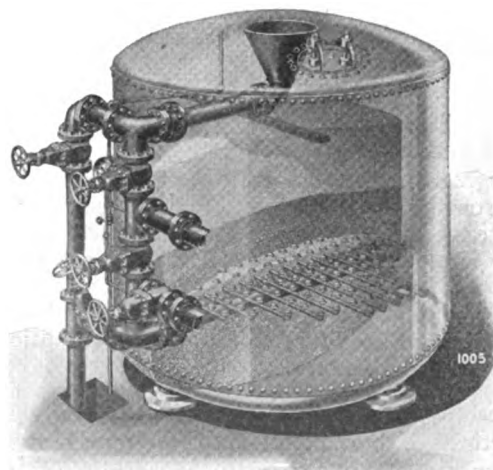
We guarantee that water delivered by the Graver hot process softener will have a temperature of 210° Fahr.; and that subjected to any test or operating conditions, it will deliver a water between 1½ grains and 2½ grains per U. S. gal. of total hardening ingredients always and uniformly.



GRAVER HOT PROCESS WATER SOFTENER

Graver Water Filters.

Graver filters are made in both vertical and horizontal styles, with two different types of feed; the open or gravity type and the closed shell or pressure type—each style covering a wide range of sizes to meet every possible requirement and condition. All types operate with equal efficiency singly or in batteries. In this way an ideal water for all industrial purposes.



GRAVER WATER FILTER

JEWELL POLAR COMPANY

Manufacturers of Water Stills

TELEPHONE:
HARRISON 2190

565-567 West Van Buren Street
CHICAGO, ILL.

Products.

APPARATUS for DISTILLING, FILTERING, STERILIZING, AERATING, SOFTENING and STORING WATER.

Jewell Polarstils.

Uses—Polarstils offer a simple and economical means for providing distilled water for any particular purpose.

Material—Polarstils are made of heavy cold rolled copper and brass with pure block tin interiors.

Notable Features—The valuable, exclusive features of these stills, which are recognized by chemists and engineers, are the result of over forty years' experience in all branches of water purification.

All gases and odors are automatically removed before raw water enters evaporator.

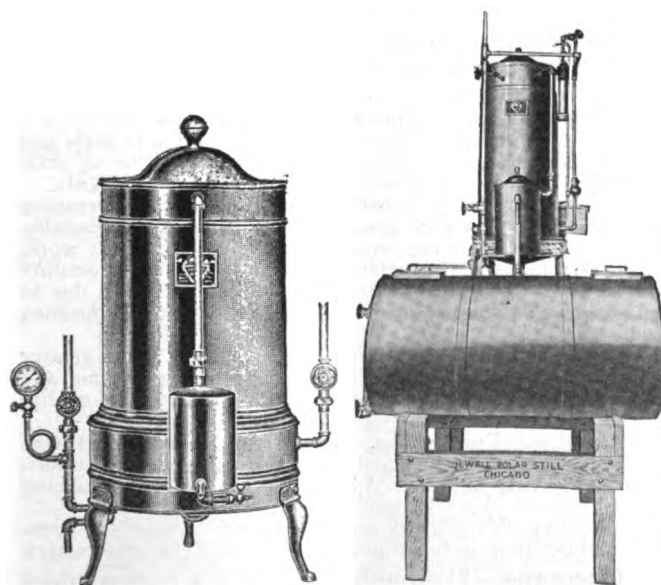
There are no condensing tubes to get "limed up" or "leaky."

All parts are easily accessible and interchangeable. Steam coil easily removed for cleaning.

Large plants may be operated in single or double effect. They conform to any building or piping arrangements.

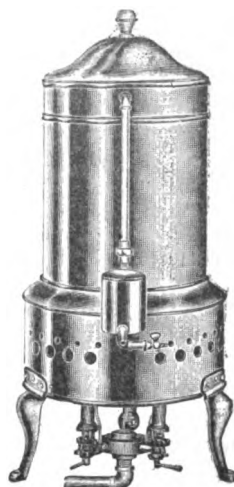
Industrial Water Distilling Plants.

Steam operated. Standard stock sizes 15 to 1000 gals. per hour. Larger plants designed and built on order. Compact, automatic and dependable installation.

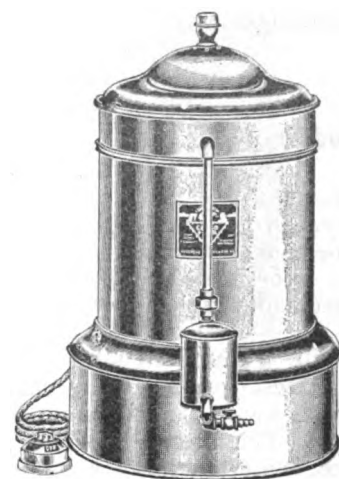


STEAM OPERATED LABORATORY TYPE POLARSTIL
Sizes: 2, 5 and 10 gals. per hour

POLARSTIL WITH STORAGE TANK
Sizes: 0 to 7



GAS OPERATED LABORATORY TYPE POLARSTIL
Sizes: 1, 2 and 3 gals. per hour.



ELECTRICALLY OPERATED LABORATORY TYPE POLARSTIL
Sizes: 1, 2 and 3 gals. per hour

tions with or without storage tanks. Write for list of users.

Drinking Systems.

Polarstils are being adopted by mills, factories, hotels, clubs, etc., to provide unquestionable water for drinking purposes. They remove all gases and odors. Washed and sterilized air aerates vapor within the still insuring perfect aeration.

Over 350 vessels are equipped with Polarstils. They may be installed in connection with any circulation and refrigerating system.

Data Required for Quotations; Catalogue.

In writing for quotations, please state amount of distilled water required per hour, or day of 10 or 24 hours; purpose water is to be used for. If laboratory type, whether steam, gas or electrically operated. If steam is available, state average pressure.

Send for complete catalogue on distilling equipment.

Some Prominent Users.

Bethlehem Steel Co., Sparrow's Point, Md.
Allegheny Steel Co., Brackenridge, Pa.
Becker Steel Co. of America, Charleston, W. Va.
Standard Oil Co., Whiting, Ind.
General Motors Corporation, Saginaw, Mich.
Pennsylvania Salt Mfg. Co., Wyandotte, Mich.
Battle Creek Sanitarium, Battle Creek, Mich.
Chicago & Eastern Illinois R.R. Co., Chicago, Ill.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Indiana Harbor, Ind.
French Lick Springs Hotel, French Lick, Ind.
Pickands, Mather & Co., Cleveland, Ohio
Pittsburgh Steamship Co., Cleveland, Ohio
Canadian Consolidated Rubber Co., Port Dalhousie, Ont.
Western Block Co., Lockport, N. Y.
University of Minnesota, Minneapolis, Minn.

THE PERMUTT COMPANY

TELEPHONE:
MADISON SQUARE 0965

Water Rectification

440 Fourth Avenue
New York, N. Y.

CABLE ADDRESS:
"PERMUTT NEW YORK"

BRANCH OFFICES

ALBANY, N. Y., 310 Journal Co. Building
BOSTON, MASS., 10 Milk Street
BUFFALO, N. Y., 304 Brisbane Building
CHATTANOOGA, TENN., 435 Volunteer State Building
CHICAGO, ILL., 208 South LaSalle Street

KANSAS CITY, MO., 401 Lathrop Building
LOS ANGELES, CAL., 404-5 Wright-Callender Building
MINNEAPOLIS, MINN., 1046 McKnight Building
PITTSBURGH, PA., 921 Union Arcade
PHILADELPHIA, PA., 311 Widener Building

AGENTS

HAMILTON, ONT., W. J. WESTAWAY, Main & McNab Streets
ST. LOUIS, MO., REEVES & SKINNER
MONTREAL, QUE., W. J. WESTAWAY, 400 McGill Building
MACHINERY Co., 2211 Olive Street

Products.

"PERMUTIT" ZEOLITE, LIME-SODA and HEATER WATER SOFTENERS, FILTERS and APPARATUS for the removal of iron, manganese and other mineral and organic matter, color, odor, objectionable gases and tastes. Patented in the United States, Canada and all other countries.



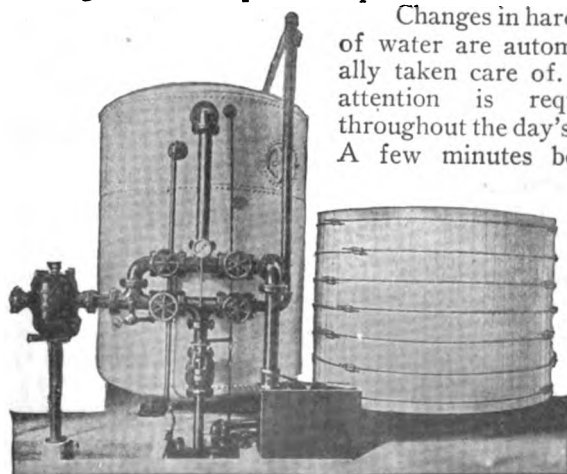
TRADE-MARK

Zeolite Water Softeners.

Description—The mechanical parts of a "Permutt" zeolite water softener are somewhat similar to a sand filter. The filtering medium, however, instead of being sand, is a synthetic exchange silicate, insoluble in water, which has the remarkable property of absorbing all calcium and magnesium from the water as it passes through the softener. The operation is entirely automatic—it requires no skilled attention. When the guaranteed amount of perfectly softened water has been realized, the "Permutt" is easily regenerated or restored to its original efficiency by introducing a solution of common salt. This solution remains in contact with the "Permutt" a few hours, and is partially recovered for further use. There is no sludge of any character to contend with. The cost of operation is extremely low, because apparatus is supplied which reclaims a large portion of the salt previously used.

Operation—"Permutt" zeolite water softeners, as conditions demand, are either of the pressure or gravity type. They are designed to deliver water in any desired capacity and to operate over any working period. The cycle of their operation permits of regeneration without interfering with the required output of softened water.

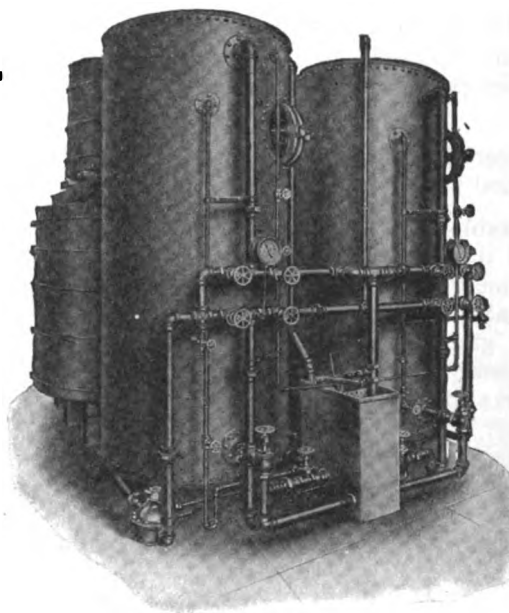
Changes in hardness of water are automatically taken care of. No attention is required throughout the day's run. A few minutes before



ZEOLITE STEEL PRESSURE WATER SOFTENER

Delivers 65,000 gals. of zero water daily from an original supply containing 11 grains of hardness per gal.

SWEET'S CATALOGUE



ZEOLITE STEEL PRESSURE WATER SOFTENING UNIT
CONNECTED FOR CONTINUOUS 24-HOUR SERVICE

and after regeneration is all the operating time required. A "Permutt" softener may be installed under any pressure. Loss of head through softener is about 3 lbs.

Advantages—Water softened by "Permutt" is ideal for industrial and domestic purposes. It obtains results.

IN BOILER HOUSES—Entire prevention of scale, sludge and mud. Elimination of the burning out of tubes due to scale and mud. Elimination of expensive boiler cleaning, due to scale and mud. Important fuel saving, 10% to 20% and upwards.

IN WASHROOMS, LAUNDRIES, ETC.—Soap saving averaging more than 50%. An even greater saving in soda. Appreciable saving in fuel. Great improvement in the quality of the work.

IN DYE HOUSES—Important saving in dye stuffs. Certainty of absolute matching of shades. Elimination of claims due to faulty dyeing. Improvement in feel and luster of finished goods.

WOOL-SCOURING—Very large soap saving. Even greater savings in soda and alkali. Important reduction in time and mechanical operation. Valuable improvement in feel and quality of wool.

BLEACHING—Pure whites, without spots. Greatly increased tensile strength and softness. Dependable uniformity of results. Important saving in time. Appreciable economy of bleaching agents.

FINISHING—Very great savings in soap. Important economy in time. Improvement in feel and luster. Uniform results.

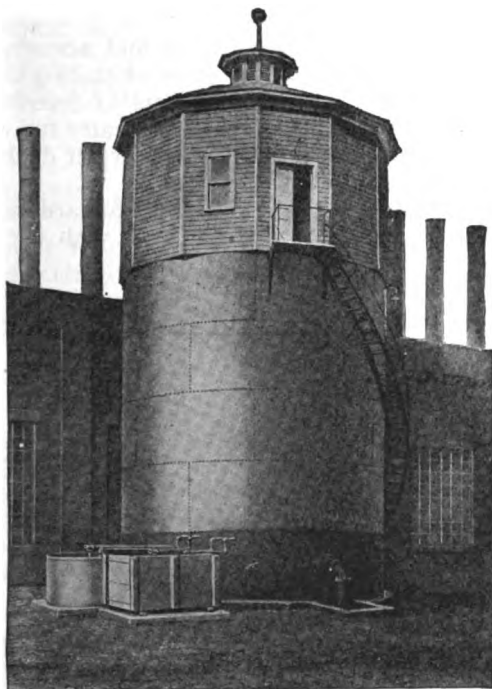
Guarantee—"Permutt" softeners are guaranteed to deliver for the manufacturing use of the purchaser 100% of the stipulated capacity, of neutral, clear water of zero hardness. It is guaranteed that scale, sludge or

Continued on next page

mud will not form or deposit in boilers or their connections when fed with the softened water.

Lime-soda Softeners.

These are built in continuous and intermittent types. A competent staff of engineers and chemists is available for studying local conditions regulating the choice of types that will adequately satisfy the require-



"PERMUTIT" LIME-SODA EQUIPMENT AT A LARGE OIL REFINERY

ments of any particular installation. Special and standard apparatus is built for any capacity.

Application—"Permutit" lime-soda water softeners are applied for softening boiler feed water and water required for industrial and municipal purposes.

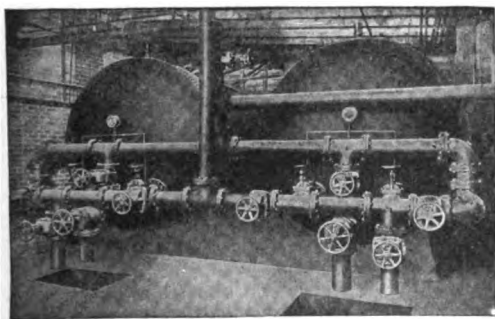
Types and Sizes—Either wood or steel equipment is available and the chemical feed can be operated from either the ground level or from the top of tanks.

Heater Lime-soda Softeners (Hot Process).

The "Permutit" heater softener is built to satisfy varying conditions and for any capacity. It can be used in connection with feed water heaters now installed.

Application—The "Permutit" heater softener is principally used for softening boiler feed water and for special industrial water requirements.

Types and Sizes—The heater softener is built for any capacity; its type consists normally of a steel settling tank over which is located the heater, so providing for flow of the heated water to the settling tank by gravity.



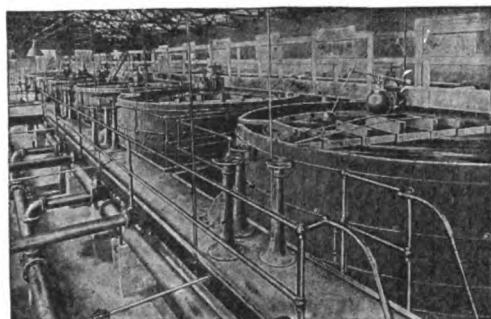
"PERMUTIT" HORIZONTAL STEEL PRESSURE CLARIFYING FILTERS

With a daily capacity of 25,000 gals.

Iron and Manganese Removal Plants.

"Permutit" iron and manganese removal plants are provided in any capacity and the choice of the type of plant is governed by the quantity of the water to be treated, the amount and the character of its iron content and local conditions. Mechanical and chemical equipment are used singly or in combination; use being made of "Permutit" aerators, chemical feeding devices, settling tanks, and iron removal oxidized filters, etc. A special zeolite is frequently applied for this service.

Application—These plants are furnished to provide "iron free" water, for boiler feed, industrial and municipal purposes.



"PERMUTIT" WOOD GRAVITY FILTRATION PLANT

With a daily capacity of 3,000,000 gals.

Filters and Filtration Equipment.

Industrial sizes of "Permutit" filters, both pressure and gravity types, and filtration equipment for industrial and municipal requirements, are available in any size and in many types. Chemical dosing apparatus required in filtration is available in any size and type indicated by local requirements.

Filter Types and Sizes—For industrial or boiler feed purposes, either steel pressure filters, or wood and steel gravity filters, are built in standard types and sizes. Special equipment is available to satisfy special requirements.

Design.

Shells of filters are conservatively designed and carefully constructed. The company has perfected excellent filter operating facilities and strainer systems, which, with careful selection of the filtering medium, guarantee maximum beneficial results.

Application.

Suitable for clarifying boiler feed and industrial waters for practically any purpose.

Operation.

The maintenance and operation of these filters are minimum, since the least possible amount of labor is required to properly operate them, and special designing has developed equipment that requires minimum wash water.

Filtration Equipment—Either wood, steel, or concrete filter units and filtration equipment are offered to satisfy local demands together with the desired control and chemical apparatus. A careful investigation and survey is made of the site and controlling conditions, to guarantee the application of types and sizes of equipment that will most accurately and economically fulfill the desired requirements.

Service.

A competent staff of water rectification engineers and sanitary experts is always available for consultation. Inquiries are welcomed and will receive prompt and careful attention.

PITTSBURGH FILTER & ENGINEERING CO.

PITTSBURGH, PA.

BRANCH OFFICE: KANSAS CITY, MO.

WORKS: OIL CITY, PA.

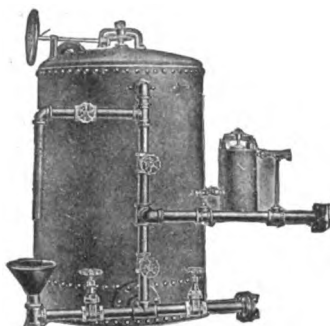
Products.

Manufacturers of PRESSURE FILTERS; GRAVITY FILTERS; SWIMMING POOL FILTERS; WATER SOFTENING PLANTS.

Also manufacturers of Feed Water Heaters; Equipment for Purification Plants: Gages, Operating Tables, Controllers, Chemical Feed, Hypo Feeding Devices, Sample Tables, Liquid Chlorine and Dry Feed Machines.

Pressure Filters.

Vertical Types—The standard vertical type is most desirable for smaller quantities of water, such as required by hotels, laundries, boiler plants, mills, etc., rendering the most turbid waters clear and sparkling. Built of steel, in capacities of from 6,000 to 150,000 gals. per day; strainers of bronze screen; alum feed cup is furnished for supply pipe, and the best grade of filtering sand supplied. Either with or without agitator, as may be desired; but the agitator is recommended where water to be filtered carries a great amount of suspended matter.



STANDARD PRESSURE FILTER, VERTICAL TYPE

A line of vertical cast iron filters, without stirring devices, is especially adaptable to waters that do not carry a continually large amount of heavy clay in suspension. They range in size from 14 to 78 in., and in capacities from 5,000 to 200,000 gals. per day.

Horizontal Type—Capacities range from 200,000 gals. per day up. Diameter of all sizes is 8 ft., the length varying with the capacity. Equipped with the manifold screen system as used in the gravity filters, and furnished with a central wash trough. Either with or without the air system of agitating, as may be desired.

DATA, STANDARD PRESSURE FILTERS, VERTICAL TYPE

No.	Size		Space	Connections			U. S. gallons capacity			Weight, lbs.	
	Diam., in.	Height, ft.	Floor room required, ft.	Inlet and outlet, in.	Wash, in.		Minute	Hour	Day 24 hrs.	Filter and connections	Filtering material
1	20	4½	2 x 3	1	1½	4½	270	6,500	800	600	
2	24	4½	2½ x 3½	1½	1½	6	360	8,500	1,000	800	
3	30	4½	3 x 4	2	2	10	600	14,500	1,500	1,200	
4	36	5½	3½ x 4	2½	2½	14	850	20,500	2,000	1,800	
5	42	6	4 x 4½	3	3	19	1,140	27,500	2,400	2,600	
6	48	6	4 x 5	3	3	25	1,500	36,000	2,600	3,000	
7	54	6½	4½ x 5½	3½	3½	32	1,900	46,000	3,400	4,000	
8	60	7	5 x 6	4	4	40	2,400	58,000	4,200	5,000	
9	72	7½	6 x 7½	5	5	56	3,350	80,000	5,400	7,000	
10	84	8	7½ x 8½	6	6	77	4,600	110,000	7,200	9,600	
11	96	8	8 x 10	6	6	100	6,000	144,000	9,600	12,500	

Test: 100 lbs. per sq. in.

Gravity Filters.

Built in sizes from 5 to 20 ft. in diameter, of wood or steel, and are most suitable for small cities, hospitals, public institutions, paper mills, etc. They are equipped

with the manifold screen system and screens. The design of these screens and system of placing them are the result of exhaustive experiments to determine the most thorough and economical use of water for washing purposes, and to secure the nearest perfect draft on all parts of the bed in filtering.

Filters are furnished with the standard rake agitator operated by gears and belts, or with the system of air agitation.



WOOD TANK GRAVITY FILTER, AIR WASH

DATA, STANDARD GRAVITY FILTERS, WOOD OR STEEL

No.	Size		Connections			U. S. gallons capacity			Weight, lbs.	
	Diam., ft.	Height, ft.	Inlet, in.	Outlet, in.	Wash, in.	Minute	Hour	Day 24 hrs.	Filter and connections	Filtering material
1	5	8	2½	2½	4	40	2,400	58,000	4,500	7,200
2	6	8	3	3	6	56	3,350	80,000	5,500	9,800
3	7	8	3	3	6	77	4,600	110,000	6,500	13,200
4	8	8	4	4	6	100	6,000	144,000	7,500	17,500
5	10	8	5	5	8	156	9,400	225,000	9,000	27,000
6	12	8	6	6	8	225	13,500	325,000	13,000	39,000
7	15	8	8	8	8	350	21,000	500,000	18,000	60,000
8	17½	8	10	10	10	480	28,800	690,000	24,000	84,000
9	20	8	12	12	12	628	37,600	900,000	30,000	109,000

Concrete filters built to sizes required.

Swimming Pool Filters.

A special line of filters is manufactured for swimming pool work for both private and public institutions. Prices furnished on application.

Water Softeners.

Both the intermittent and continuous process plants, for either hot or cold water; of steel, wood, or concrete; of any capacity from a few thousand gallons a day to millions of gallons.

Municipal Filter Plants.

The PITTSBURGH FILTER & ENGINEERING CO. are prepared to build complete, or equip, plants of any desired capacity, in the shortest time, and at lowest cost consistent with good workmanship and material. They are ready to assume the entire responsibility and deliver a completed plant, ready for daily operation, and one producing the purest water obtainable.

Long and varied experience enables this company to design plants to meet any peculiar local condition, and at the least cost for installation and operation.

THE REFINITE COMPANY

Water Rectification

REFINITE MINERAL FACTORY,
ARDMORE, S. D.

OMAHA, NEBR.

EQUIPMENT ASSEMBLING PLANT,
OMAHA, NEBR.

MEMBER ASSOCIATED MANUFACTURERS OF WATER PURIFYING EQUIPMENT

CHICAGO BRANCH (Special Display Sales Rooms), 908 South Michigan Avenue

NEW YORK, N. Y., 1116 National Association Building

MINNEAPOLIS, MINN., 703 Plymouth Building

ATLANTA, GA., 320 Hurt Building

ST. LOUIS, MO., Boatmen's Bank Building

CINCINNATI, OHIO, 410 Traction Building

SAN FRANCISCO, CAL., 419 Call Building

SPOKANE, WASH., 1015 Old National Bank Building

LOS ANGELES, CAL., 303 Story Building

Products.

REFINITE (ZEOLITE) WATER SOFTENERS.

BOOTH LIME-SODA WATER SOFTENERS.

REFINITE RAPID PRESSURE FILTERS.



Nature's Water Softener
Copyright 1920—The Refinite Company

Lime-soda Water Softeners.

Continuous gravity type, using milk-of-lime and soda ash. Standard and our conical tank types. Sizes to suit individual needs. Used by railroads, municipalities and larger steam power and central heating plants to prevent boiler scale.

Advantages—First softener built with continuous feeding and proportional regulation of chemicals accomplished at ground level. Size of sedimentation tank allows ample time for softening and clarifying. Large softening tank. Chemical reagent tank holds supply for 12-hour run at maximum speed; agitators prevent lime from settling. Chemical feed regulator controlled by flow of incoming water, and measures uniform amount of chemical solution regardless of fluctuations in supply or use of water. Operating power obtained from incoming water passing over an overshot wheel or from electric motor or gas engine.

Refinite (Zeolite) Water Softener.

The Refinite system consists of a tank containing a bed of softening agent, Refinite Mineral; necessary piping and inlet and outlet valves, water meter and brine tank. It attaches to the cold water supply line. Various sizes. Horizontal and upright styles.

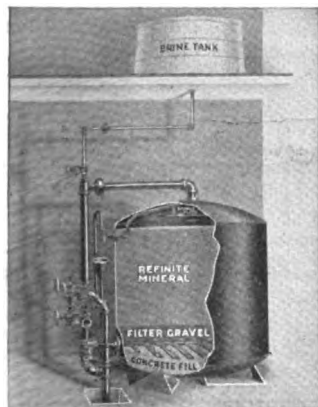
Refinite, nature's own water softening mineral, has the property of exchanging sodium for the calcium and magnesium present. Through this exchange action water is softened as it passes downward through the mineral bed. The sodium component when exhausted, is replenished by allowing common salt water from the brine tank to remain in the container overnight. The brine is flushed out the following morning and the mineral is again ready for a capacity run. No expert supervision required. Operation cost very low.

The necessary size of each installation is determined by the hardness of the water and the amount required in a 10-hour period. Two or more containers or units may be connected in one installation. Designed to deliver water of no hardness, in the quantity desired, regardless of variations in hardness of the raw water.

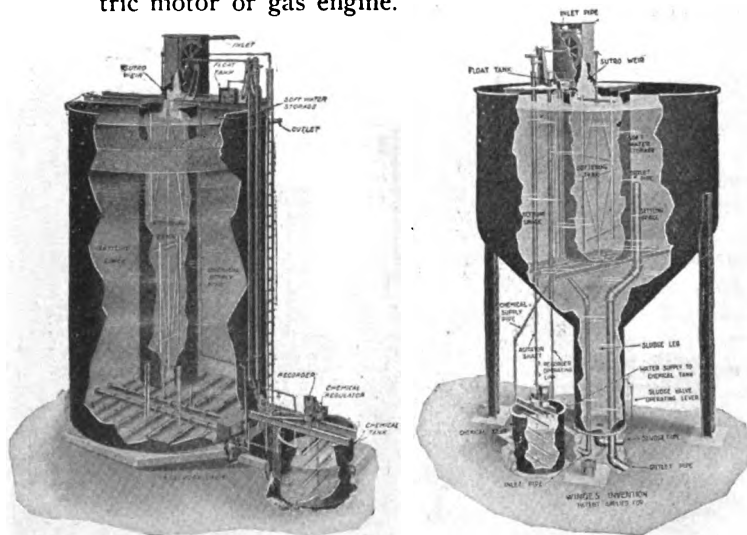
Advantages—In textile mills Refinite soft water saves on dyestuffs and makes fast vat dyeing possible; greatly improves the feel and luster of the finished products; saves fully 35% of the soap in degumming of silk and scouring of wool. Quickens production.

In laundries it saves more than half the washroom supplies; improves appearance of wash and prevents boiler scale. Used for same purpose in laundry departments of hotels, hospitals and institutions.

Desirable for bath and shampoo. Used in hotel guest rooms, beauty parlors, hair dresser and barber shops, and private homes. Prevents boiler scale in dishwashing machines, makes silver and glass cleanse and polish easier. Ice manufacturers, food factories, soft drink bottlers, and tanneries find it better than hard water.



SECTIONAL VIEW OF
REFINITE WATER SOFTENER



BOOTH LIME-SODA WATER SOFTENERS

Refinite Rapid Pressure Filter.

Sand-and-gravel type. Three styles. Sizes to suit individual needs. Used for removal or reduction of impurities and substances other than calcium and magnesium.

Guarantees, Literature.

Each Refinite or Booth installation is built and installed to give absolute satisfaction, to accomplish definite results at a definite cost, and each sale is conditioned upon the apparatus fulfilling these guarantees. A staff of competent chemists and engineers is maintained to work with prospective purchasers. Analyses of water and recommendations as to sizes, etc., are made by us without charge.

Full descriptive literature furnished on request.

ROBERTS FILTER MANUFACTURING CO.

DARBY, PA.

KANSAS CITY OFFICE, Mutual Building

NEW YORK OFFICE, Flatiron Building

Products.

CAST IRON and STEEL VERTICAL PRESSURE FILTERS.
STEEL HORIZONTAL PRESSURE FILTERS.

WOOD TANK GRAVITY FILTERS; CONCRETE GRAVITY FILTERS.

Also manufacturers of Water Softening Apparatus.

Slogan.

Water Fit For Use.

Co-operative Service.

We make a specialty of water works engineering problems which can not be covered by our standard apparatus. Recommendations will be made, plans prepared, and estimates submitted if you will acquaint us with the details of the water difficulty. Wherever conditions justify, an expert will be sent to investigate water works systems and to collect data necessary for determining the proper remedies. This service is intended to co-operate and not to conflict with the work of any representative or engineer appointed by the prospective purchaser.

How to Specify Roberts Filters.

Filters should be specified either by the inside diameter of the unit or by a stated per minute capacity at a definite rate of

filtration expressed in gallons per minute per square foot of filtering area.

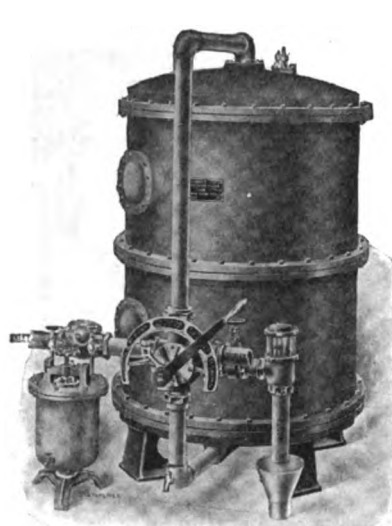
The rate of filtration that may be safely employed in a given case is determined by two factors: first, the character of the raw water, and second, the quality of the filtered water desired. When bacterial efficiency and complete clarification are desired a 2-gal. unit rate is the maximum. For clarification of a turbid water use a 2-gal. rate. If the water is already fairly clear, a 3- or 4-gal. rate may be used. In the purification of water for swimming pools, the 3-gal. rate is usually employed.

In a pressure filter installation always specify the maximum pressure to which the filters will be subjected in operation.

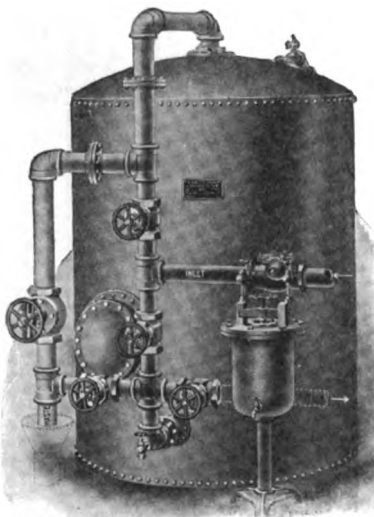
When asking for recommendations as to proper treatment for filtration or other water purification problems submit either a sample of water or an analysis covering the following points: turbidity, color, erythrosine alkalinity (as CaCO_3); phenolphthalein alkalinity; incrustants (as CaCO_3); magnesium (as Mg); iron (as Fe).

Roberts Standard Vertical Pressure Filters.

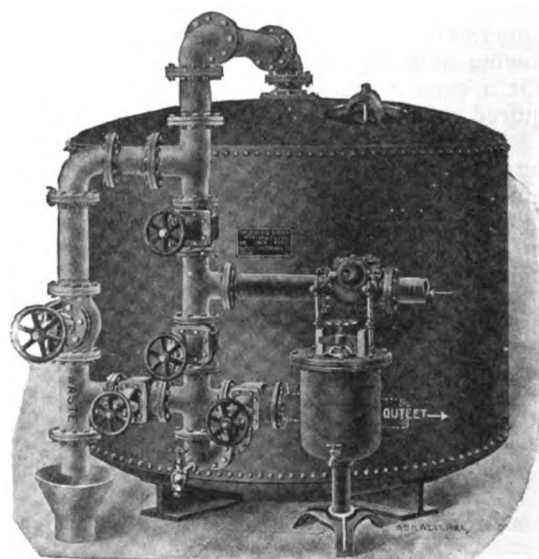
The style "E" filter illustrated below is constructed of cast iron and is capable of withstanding working pressures up to 60 lbs. per sq. in. The styles "H" and "L," also shown, are constructed of steel and are designed either for 60 or 100 lbs. per sq. in. working pressure. All filters are furnished substantially as shown in the illustrations; with full charge of filtering material, immediate filter pipes, valves and fittings, and pressure coagulant feeding device.



Style "E"



Style "H"



Style "L"

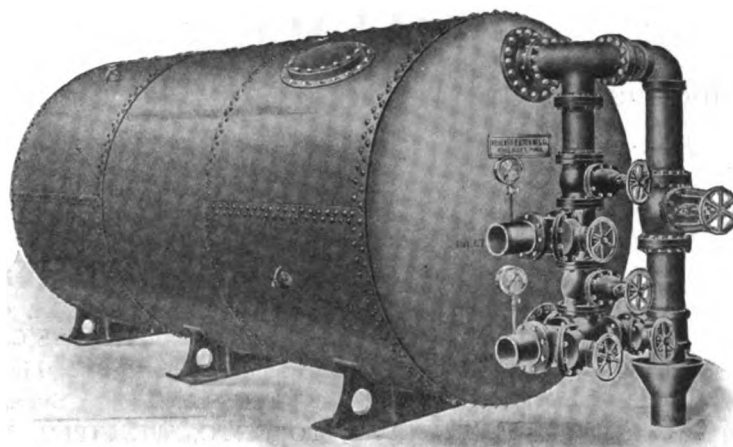
ROBERTS STANDARD VERTICAL PRESSURE FILTERS

Size	Style	Filtering area, sq. ft.	Capacities, 2- and 3-gal. rates				Height over all, in.	Floor space, ft.	Inlet and outlet, in.	Waste, in.	Shipping weights, lbs.				
			Minute	Hour	24 hours						Shell	Pipe and parts	Sand and gravel		
12	E	.78	15	23	94	140	2260	3360	58	3 x 2½	1	1¼	290	99	290
16		1.39	28	42	167	250	4010	6000	63	3 x 3	1	1¼	423	104	530
20		2.19	44	66	263	394	6320	9460	64	3 x 3	1	1¼	652	111	830
24		3.14	63	94	377	565	9050	13550	64	3¼ x 3	1¼	1½	880	140	1190
30		4.91	98	147	589	884	14150	21300	74	4½ x 3	1½	2	1338	363	1850
36		7.07	141	212	848	1273	20360	30600	76	5 x 3½	2	2½	1880	451	2660
42	H	9.62	192	289	1154	1732	27700	41600	78	6 x 4	2	2½	3508	521	3630
48		12.56	251	377	1508	2262	36200	54300	79	6¼ x 5	2½	3	4827	702	5120
30		4.91	98	147	589	884	14150	21300	73	4½ x 4	1½	2	1300	269	1730
36		7.07	141	212	848	1273	20360	30600	75	5 x 4	2	2½	1530	355	2480
42		9.62	192	289	1154	1732	27700	41600	76	5½ x 4	2	2½	1992	357	3630
48		12.56	251	377	1507	2262	36200	54300	77	6¼ x 4½	2½	3	2439	474	4720
54	L	15.90	318	477	1908	2862	45800	68800	78	6¾ x 5	2½	3	3336	474	5970
60		19.63	393	589	2356	3533	56500	84800	79	7 x 5½	2½	3	3918	474	7370
72		28.27	565	848	3392	5089	81500	122100	94	8½ x 6½	3	4	3700	840	10610
78		33.17	663	995	3980	5971	95500	143300	96	9 x 7	3	4	4100	882	12450
84		38.48	769	1154	4618	6924	110900	166200	98	10 x 7½	4	5	4700	1284	14450
96		50.26	1005	1508	6030	9048	144800	217000	100	10½ x 8½	4	5	5400	1375	18860

Roberts Horizontal Pressure Filters.

These filters are constructed of steel and designed either for 60 or 100 lbs. per sq. in. working pressure. They are furnished with full charge of filtering material, immediate outside pipes, valves and fittings, and pressure coagulant feeding device. The shells are tested to hydrostatic test pressure 50% in excess of that under which they are intended to operate. All external piping is standard wrought pipe with cast iron flanged and screwed fittings. All valves are of the gate pattern, double disk, wedge type, with iron body and bronze mountings, except on the waste line, which is of the globe type.

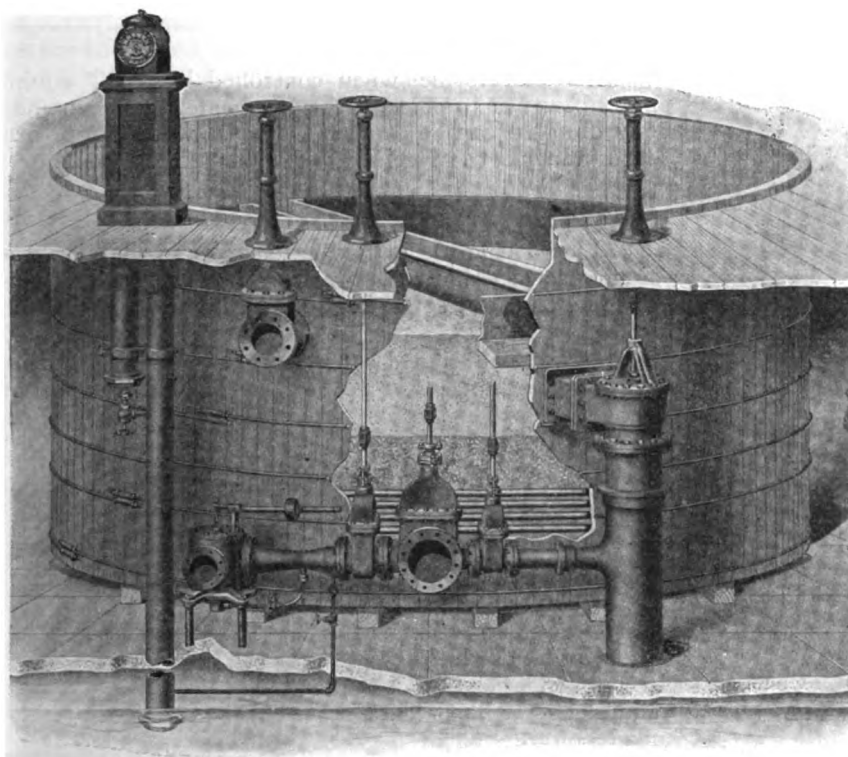
Pressure gauges are furnished on raw water influent and filtered water effluent pipes. Supporting cradles are of heavy cast iron.



ROBERTS HORIZONTAL PRESSURE FILTER

DATA, ROBERTS STANDARD HORIZONTAL PRESSURE FILTERS

Size		Filtering area, sq. ft.	Capacities, 2- and 3-gal. rate				Inlet and outlet, in.	Waste, in.	Shipping weights, lbs.				
Inside diam., ft.	Over all length, ft.								Shell	Pipe and parts	Sand and gravel		
			Minute	Hour	24 hours								
8	10	65	129	194	7750	11620	185760	278640	6	6	8210	2725	29500
8	12	79	157	235	9420	14100	226080	339120	6	6	9310	2884	36000
8	14	93	185	278	11100	16650	266400	399600	6	8	10810	3300	42000
8	16	107	213	320	12800	19200	306720	460080	6	8	12810	3539	48000
8	20	135	269	404	16150	24200	387360	581040	6	8	14215	3993	60000
8	25	170	339	508	20350	30500	488160	732240	8	10	17215	6505	72000



ROBERTS WOOD TANK GRAVITY FILTER

Roberts Gravity Filters.

The illustration represents the standard wood tank high rate wash gravity filter unit such as is commonly employed in industrial installations and the smaller and more temporary municipal plants. They are usually operated, however, in conjunction with a wood tank settling basin. The type of filter shown is furnished complete with manifold and strainer system, filtering material, circumferential and cross wash troughs, immediate pipes, valves and fittings, rate controller and indicating loss of head gauge. The valves are operated by means of hand wheels with floor stands and extension stems.

Wood tank gravity filters may also be equipped with mechanical agitator. When this type is desired, full particulars will be sent on request.

Standard designs for concrete plants will be submitted on request.

DATA, ROBERTS STANDARD WOOD TANK GRAVITY FILTERS

Inside diam., ft.	Filtering area, sq. ft.	Capacities, 2- and 3-gal. rate					Pipe sizes, in.					Strainer system		Shipping weights, lbs.			
		Minute		Hour	24 hours		Influent	Effluent	Wash	Waste	Rewash	Manifold, in.	Lateral, in.	Tank	Pipe and parts	Sand and gravel	
6	2827	56	84	3260	5040	77600	121000	4	4	4	8	3	4	1 1/2	2000	2840	10600
8	5026	100	150	6000	8000	144000	272000	4	4	6	8	3	6	1 1/2	3000	4050	18848
10	7854	157	235	9430	14100	226000	339000	6	4	8	10	3	8	1 1/2	4000	5484	29453
12	11310	230	345	13800	20700	335000	500000	6	4	8	10	4	8	1 1/2	5000	5920	42413
14	15394	310	460	18600	27600	450000	660000	8	6	10	12	4	10	1 1/2	6000	7500	57728
15	17671	350	530	21000	32000	500000	750000	8	6	10	12	4	10	1 1/2	7500	7800	66267
16	20106	400	600	24000	36600	580000	860000	8	6	12	14	4	12	1 1/2	9000	9000	75398
17	22698	450	680	27000	40000	650000	1000000	8	6	12	14	4	12	1 1/2	10000	9300	85118

WALLACE & TIERNAN CO., INC.

Chlorine Control Apparatus for Water and Sewage Purification, Bleaching and Industrial Work

MAIN OFFICE AND FACTORY
NEWARK, N. J.

BRANCH SALES OFFICES

ATLANTA, GA.

DALLAS, TEX.

PITTSBURGH, PA.

CHICAGO, ILL.

KANSAS CITY, MO.

SAN FRANCISCO, CAL.

BRITISH OFFICE: UNITED WATER SOFTENERS, LTD., 20-22 Lincoln's Inn Fields, LONDON, W. C. 2, ENGLAND

CANADIAN REPRESENTATIVES: GENERAL SUPPLY COMPANY OF CANADA, LTD., OTTAWA,

MONTREAL, TORONTO, WINNIPEG, VANCOUVER, NORTH BAY

Products.

CHLORINE CONTROL APPARATUS and APPLIANCES for water and sewage purification and swimming pool sanitation.

Processes and Apparatus for bleaching paper, textiles, and shellac; for maturing flour; for chemical process; for mineral separations; deodorizing, etc.

Chlorine Solution Injectors and Pumps, Special Automatic Valves for application of chemical solutions, Valves, Gauges, etc., for corrosive gases and solutions. Compressed Gas Cylinder Valves.

Apparatus to manufacture Dakin's Hypochlorite Solution from Liquid Chlorine.

Special Apparatus to apply, control, measure, and proportion gases.

Portable Bacteriological Testing Apparatus, Air-sampling Devices.

Portable Motor Truck Mounted, Water Purification and Laboratory Equipment.



TRADE-MARK

treating water supplies, ranging from a few thousand gallons per day up to installations with a total capacity of one billion gallons daily, as installed by WALLACE & TIERNAN CO., INC., for cities such as New York, Chicago, Philadelphia, etc.

Types and Capacities of Equipment.

There are 20 different types of W&T equipment, with capacities ranging from 1/100 lb. of chlorine per day, upwards. Either manual or automatic equipment is available.

Operation and Cost.

Liquid chlorine, when controlled by W&T equipment becomes so efficient that the water supply of any city or town can be protected against water-borne diseases at a cost of from 17¢ to 50¢ per million gals.

Sewage and Trade Wastes.

Liquid chlorine is used extensively in the sterilization of sewage and trade wastes. It is particularly recommended where sewage is discharged into streams used as water supplies.

Liquid chlorine is the most effective sterilizing agent for tannery wastes, where the destruction of specific organisms, such as the anthrax spore, is required by law.

Liquid chlorine controlled by W&T equipment is applicable to any problem of sterilization or disinfection, bleaching or industrial use.

Quotations and recommendations on equipment will be made on receipt of details. Send for information blank.

Literature.

A full set of technical publications describing the various phases of chlorination and W&T equipment is available, and will be sent on request.

General Use.

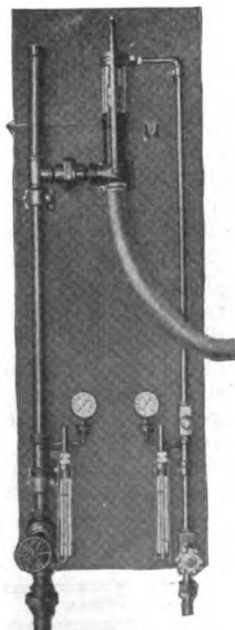
W&T chlorine control apparatus and appliances are used to introduce liquid chlorine into water or sewage to effect bacteriological purification and destroy typhoid and all other water-borne disease germs. Used extensively by municipalities, swimming pools and by industrial plants. Also used for bleaching paper and textiles, for maturing flour, chemical processes, oxidation, deodorization, etc.

About Chlorine.

Pure chlorine compressed in cylinders is now recognized as the most efficient sterilizing agent for water and sewage. In its liquid state it replaces chloride of lime so largely used in the past for this purpose.

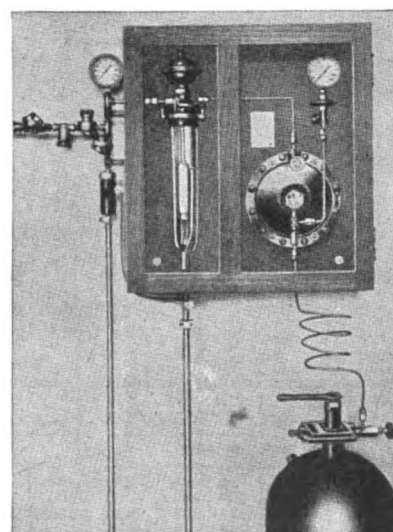
Liquid chlorine has come into general use in these fields through the development by this company of suitable apparatus for its control and application.

There are now thousands of installations of W&T apparatus



W&T CHLORINE CONTROL APPARATUS FOR BLEACHING

When used for bleaching is more economical than bleaching powder and gives a better color and stronger fiber



W&T MANUAL CONTROL CHLORINATOR
Solution Feed Type MSA

ATEN SEWAGE DISPOSAL CO.

286 Fifth Avenue
NEW YORK, N. Y.

TELEPHONE CONNECTION

Products and Services.

ATEN SANITARY SEWAGE DISPOSAL SYSTEMS, adapted to single buildings or groups of buildings unable to connect with city sewers.

The following special parts are required: Combination Form and Reinforcement for Concrete Walls, allowing a reinforced concrete wall to be built without the use of wooden or other auxiliary forms; Cast Iron Manhole Collars and Covers; Metal Tops for Concrete Roof; Automatic Sewage Siphon; Cast Iron Diverting Gate Chamber; Double Porous Disposal Tile; special Y Distributing Branches; special Septic Tank connecting pipes and vents.

Special reports and designs are rendered on sewage disposal problems for buildings, municipalities, factories, etc. Recovery of valuable constituents from manufacturing trade wastes investigated from a chemical and engineering standpoint, and designs and reports submitted for plants where it is necessary to produce efficient results.

Cost estimates will be furnished for systems using Aten materials, and where sufficient data or topographic maps are submitted, details of location and a general layout of the system will be supplied at no cost to the inquirer. When materials are ordered construction specifications are supplied so that complete systems can be installed by inexperienced labor. Materials furnished by this company can also be used in plants designed by other engineers.

Designs.

For smaller systems handling domestic sewage, the design advocated by the ATEN SEWAGE DISPOSAL CO. follows that recommended by leading state boards of health,



TRADE-MARK

providing septic tanks for settling and digesting solids, and disposing of the effluent by intermittent filtration through the soil by means of percolating tile lines. No chemicals are used. By installing an Aten system all the sanitary comforts of a modern city building are obtained, and free use can be made of toilets, sinks, bathtubs and similar fixtures.

Catalogue 15, giving description of systems, operation, and other useful information, sent free on request.

Guarantee.

Aten systems are guaranteed, and assurance of their efficient operation is based on years of successful experience with them.

Partial List of Aten Users.

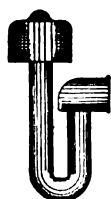
Engineers Club, Roslyn, N. Y.
Thos. Hastings, Architect, Carrere & Hastings, Old Westbury, N. Y.
Saito Shozo, Tokyo Office, Builder, Osaki Sta., Tokyo, Japan
M. Van Geisen, Merchant, Soerbaya, Java
Wm. F. Schlemmer, Hammacher & Schlemmer, Tools, Great Neck, N. Y.
E. P. Charleton, Manager Woolworth Stores, Westport Harbor, Mass.
Fred Ruchti, Engineer, American Bridge Co., Gary, Ind.
Blind Brook Club, Port Chester, N. Y.
Nazareth Trade School, Farmingdale, N. Y.
Camp Merritt Inn, Camp Merritt, N. J.
Isolation Hospital, Perth Amboy, N. J.
Holyoke Canoe Club, Holyoke, Mass.
Wm. L. Lyall, Pres. Brighton Mills, Passaic, N. J.
C. S. Stolp, Contractor and Builder, Ellendale, N. Dak.



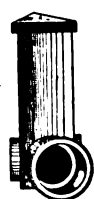
SHEET METAL TOPS
FOR CONCRETE
ROOFS OF TANKS



CAST IRON MANHOLE
COLLAR



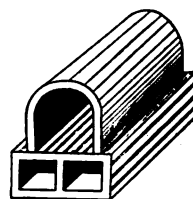
AUTOMATIC
SEWAGE
SIPHON



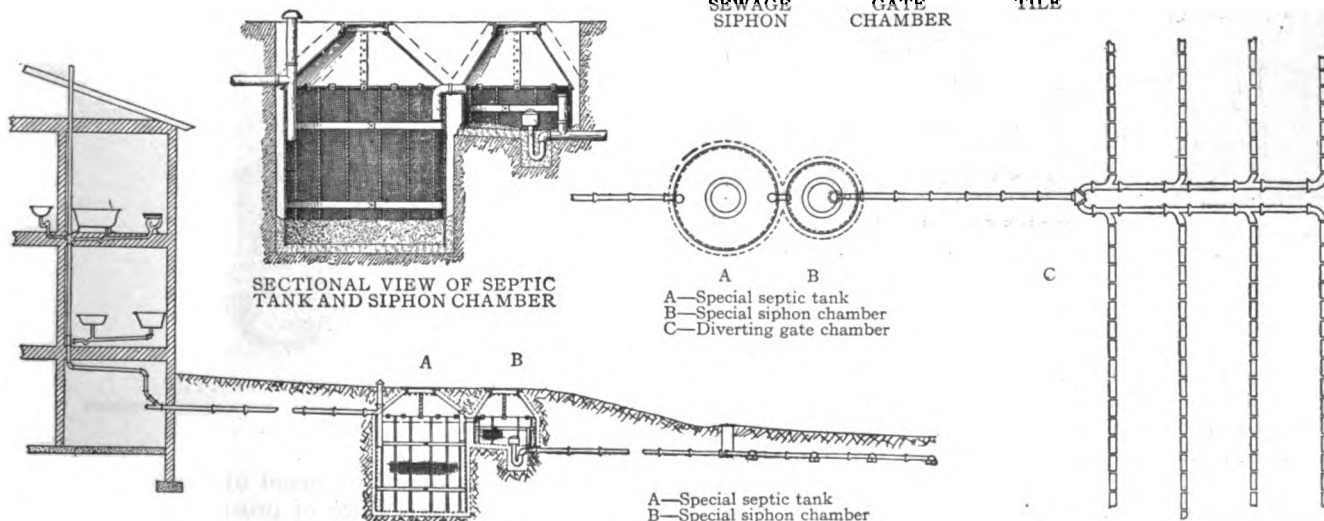
DIVERTING
GATE
CHAMBER



Y-BRANCH
TILE



DISPOSAL TILE



ELEVATION SHOWING INSTALLATION OF ATEN SANITARY SEWAGE DISPOSAL SYSTEM AND A FEW ACCESSORIES

ARRANGEMENT OF TANKS AND TILE FIELDS

CEMENT PRODUCTS COMPANY

Manufacturers of Portable Sewage Disposal Systems

WILMINGTON, N. C.

BRANCH OFFICES

NEW YORK, N. Y., 39 Cortlandt Street
 OMAHA, NEBR., 602 Paxton Block
 SEATTLE, WASH., 14 Haller Building
 BOSTON, MASS., 25 Huntington Avenue

PITTSBURGH, PA., Oliver Building
 CHICAGO, ILL., Standard Oil Building
 ATLANTA, GA., 31 Peachtree Arcade
 BALTIMORE, MD., 713 American Building

FACTORIES AT WILMINGTON AND CHICAGO

Products.

"SANISEP" PORTABLE SEWAGE DISPOSAL SYSTEMS, for industrial and mining villages, residences, hotels, schools, etc.



TRADE-MARK

What "Sanisep" Systems Will Do and How.

"Sanisep" systems offer an economical means of disposing of all sewage as completely and effectively as if connected with city trunk line sewers.

"Sanisep" does not use chemicals. By simple, automatic process, all solid matter is disintegrated under water in one-piece, leakproof cement containers. Cement is used because it is immune from the rust and corrosion which attack metal.

The drainage from the tank, being clear water, passes off into a bed of cinders or other loose material. It may be used effectively as irrigation beneath a flower bed. This seepage will not pollute soil or contaminate adjacent water.

The entire system is installed out of sight below ground. It is odorless, flyproof, and absolutely sanitary.

The tanks are built in various capacities.

The type most strongly recommended is the one connecting with ordinary plumbing and running water (any

afford an economical, effective installation.

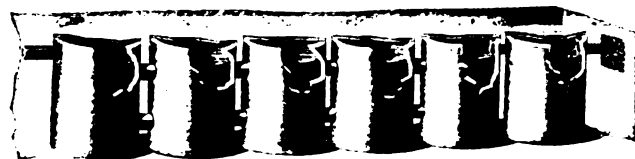
As many tanks as are needed can be coupled together. "Sanisep" grows with the village. As the community becomes larger add more tanks to the "Sanisep"

battery and enlarge the nitrification bed.

The system can be expanded to take care of a fairly large community.

The list below includes a few of the large mining companies making use of "Sanisep:"

Berwind-White Coal Co.; Bessemer Coal & Coke Co.; Central Pocahontas Coal Co.; Clinchfield Coal Corporation; Consolidation Coal Co.; Corrigan McKinnery Co.; H. C. Frick Coke Co.; Greensburg Connellsville Coal & Coke Co.; Hillman Interests; Jamison Coal & Coke Co.; Lehigh Coal & Navigation Co.; Lincoln Gas Coal Co.; McKinney Steel Co.; Mather Collieries Co.; Nant-Y-Glo Coal Mining Co.; New River Pocahontas Consolidated Coal Co.; Pickands Mather Co.; Pittsburgh Coal Co.; Pruden Coal & Coke Co.; Solvay Collieries Co.; Stonega Coal & Coke Co.; United States Coal & Coke Co.; United States Fuel Co.



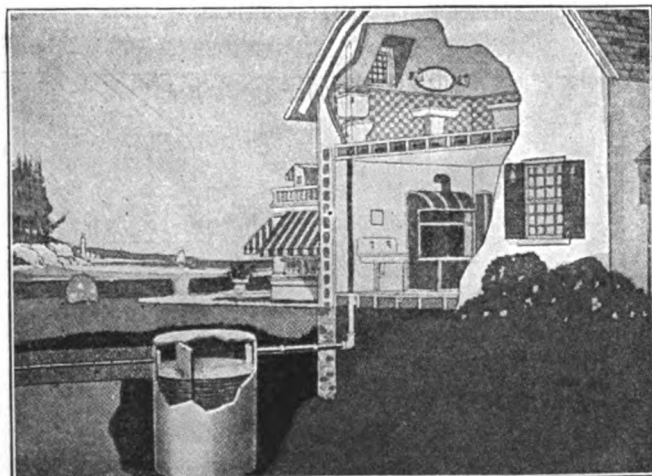
A BATTERY OF "SANISEP" TANKS FOR VILLAGE INSTALLATION

"Sanisep" Outhouse Type.

Where running water is not available, a special "Sanisep" system is furnished. The principle of operation is exactly the same, but a slight amount of attention is necessary, merely to keep sufficient water in the tank. No scavenging is required. At intervals of several years the tanks are opened for attention. The house and floor will be supplied if desired.



"SANISEP" OUTHOUSE TYPE
 For installation where running water is not available



A COUNTRY HOME EQUIPPED WITH "SANISEP" SYSTEM
 For installation in connection with sanitary plumbing and running water

good system) in the building. Closets, basins, sinks, and bathtubs are connected to the soil pipe just as though they were emptying to a city sewer line. The water passing through the plumbing supplies all the water needed in the tank. No attention is required; scavenging is abolished.

Village Installations of "Sanisep."

Where there are a number of houses to be served with a system of sewage disposal, "Sanisep" batteries

Service.

The engineering department of CEMENT PRODUCTS COMPANY is at the service of prospective customers to render all possible assistance.

Special literature will be mailed on request.

NEW YORK SEWAGE DISPOSAL CO.

Sewage Disposal, Drainage and Water Supply Plants

37-39 East 28th Street

NEW YORK, N. Y.

Products and Service.

The DESIGN and CONSTRUCTION of SEWERS, SEWAGE TREATMENT PLANTS, WATER SUPPLY.

Scope of Work.

The NEW YORK SEWAGE DISPOSAL CO. will undertake the entire solution of sewerage and sewage disposal problems, furnishing design and construction, or they will plan and supervise the work to be done under separate contract.

They will investigate and report on water supply projects, furnish valuation reports, plans and specifications with or without installation, or will act in a purely advisory capacity.

Experience.

Over seventeen years' experience enables this company to offer the most expert engineering service obtainable. Our engineers are graduates of technical schools of the highest standing and are making a specialty of sanitary engineering in all its branches.

Method of Procedure.

In each case study is made of the topography, stream flow, nature of soil, number and type of dwellings, relation of water supply to sewerage system, state and local health laws, street locations, grades, etc., all of which is considered in the final design.

The sewerage work includes storm and domestic sewers, manholes, catchbasins, flush-tanks, etc.

The disposal plants may be made up of a number of elements, such as screen chamber; settling tanks (single or double deck); dosing tanks; filter beds (sprinkler, contact or sand); sludge drying beds; chemical sterilization.

The amount and nature of the sewage to be treated determines the type of digestion tank to be used and the kind of secondary treatment.

This company will furnish special equipment such as automatic sewage flushing siphons (patented), diverting valve boxes; pipe tile and the like.

This equipment has originated with our engineers and has been proved successful by years of operation.

No work is too small and none too large to receive our best effort. We have developed a standard for

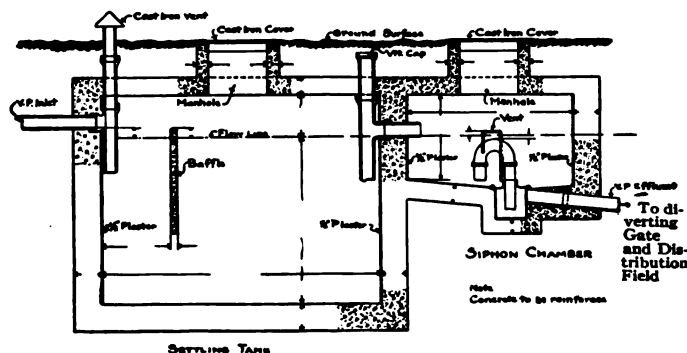
small detached dwellings which can be used in mining or manufacturing villages with great economy.

Representative Installations.

The following list of clients shows something of the breadth and variety of our experience:

BUILDING	LOCATION
Willard State Hospital for Insane	Willard, N. Y.
Kings Park State Hospital for Insane	Kings Park, N. Y.
Craig Colony for Epileptics	Sonyea, N. Y.
New York State Custodial Asylum	Newark, N. Y.
New York State Prison	Wingdale, N. Y.
New York City Women's Farm Colony	Greycourt, N. Y.
New Jersey Sanatorium for Tuberculosis Diseases	Glen Gardner, N. J.
State Institution for Feeble Minded	Vineland, N. J.
Presbyterian Hospital	Devon, Pa.
Schuylkill County Hospital for Insane	Schuylkill Haven, Pa.
State Hospital for Insane	Allentown, Pa.
West End Coal Company	Mocanaqua, Pa.
Alan Wood Iron & Steel Co.'s Industrial Village	Swedeland, Pa.
Semet-Solvay Company	Syracuse, N. Y.
Tide Water Oil Company Housing Development	Bacova, Va.
Buck Hill Falls Inn	Buck Hill Falls, Pa.
Boys' Camp	Jamesport, L. I., N. Y.
Gregg Company	Hackensack, N. J.
Millbank Bleachery	Lodi, N. J.
Princeton University	Princeton, N. J.
Rockefeller Institute for Medical Research	Princeton, N. J.
Home for Feeble Minded Women	Laurelton, Pa.
Metropolitan Sanatorium	Mt. McGregor, N. Y.
Niagara County Tuberculosis Hospital	Lockport, N. Y.
Scarlet Fever Hospital	Yonkers, N. Y.
Pittsfield Tuberculosis Hospital	Pittsfield, Mass.
Charles Dalton Sanatorium	Pr. Edward Island, N. S.
Woodmere Club	Woodmere, L. I., N. Y.
Nassau County Country Club	Glen Cove, L. I., N. Y.
Greenwich Country Club	Greenwich, Conn.
St. Francis Health Resort	Denville, N. J.
Asbury Park Golf Club	Asbury Park, N. J.
Rockville Centre Public School	Rockville Centre, L. I., N. Y.
Franklin Vocational School	Franklin, N. J.
Bennett School	Millbrook, N. Y.
Convent and Parochial School of Our Lady of Perpetual Help	Bernardsville, N. J.

Over 1,000 installations for private estates and country houses.



A TYPICAL SEWAGE DISPOSAL PLANT, SHOWING SECTION OF SIPHON CHAMBER

PACIFIC FLUSH-TANK CO.

Apparatus for Flushing Sewers and Handling Sewage

4241 Ravenswood Avenue
CHICAGO, ILL.
NEW YORK OFFICE, 149 Broadway

Products.

MILLER FLUSH-TANK SIPHONS; FLUSH-TANK REGULATORS; COUNTER METERS.

AUTOMATIC SEWAGE DISPOSAL APPARATUS for Sewage Disposal Plants, either Sand, Contact Beds or Sprinkling Filters.

SEWAGE EJECTORS for lifting sewage.

WATERTIGHT SEWER JOINT COMPOUNDS.

Patents and Scope of Service.

The entire line of equipment manufactured by this company is covered by letters patent, and carries a paid-up policy of insurance against failure when set and operated in accordance with this company's instructions.

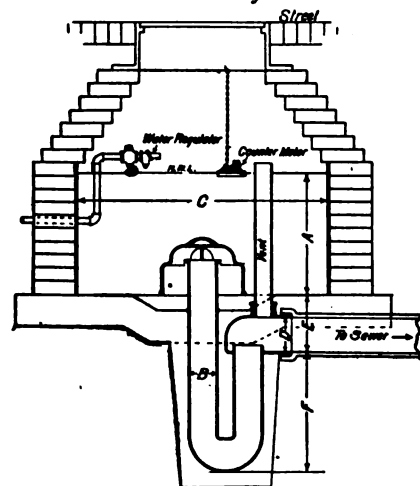
Miller Flush-tank Siphons.

The standard design of the Miller siphon consists of two pieces only and operates without moving parts. Miller siphons are manufactured in 4-, 5-, 6-, and 8-in. standard design; 5- and 6-in. shallow standard design; 4-, 5-, 6-, and 8-in. special design; 5- and 6-in. Miller-Potter design; also single, double and triple alternating siphons for flushing one, two or three sewers from one flush-tank.

Flush-tank siphons are detailed and illustrated in catalogue No. 15.

Flush-tank Water Regulators.

These regulators are attached to the water supply pipe inside of the wall of the flush-tank and control the flow of water. They are furnished with different orifices to suit desired total daily flow, and to operate under the different water pressures as they exist in the flush-tanks.



SETTING PLAN OF STANDARD MILLER FLUSH-TANK SIPHON

FLUSH-TANKS WITH MILLER SIPHONS

Size	Volume of water used each flush	Cost of each flush (water at 20 cents per 1000 gals.)	A Drawing depth	B Diam. or bore of siphon	C Diam. of flush tank	D Diam. of disch. head	E Distance floor to disch. head	F Distance disch. head to bottom of bend
5"	3'6" tank 138 gals.	3'6" tank 2 3/4 cents	23"	5"	3'6" to 4'	6"	11"	22"
	4' tank 180 gals.	4' tank 3 1/4 cents						
	4' tank 235 gals.	4' tank 4 1/4 cents						
	4'6" tank 298 gals.	4'6" tank 6 cents						
6"			30"	6"	4' to 4'6"	8"	14"	30"

These counter meters rest on floats and each discharge of the siphon registers one count, thus becoming an accurate meter of the volume used, the siphon drawing the same depth each time.

Counter Meters.

These counter meters rest on floats and each discharge of the siphon registers one count, thus becoming an accurate meter of the volume used, the siphon drawing the same depth each time.

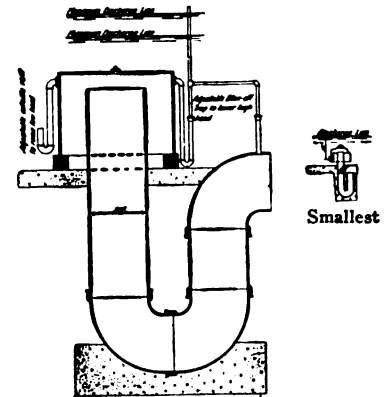
Automatic Sewage Disposal Apparatus.

Manually operated sewage disposal plants are unsatisfactory and generally give poor results.

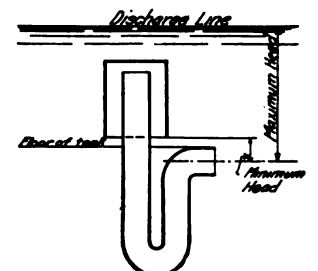
Automatic apparatus such as this company manufactures gives regular doses at all times to the filter beds, at intervals regulated by the dosing tank in which the apparatus is installed, and requires no maintenance other than an occasional cleaning, as there are no moving operating parts. Cut-outs are provided in the contact and sand bed design; in the sprinkling filter design, it is provided with equipment for varying the high and low heads.

Engineers designing sewage disposal plants are urged to consult this company in regard to the form of automatic apparatus best suited.

Miller sewage siphons manufactured in any size from 3 to 30 in. in diameter and for any desired drawing depth. Will operate singly, double or plural as may be required.



Largest MILLER SEWAGE SIPHONS



SHOWING MAXIMUM AND MINIMUM HEADS OF SIPHONS

SIZES OF SEWAGE SIPHONS TO BE USED WITH VARIOUS RATES OF INFLOW

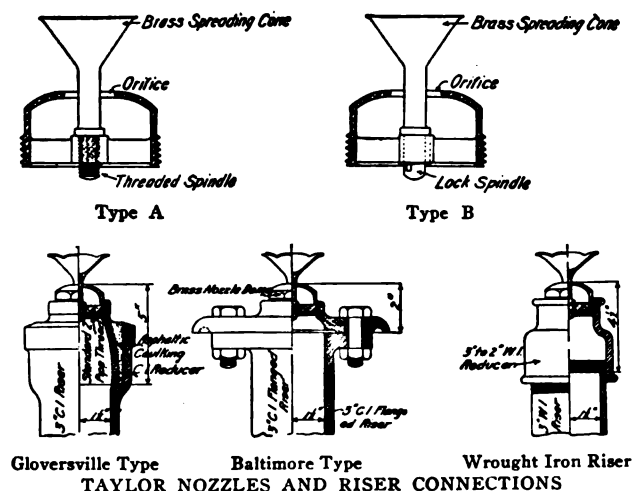
Max. inflow in gals. per 24 hrs.	Diam. of siphon	Min. head	Discharge in gals. per min. at min. head
Up to 100,000	5"	6"	160
100,000 to 135,000	6"	6 1/4"	230
135,000 to 280,000	8"	7 1/4"	450
280,000 to 480,000	10"	9 1/4"	800
480,000 to 720,000	12"	10 1/4"	1200
720,000 to 1,070,000	14"	13"	1780
1,070,000 to 1,465,000	16"	14"	2440
1,465,000 to 1,925,000	18"	15"	3210
1,925,000 to 2,540,000	20"	17"	4230
2,540,000 to 3,860,000	24"	19"	6430
3,860,000 to 6,360,000	30"	22"	10600

RATES OF DISCHARGE IN GALLONS PER MINUTE FOR SEWAGE SIPHONS DISCHARGING INTO AN OPEN TROUGH

Head	Diameter of siphon									
	5"	6"	8"	10"	12"	14"	16"	18"	20"	30"
1'3"	255	345	640	1000	1420	1950	2560	3210	3960	8950
1'6"	280	375	690	1060	1545	2120	2770	3485	4320	9720
1'9"	300	410	750	1180	1675	2300	3010	3780	4680	10530
2'0"	320	435	800	1260	1785	2450	3210	4030	5000	11250
2'3"	340	460	850	1340	1900	2605	3410	4290	5320	11970
2'6"	360	490	900	1420	2000	2760	3610	4530	5580	12650
2'9"	380	510	945	1490	2100	2890	3780	4750	5900	13230
3'0"	395	535	985	1550	2200	3010	3950	4960	6120	13830
3'3"	410	555	1020	1600	2275	3130	4100	5150	6400	14350
3'6"	425	575	1060	1675	2370	3250	4260	5350	6620	14930
3'9"	440	590	1100	1730	2455	3370	4410	5540	6880	15470
4'0"	455	620	1140	1790	2540	3470	4550	5720	7060	15960
4'3"	470	635	1170	1840	2610	3580	4690	5900	7300	16440
4'6"	485	650	1200	1880	2670	3690	4820	6070	7510	16900
4'9"	500	670	1235	1950	2760	3790	4960	6240	7700	17380
5'0"	510	690	1270	2000	2840	3890	5100	6410	7920	17870
5'3"	520	710	1300	2050	2900	3980	5220	6550	8100	18270
5'6"	535	725	1335	2100	2980	4080	5340	6720	8320	18740
5'9"	545	740	1365	2145	3045	4170	5460	6860	8500	19120
6'0"	555	755	1395	2190	3100	4270	5570	7000	8650	19530
6'3"	570	770	1420	2230	3165	4340	5680	7150	8820	19930
6'6"	580	780	1450	2280	3230	4430	5800	7300	9000	20340

Taylor Nozzles and Riser Connections for Sprinkling Filters—The sewage after leaving the dosing tank, which is operated by a specially designed dosing siphon, is distributed through the filter by a system of mains and laterals and riser connections to the centers of the nozzles, the orifices of which are usually a few inches above the top of the filter bed, and the sewage is sprinkled over the beds intermittently through the nozzles. These nozzles are standard with 2-in. male thread domes and are attached to various types of fittings for various forms of risers.

All of the apparatus described above is explained and shown in considerable detail in Catalogue No. 14.



Automatic Sewage Ejectors.

P.F.T. automatic sewage ejectors are manufactured to handle crude unscreened sewage in volumes up to 1000 gals. per minute and for lifts up to 100 ft. They are of the pneumatic type and are operated by compressors of either the motor, steam or gasoline engine driven type.

Advantages in use over centrifugal devices lie in the fact that no screening is required, as there are no port openings smaller than the diameter of the pipe. As there are no open sumps or wells, the plant is practically odorless.

The P.F.T. ejector is now operated by the new Cox sewage ejector valve of the piston type controlled by an open float.

We can furnish ejectors, which are made in 50-, 100-, 150-, 200- or 250-gal. unit capacity, with foot pieces, operating valves, inlet and outlet checks and gates, the purchaser to provide air for operating; or, if desired, we can furnish complete stations, consisting of compressors, motors, switchboard, air tank, sump pumps, etc.

With several ejectors in different locations, it is

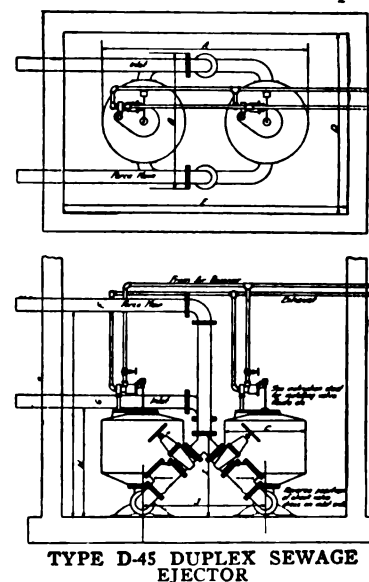
more desirable to erect a central air station, piping the air to the ejector stations, which latter may be, and usually are, constructed underground.

Complete ejector stations when designed by us are so arranged that they are practically automatic, requiring little or no attention except oiling and periodical inspection.

In determining the proper size to use, it is well to bear in mind the fact that our ejectors eject their rated capacity per discharge. It takes from 8 to 16 seconds to discharge an ejector, depending on the head and capacity, so it is readily seen that it is possible to secure a higher rate per minute than the nominal capacity. In actual test we obtained 1250 gals. per minute from three 250-gal. machines.

Plant superintendents will find the P.F.T. ejector very useful in lifting fluids whose content would seriously clog and interfere with the operation of a centrifugal pump.

Sewage ejectors are made to operate singly, double or triple for the duty required and are completely described in Catalogue No. 17.



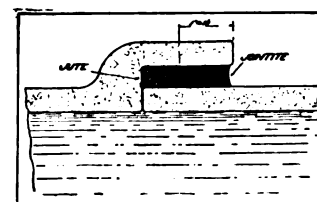
DATA, TYPE D-45 DUPLEX SEWAGE EJECTORS

Capacity, gals.	A	B	C	D	E	F	G	H	I	J
50	73 3/4"	46"	25 1/4"	98"	82"	4"	4"	48"	36 1/2"	49 1/4"
100	95 3/4"	63"	37 3/4"	120"	99"	6"	6"	48"	39 1/4"	57 1/4"
150	104 1/4"	67"	37 3/4"	129"	103"	8"	8"	60"	49 1/4"	66 1/4"
200	113 1/2"	77 1/2"	47"	138"	114"	8"	8"	59"	49 1/4"	66 1/4"
250	113 1/2"	77 1/2"	47"	138"	114"	8"	8"	66"	49 1/4"	66 1/4"

Watertight Sewer Joint Compounds.

To meet the demand for watertight flexible joints in vitrified pipe sewers, this company manufactures Fil-tite and Jointite. When computing total quantity required, allow liberally for waste and differences in the annular space, owing to imperfect moulds and bells. The equipment necessary for laying these joints consists merely of a heating kettle, a few runners and a pouring ladle.

Catalogue No. 12.



METHOD OF USING JOINTITE

APPROXIMATE NET QUANTITIES IN POUNDS PER JOINT COMPOUND, 1 1/4 IN. DEEP

Size	JOINTITE		FILTITE	
	105 lbs. per cu. ft.		85 to 92 lbs. per cu. ft.	
	D&W	STD.	D&W	STD.
6"	1.46	0.82	1.28	0.72
8"	1.82	1.06	1.60	0.95
10"	2.26	1.30	1.98	1.15
12"	2.65	2.08	2.32	1.82
15"	3.20	2.52	2.80	2.20
18"	3.75	3.02	3.29	2.64
20"	4.30	3.44	3.78	3.00
22"	4.62	3.62	4.07	3.16
24"	4.91	4.03	4.31	3.50
30"	Double strength 13.00		Double strength 11.50	
36"	23.40		20.50	



P.F.T. SEWAGE EJECTOR OPERATING VALVE

JOSAM MANUFACTURING CO.

Double Drainage Drains

MICHIGAN CITY, IND.

(Formerly Cleveland, Ohio)

BRANCH OFFICES

NEW YORK, N. Y., 7 West 45th Street
ST. LOUIS, MO., 317 DeBaliviere Avenue
BEAUMONT, TEX., 317½ Pearl Street

CHICAGO, ILL., 231 Insurance Exchange Building
CLEVELAND, OHIO, 3063 East 61st Street
SAN FRANCISCO, CAL., Merchants Nat'l Bank Building

Products.

JOSAM DOUBLE DRAINAGE DRAINS for Shower Stalls, Floor, Roof and Garage.

Also manufacturers of Double Eccentric Unions and Concrete Inserts.



Description of Josam Double Drainage Drains.

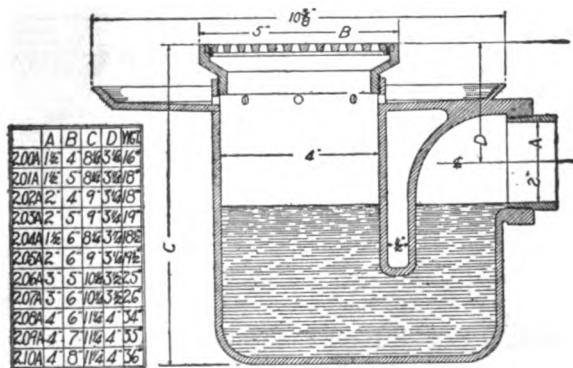
Double drainage drains prevent leakages to ceiling below at points of contact between the metal and floor or roof. Economy in installation. Absolutely trouble-proof. Once installed no further attention is necessary.

All numbers made in cast iron, black or galvanized finish; and all brass, plain or nickelplate finish.

Josam Double Drainage Drain and Trap Combination.

200A Series—Heavy cast iron body with adjustable brass strainer to suit floor thickness variations. Regular finish black japan. Galvanized extra. Also furnished in all brass.

Strainers for porcelain shower receptors furnished.

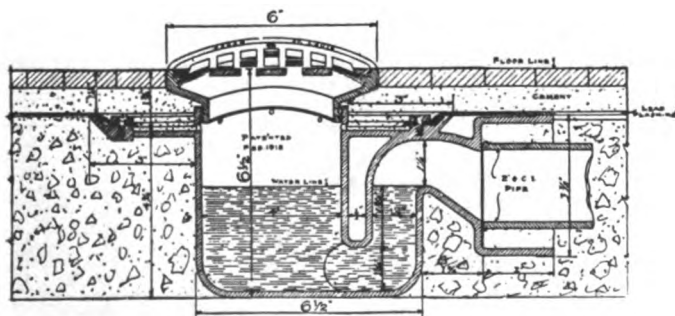


DETAILS, 200A SERIES DRAIN AND TRAP

No.	200A	201A	202A	203A	204A	205A
Strainer	4"	5"	4"	5"	6"	6"
Outlet	1 1/2"	1 1/2"	2"	2"	1 1/2"	2"
Price	\$10.30	11.30	11.50	12.00	12.50	13.00

No.	206A	207A	208A	209A	210A	211A
Strainer	5"	6"	4"	4"	7"	8"
Outlet	3"	3"	4"	4"	4"	4"
Price	\$15.00	15.00	18.00	19.00	20.00	21.00

2003A Special Shallow Type—Same construction as 200A, but designed for shallow installation.



DETAILS, 2003A DRAIN AND TRAP WITH FLASHING RING AND BOLTS

6" strainer, 2" outlet, \$18.00

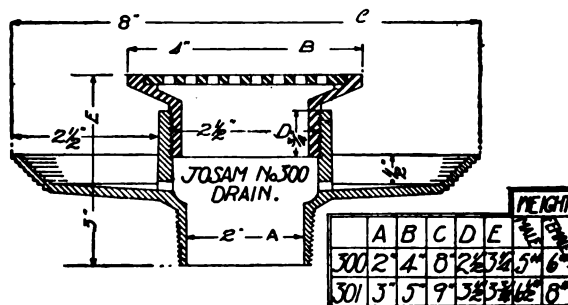
This number comes fitted with flashing ring and bolts to clamp and hold flashing permanently. Also nickelplated brass strainer and adjustable collar.

Josam Double Drainage Drain for Shower and Urinals.

300 Series—Without trap, for shower stalls. Body is of cast iron and strainer nickelplated brass.

Can be installed in connection with independent trap to suit construction.

Can furnish either flat, convex or concave nickel-plated strainers. Adjustable to variations in floor thickness.



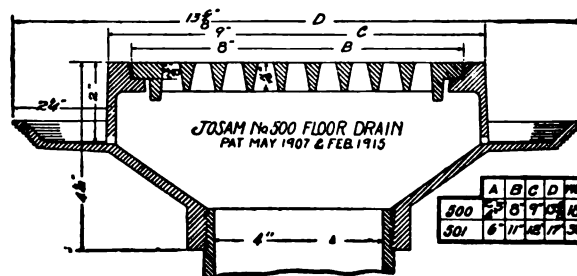
DETAILS, 300 SERIES DRAIN

No.	300	301
Strainer	4"	5"
Outlet	2"	3"
Price	\$6.80	9.60

Josam Double Drainage Drains or Cesspools.

500 Series—For dairy, laundry, warehouse or factory floors.

Made of cast iron with antitilting cast iron grate, or brass grate furnished if desired.

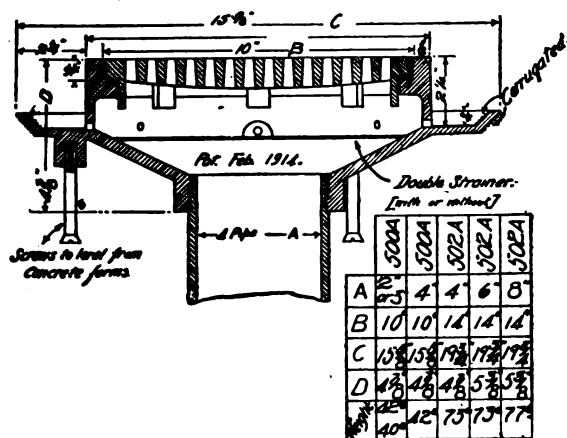


DETAILS, 500 SERIES DRAIN

No.	500	500	500	501
Strainer	8"	8"	8"	11"
Outlet	2"	3"	4"	6"
Price	\$7.50	7.50	7.50	12.00

500A Series—Extra heavy type made of cast iron and especially adapted for packing house, dairy, laundry or cold storage buildings where heavy trucking is necessary, also suitable as garage drains. The supplementary grate is of utmost importance in preventing sewer stoppage.

This series comes equipped with leveling screws for adjustment to suit floor variations. Also has an extra heavy cast iron non-tilting grate 1 in. thick.

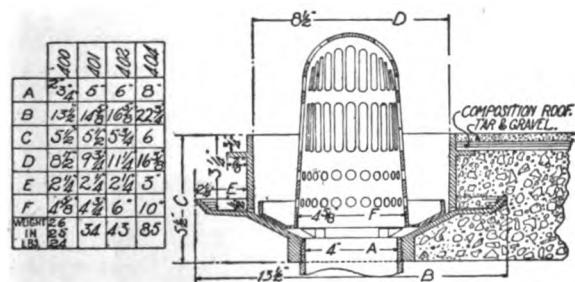


DETAILS, 500A SERIES DRAIN

No.	500A	500A	502A	502A	502A	502A
Strainer	10"	10"	14"	14"	14"	14"
Outlet	3"	4"	4"	5"	6"	8"
Price	\$10.00	10.50	12.00	14.00	18.00	24.00

Josam Double Drainage Drains for Roofs.

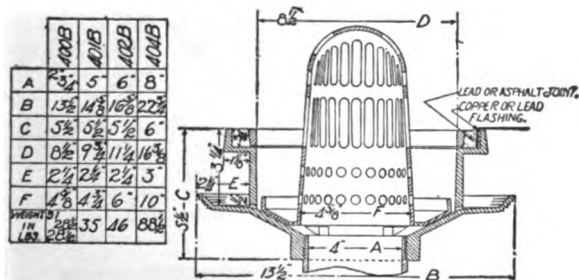
400 Series for Concrete Roof—All roof drains have removable strainer and sediment cup cast integral, to catch gravel, etc., making it easy to remove and clean out. Tapped for standard iron pipe thread. All cast iron. Soil pipe connectors for all sizes and all series of roof drains can be furnished.



DETAILS, 400 SERIES ROOF DRAIN

No.	400	400	400	401	402	404
Outlet	2"	3"	4"	5"	6"	8"
Price	\$12.00	12.00	12.00	14.00	16.00	20.00

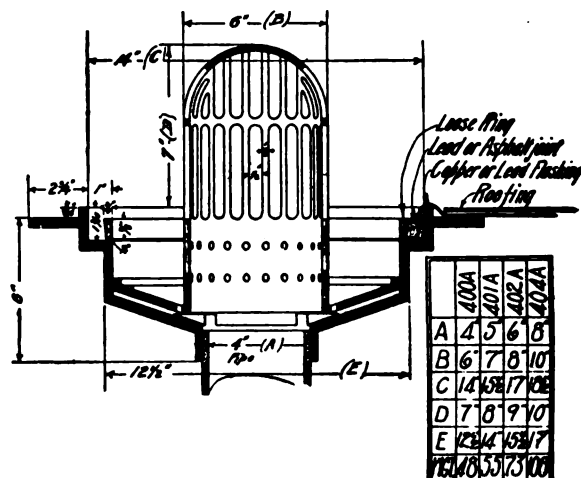
400B Series for Concrete Roof—Construction as in 400 series with a loose cast ring additional. This ring forms a wall for making a poured lead, pitch or asphaltum joint to tie copper or lead flashings in place.



DETAILS, 400B ROOF DRAIN

No.	400B	400B	401B	402B	404B
Outlet	2"	3"	5"	6"	8"
Price	\$13.00	13.00	15.00	17.00	24.00

400A Series for Wood Roof—This series does not embrace the double drainage feature as it is not practical on wood roof construction. Otherwise it is of the same general construction as the 400B series and is also equipped with the loose cast iron ring. A 3-in. flange carries the roofing composition.

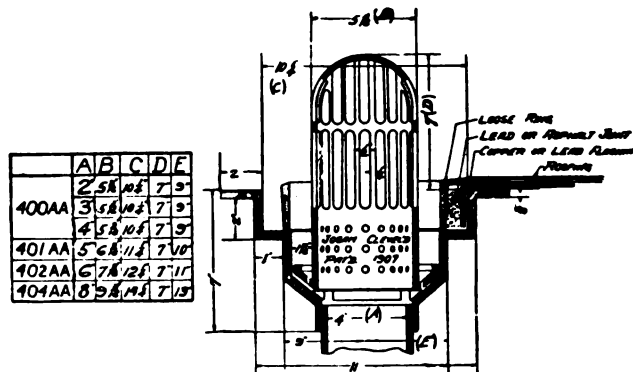


DETAILS, 400A ROOF DRAIN

No.	400A	400A	400A	401A	402A	404A
Outlet	2"	3"	4"	5"	6"	8"
Price	\$16.00	16.00	16.00	18.00	20.00	28.00

400AA Series for Wood Roof—The design and construction of this series is the same as the 400A series.

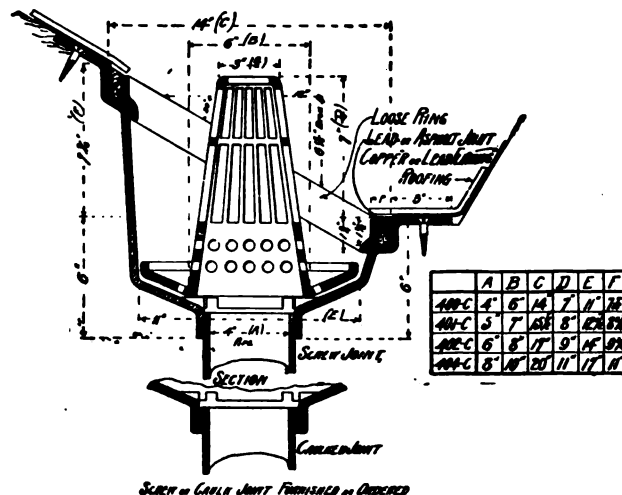
It was designed for installation where space is limited and is 5 1/2 in. less in diameter than the 400A.



DETAILS, 400AA SERIES DRAIN

No.	400AA	400AA	400AA	400AA	400AA	400AA
Outlet	2"	3"	4"	5"	6"	8"
Price	\$16.00	16.00	16.00	18.00	20.00	28.00

400C Series for Sawtooth and Box Gutters—All cast iron. For wood roofs, it has not the double drainage feature. Can furnish either calk or thread joint.



DETAILS, 400C ROOF DRAIN

No.	400C	401C	402C	404C
Outlet	2"	3"	4"	8"
Price	\$26.00	28.00	30.00	31.00

KAUSTINE COMPANY, INC.

Sanitation Engineers and Manufacturers of Sewage Disposal Equipment
BUFFALO, N. Y.

SALES OFFICES

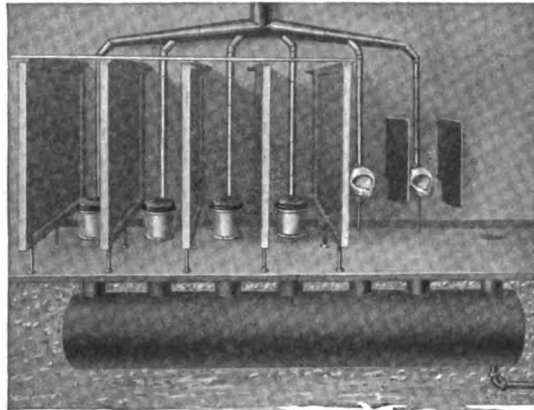
NEW YORK CHICAGO BOSTON PHILADELPHIA PITTSBURGH ALTOONA HUNTINGTON
TORONTO, ONT., CANADA HAWTHORNE, MELBOURNE, AUSTRALIA

Products.

KAUSTINE WATERLESS (CHEMICAL) SYSTEMS;
HYDRO-KAUSTINE ENAMELED IRON SEPTIC TANKS;
HYDRO-KAUSTINE ENAMELED IRON SEPTIC CLOSETS.
Also Hydro-Kaustine Solvent.

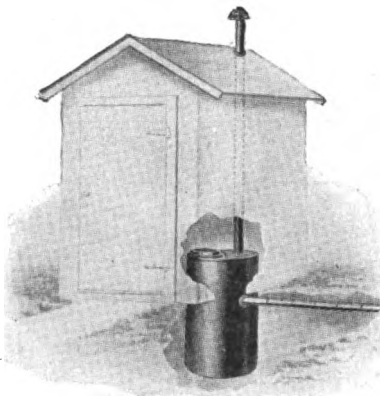
Services.

Sanitation engineers and manufacturers of sewage disposal systems for homes, schools, industrial plants, and villages.



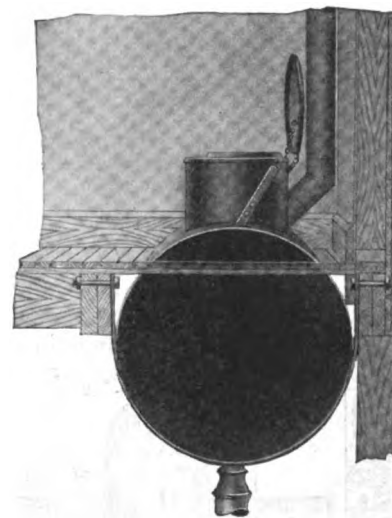
KAUSTINE STANDARD (WATERLESS) MULTIPLE SYSTEM

Provides for disposal of excremental sewage by chemical action resulting in sterilization and liquefaction. This system consists of vitreous china bowl, enameled ventilating pipe, enameled iron tank, internal valve for draining, and rotary agitator. Made in all sizes



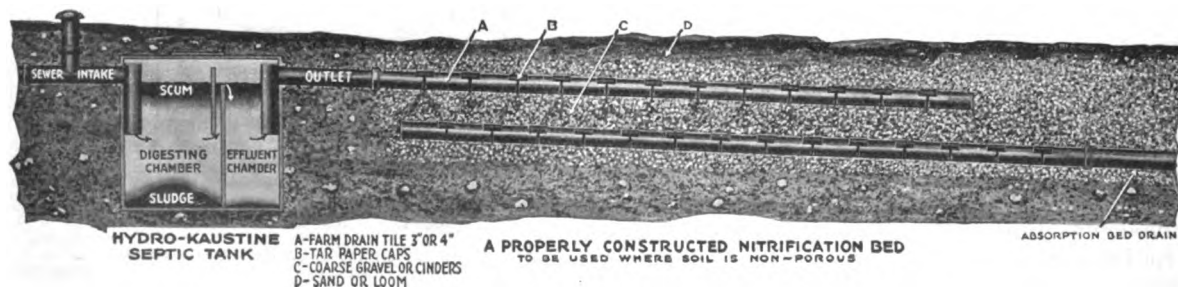
ENAMELED IRON SEPTIC CLOSET

For outside use only. Provides for disposal of excremental sewage by bacteriological action



"JERRY" TYPE SYSTEM

For use where bowl is not desired. Made in all sizes. Single seat system used extensively in mining and industrial housing



ENAMELED IRON SEPTIC TANK

Practically indestructible; easy to install. No danger of leakage, as with brick or masonry tanks, with resultant pollution due to the escape of unreduced sewage

BETZ BROS., INC.

Manufacturers of Steel Toilet Partitions

Woolworth Building
NEW YORK, N. Y.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

Product.

SANITARY TOILET PARTITIONS.

"Steelbilt" Sanitary Toilet Partitions.

Our partitions are durable and strong, because they are made of steel with all parts electrically or oxy-acetylene welded. They are practically indestructible. They are sanitary, because non-absorbent, and also because all surfaces where dust or dirt might collect have been eliminated. In appearance they are neat and clean.

General Construction—Partitions are made of heavy gage patent level steel, with stiles, rails and panels electrically welded together forming a unit. The post is formed with a lug at each end; the bottom lug fits into a cast base which fastens to the floor, the top fits into a cast cap, both of which allow for vertical adjustment (to correct unevenness of floor). The rear end of the partition fits over and is bolted to a tee shape member, which is fastened to the wall with expansion bolts, and is arranged for vertical and lateral adjustments to meet variable wall conditions.

Doors—Stiles and rails are heavy gage drawn steel and are mitered and oxy-acetylene welded at corners, being electrically welded to panel. Joints are ground down to a smooth surface.

Caps and Bases—Castings for caps and bases are neatly fitted.

Caps are made to receive 1-in. diameter pipe, which passes through same and serves as bracing for partitions.

The base is made of a special composition non-corrosive metal and is fastened to floor through center in a concealed manner with expansion bolts.

Hardware—The hardware furnished consists of

BETZ
Steelbilt
TRADE MARK
TOILET PARTITIONS

special pivot hinge, 2 rubber bumpers, 1 door pull and 1 latch for each compartment.

Finish—We furnish our partitions with 1 prime coat applied, or either one of the standard finishes such as olive green or gray enamel. Finish coats are baked

on. All of the hardware, including cast caps and bases, is always finished the same as the partition proper.

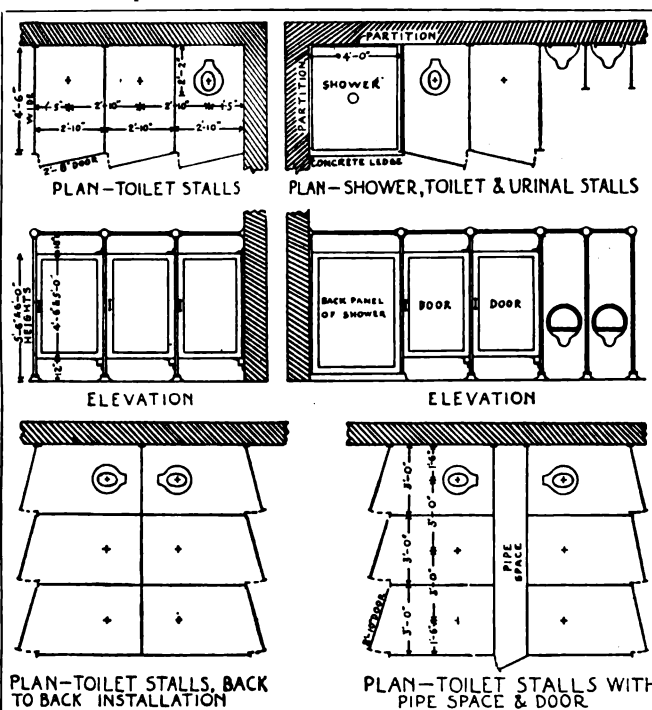
Our standard olive green enamel finish is recommended where service and durability is a special requirement. Other colors furnished if required.

Erection—Partitions and doors are delivered ready for erection.

We will erect the partitions or they can be erected by customer's mechanic. They are easily erected and do not require specially trained men.

Cost of "Steelbilt" Partitions.

For prices and further information write Dept. "C." On application, inquiries will be referred to our nearest representative.



PLANS AND ELEVATIONS OF BETZ BROS., INC., TOILET PARTITIONS

PARTITIONS AND DOORS IN STOCK

Partition		Partition		Door	
Width	Height	Width	Height	Width	Height
3 ft. 6 in.	5 ft. 6 in.	3 ft. 6 in.	6 ft. 0 in.	2 ft. 8 in.	4 ft. 6 in.
4 ft. 0 in.	from top of partition	4 ft. 0 in.	from top of partition	2 ft. 10 in.	5 ft. 0 in.
4 ft. 6 in.	to floor	4 ft. 6 in.	to floor		
5 ft. 0 in.		5 ft. 0 in.			

Above are sizes in stock, but standard sizes other than those mentioned can be furnished. Also special sizes and requirements, to suit conditions.



INSTALLATION "STEELBILT" TOILET PARTITIONS

THE E. F. HAUSERMAN CO.

Steel Partitions; Skylights; Glazing

1729 East Twenty-second Street
CLEVELAND, OHIO

BRANCH OFFICES

PITTSBURGH, PA., Oliver Building

DETROIT, MICH., Penobscot Building

Products and Service.

UNITBILT STEEL TOILET PARTITIONS; GLASTEEL PUTTYLESS SKYLIGHTS; HAUSERMAN UNITBILT GLASTEEL PARTITIONS; STEEL SASH GLAZING CONTRACTORS.

Slogan.

"Organized for Service."

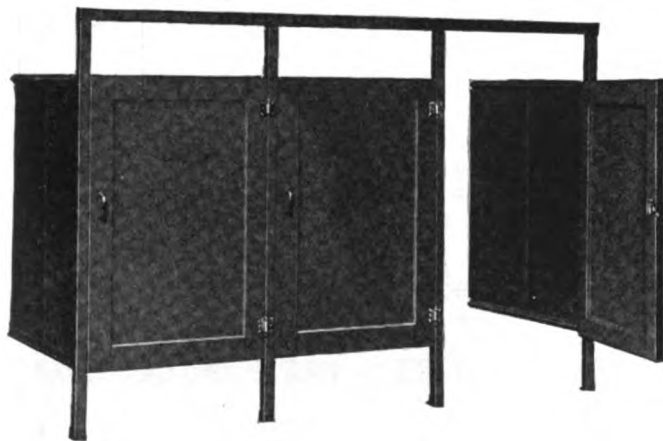
Unitbilt Steel Toilet Partitions.

Hauserman steel toilet partitions are designed and built to combine the utmost strength and rigidity with the greatest sanitary utility.

There are no unnecessary joints, no projecting bolt or screw heads. The sheer, smooth doors and walls, finished in hard baked olive green enamel, and the special diamond shaped rails offer no chance for dust, dirt or moisture to collect.

After years of the hardest usage, the uprights and walls will stand true and rigid. The doors will swing freely and close snug and flush.

Hauserman toilet and shower partitions are shipped knocked down, ready for easy and speedy erection.



SECTION OF UNITBILT STEEL TOILET PARTITION

Glasteel Puttyless Skylights.

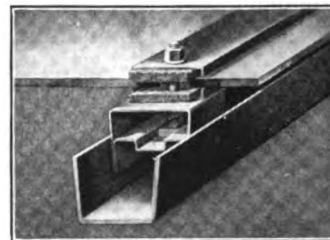
The Hauserman Glasteel puttyless skylight is built with a complete and thorough knowledge of skylight requirements. The steel channels which carry the glass will withstand the strongest wind pressure and heaviest snow loads without endangering the glass.

The lights of glass are independent, and may be easily removed for painting the supporting structure or replacing the glass.

Condensation drip is eliminated by the channel construction, which in addition to serving as a gutter, permits free circulation of air to the underside of the glass and allows accessibility for maintenance.

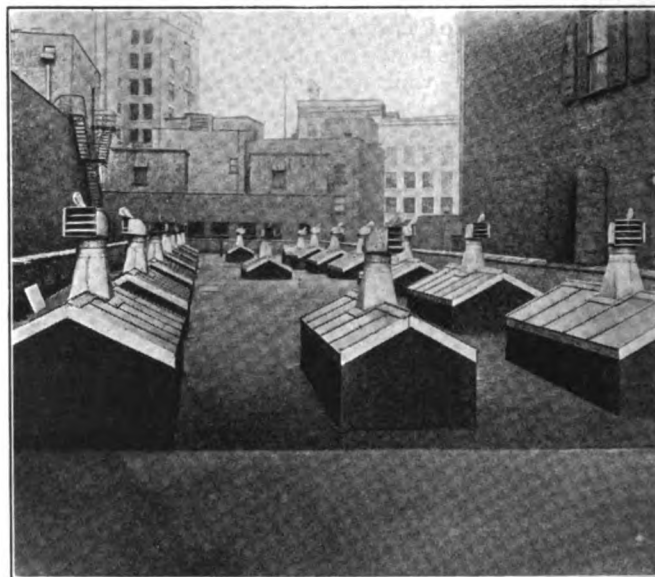
All exposed parts are galvanized. All interior members are heavy gauge steel, coated with a metal protective paint.

The special spring clips and cowhair felt cushions, which serve in place of putty to grip the glass, make a watertight, dustproof, permanent, yet elastic joint, that allows amply for shock of vibration and contraction and expansion of glass under atmospheric changes.



GLASTEEL PUTTYLESS SKYLIGHT CONSTRUCTION

Hauserman skylights are adaptable to all types of roof. They are shipped knocked down, and can be erected by unskilled labor.



SKYLIGHT INSTALLATION, MORRIS PLAN BANK BUILDING, CLEVELAND, OHIO

Glazing.

Since the inception of THE E. F. HAUSERMAN CO. in 1913, this organization has gained and maintained a reputation as the foremost steel sash glazing contractors in America.

Millions of square feet of glass have been installed by the Hauserman organization. Hundreds of "daylight" factories from coast to coast and from Gulf to boundary stand as evidence of Hauserman service.

There is no glazing job too big, no job too difficult, no time limit too steep for the Hauserman organization.

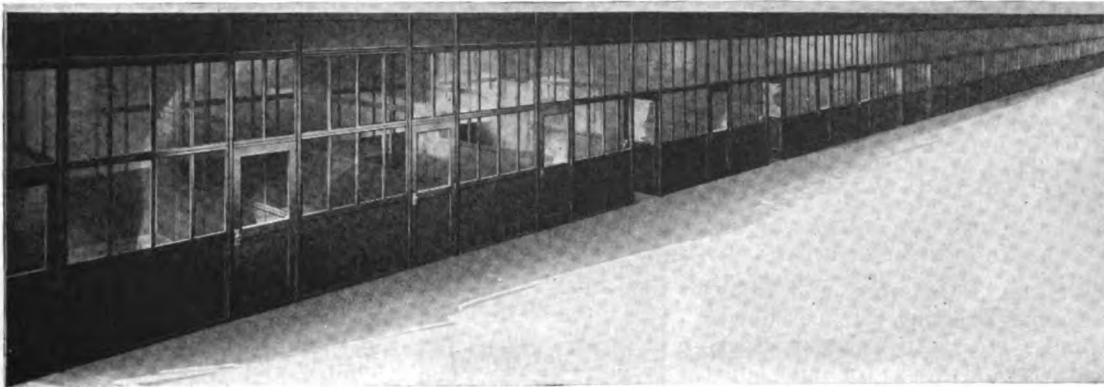
A complete stock of glass is carried in our Cleveland warehouse which runs into hundreds of thousands of square feet of the standard kinds— $\frac{1}{8}$ -in. factory ribbed, $\frac{1}{4}$ -in. wire ribbed, and double strength clear glass.

Hauserman Unitbilt Glasteel Partitions.

The Unitbilt Glasteel partition consists of an assembled group of standard units. Each of these units is composed of a number of panels or doors and two half posts.

Owing to the depth of the muntin on the glass panels, glass of any desired thickness may be used.

An assembly of glass, steel, or wire mesh panels of like width between steel uprights forms each unit of a Hauserman Unitbilt Glasteel partition. Units are de-



A CORRIDOR OF HAUSERMAN UNITBILT GLASTEEL OFFICES, IN PLANT NO. 2 OF THE STUDEBAKER CORPORATION, SOUTH BEND, IND.

Ceiling height partition is securely anchored at floor and ceiling—dwarf partitions secure their lateral rigidity through the use of a 30-in. splice plate between all panels. The strength of this construction is such that runs of 25 ft. can be made between lateral partitions, columns, or other supports, without the necessity of bracing the partitions. In unusual cases where continuous unsupported runs of greater length are required, occasional posts are carried to the ceiling.

Panels are 2, 3 and 4 lights wide, and are of steel, wire or glass. Panels of the same width are interchangeable with one another. They are made in two standard heights, 41¾ in. for the full panel and 20⅞ in. for the half panel. The top filler panel is of steel and has adjustment features to meet building variations.

Where the standard width units do not take up the full dimensions of a given space, a half post and adjustable steel plates are furnished at either or both ends of a run.

Single or double swing doors can be furnished on the standard units, 2 and 4 lights wide, and sliding doors on the units 3 and 4 lights wide. Doors of either type are equipped with the necessary high grade hardware.

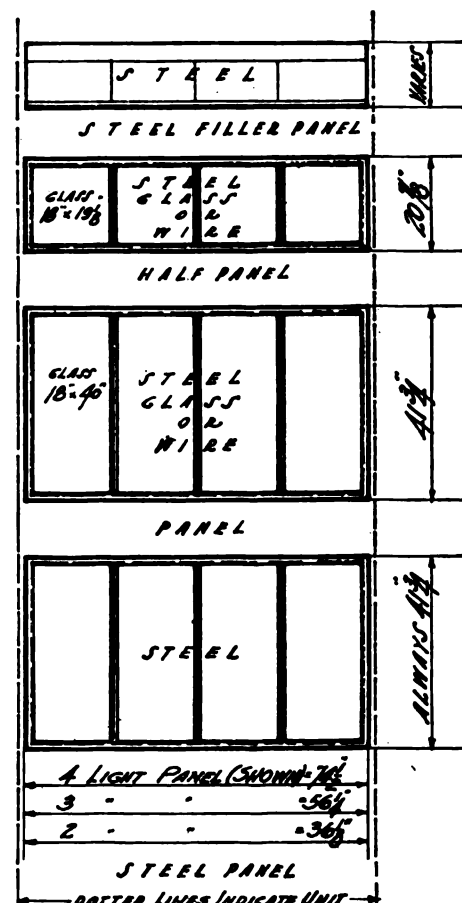


FOUR-LIGHT UNIT WITH STEEL PANEL AND CORNICE

signed to take lights of glass 18 in. wide and are built in the three following widths:

- 2 lights wide.— 3 ft. 2⅞ in. over all width of panel
- 3 lights wide — 4 ft. 10⅜ in. over all width of panel
- 4 lights wide — 6 ft. 4⅝ in. over all width of panel

Units are designed to take lights of glass 40 in. high or 19⅞ in. high, depending on the use of a full size or half size height. The over all dimension of a full size panel is just twice that of a half panel, permitting changes at any time in the height of kick plate or combination of enclosing materials.



POSSIBLE COMBINATIONS FOR COMPLETING UNITS

THE HUGHES-KEENAN CO.

Manufacturers of Steel Toilet and Shower Partitions

MANSFIELD, OHIO

AGENCIES

AKRON, OHIO, ATWOOD-KNOSKE SALES Co., 501 Ohio Bldg.
 CLEVELAND, OHIO, LOEB-WALTERS Co., 1110 Walnut Ave.
 COLUMBUS, OHIO, FRED A. TARRIER Co., 38 So. Sixth St.
 DALLAS, TEX., J. W. BARTHOLOW & Co., 907½ Commerce St.
 DAYTON, OHIO, JOHN G. POOL Co., Schwind Bldg.
 DETROIT, MICH., J. W. ROLLINSON, 203 Owen Bldg.
 GREENSBORO, N. C., J. D. WILKINS

HARTFORD, CONN., THOMAS TRANT & Co., 228 State St.
 HUNTINGTON, W. VA., JAMES J. WEILER, Robson-Prichard Bldg.
 INDIANAPOLIS, IND., F. O. DUVAL Co., 136 W. Maryland St.
 LOS ANGELES, CAL., MARITZEN-KUNS Co.
 SEATTLE, WASH., D. E. FRYER & Co., Lumber Exch.
 ST. LOUIS, MO., HERMAN SCHEEL, 914 Pine St.

Products.

HYGEA STEEL PARTITIONS and DOORS for Toilet Rooms, Dressing Rooms, Shower Baths, Urinals, etc.; ADJUSTABLE SELF-CLOSING GRAVITY HINGES for all Toilet Doors.

Also manufacturers of Plain and Ornamental Steel Stairs for all types of public buildings and factories.

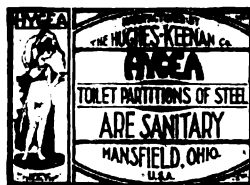
Hygea Steel Partitions and Doors.

The Hygea design is simple and neat, allowing standardized method of manufacture and moderate cost.

Construction—Posts or supporting members are square, formed steel tubes, resting on adjustable cast iron bases or shoes, beveled and sufficiently high to allow for mopping and having secure anchorage.

Top rails or connecting members are formed steel channels, or when desired, double channels giving square tube effect.

Stiles and rails of both doors and dividing partitions have patented sanitary mould and panel securing device, eliminating riveting or spot welding and assuring a tight,



TRADE-MARK

straight panel free from waves or buckles.

Patented self-closing gravity hinge is built for hard service, designed to swing door either in or out, and make it stand slightly ajar when toilet is not occupied.

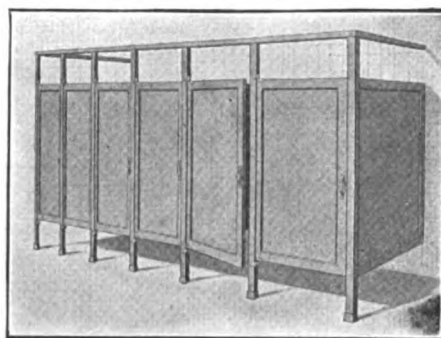
Double batteries have dividing partitions between rows from floor or curb to top rail 6 ft. 6 in. high.

Standard Sizes—

4 ft. 0 in. wide—4 ft. 6 in. deep inside
 4 ft. 6 in. wide—4 ft. 6 in. deep inside
 4 ft. 6 in. wide—5 ft. 0 in. deep inside

Special sizes designed—with or without utility spaces.

Finish—Gray, olive green, or white baked enamel.

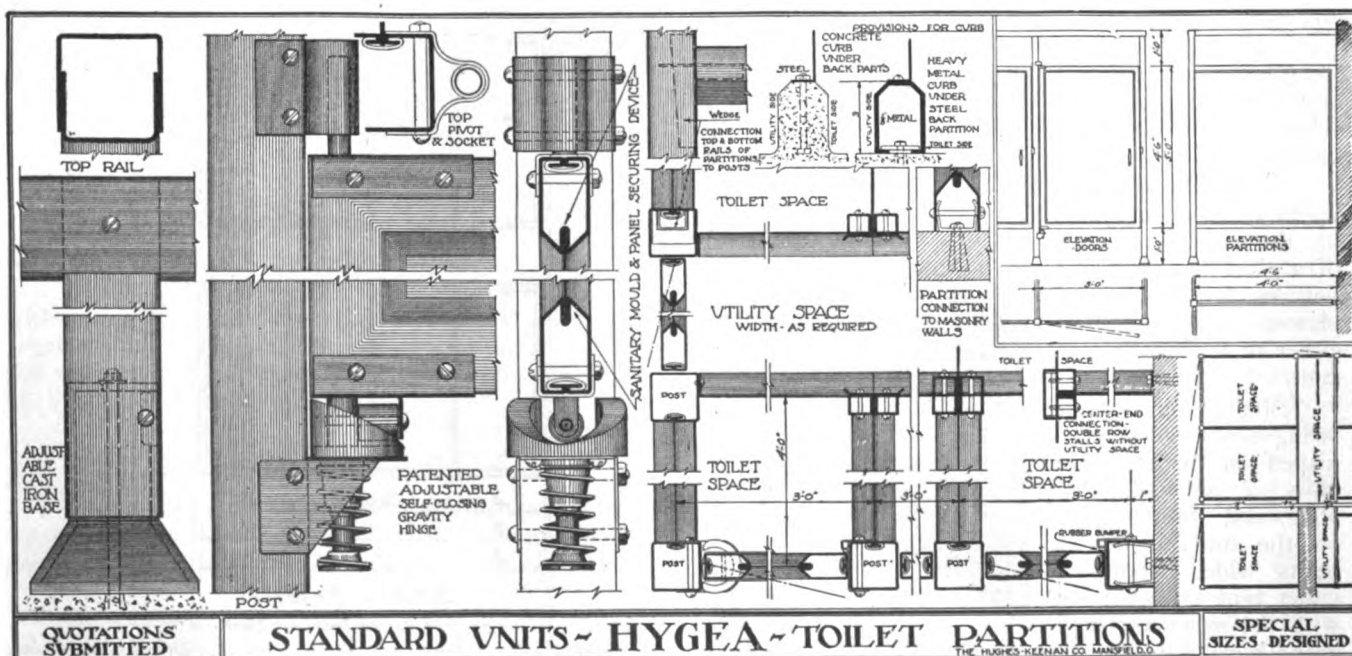


HYGEA STEEL TOILET PARTITION

Shower Bath and Urinal Partitions.

Made of special lead coated steel enameled same as toilet partitions and having bottom mould lead-sealed. Patented mould and panel securing device eliminates exposed sheared edges—where rusting starts. All ends of sheets are turned in and lead-sealed.

Special provisions for concrete curb for either toilet or shower partitions; also a heavy metal curb furnished for either, where desired.



THE SANYMETAL PRODUCTS COMPANY

(NAME CHANGED FROM THE R. F. CARPENTER MFG. CO.)

Steel Door and Partition Sections

984 East Sixty-fourth Street

CLEVELAND, OHIO

Products.

Manufacturers of SANYMETAL PARTITIONS and DOORS for toilet rooms, dressing rooms, shower baths, urinals, etc.

SANYMETAL DIVIDING PARTITIONS for offices and factories.

SANYMETAL GRAVITY ROLLER BEARING HINGES for all toilet doors.

Partitions and Doors.

SANYMETAL consists of two essential units—a partition with an integral supporting post, and a door. For the partition, a heavy gauge, cold rolled steel sheet is electrically welded to a hollow steel vertical post, and fitted top, bottom and rear with rigid steel mouldings—all electrically welded into one complete whole. The door, of similar construction, is fitted with special spring or gravity roller bearing hinges, rubber bumpers, and pull. These two units, with necessary castings for base and caps, and pipe rails for top finish, constitute SANYMETAL sections.

Finish—Partitions and doors present an impervious hard enameled surface. Standard finish is olive green. Other colors furnished are Brewster green and gray. Sections can be supplied with a filler and primer coat and finished by the painter after the work is set. White enamel is best furnished in this way.

For showers and urinals a lead coated special steel is used, finished, like the partitions, with baked enamel.

Erection—Quotations will be given on SANYMETAL either erected, or f. o. b., the work. The erection of SANYMETAL is a simple matter. After work has been laid out, base castings are set. Into these the hollow vertical posts are set. A setscrew in the castings makes the partition adjustable to uneven floors. The rear of the panel has a moulding electrically welded to it and mitered to the top moulding. This is bolted into a U-channel, which snugly fits the back moulding of the partitions.

This U-channel is first fastened to the wall, and allows the partition to be adjusted to uneven walls. With the required number of sections erected, the drawn steel tubing is run through the top castings and fastened to the walls, forming a solid brace to hold the partition.

Sanymetal
TOILET PARTITIONS

Steel Interior Dividing Partitions.

SANYMETAL sectional dividing partitions for offices and factories consist of a hollow metal post, a well built lower panel, and a glass section above.

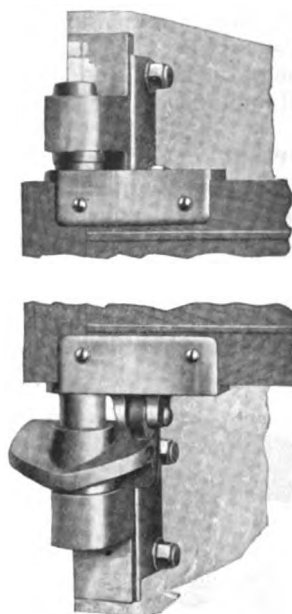
Flexible construction for any room dimensions. Can be installed with wire or metal ceilings. Top panels may be glass, metal or wire mesh. Partitions finished the same on both sides.

Gravity Roller Bearing Hinges.

Gravity roller bearing hinges for double and single acting doors of wood or steel made to fit SANYMETAL, slate, marble or wood partitions.

Hinge consists of five parts only. Upper hinge is a heavy casting with pivot carried in socket. Lower hinge is of similar design, the weight of the door being carried by a wheel rolling on a double inclined cam. Hinge can be used for either right- or left-hand door, and can be made for any thickness of material. The cam is reversible, one side making a double acting hinge, reverse side making an inswing hinge to hold door open when not in use. Cam is adjustable to make doors in pairs swing even, or to allow single doors to stand open 6 in. or more.

Finish—The hinge is made in malleable iron or brass, with a black japanned or nickelplated finish.



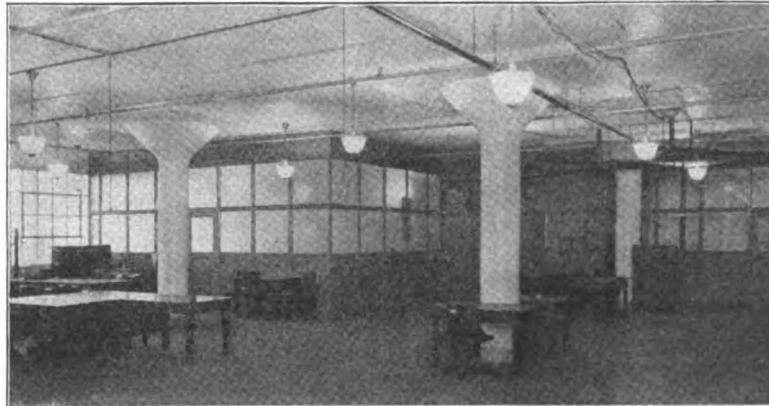
SANYMETAL GRAVITY ROLLER HINGE

Catalogues.

SANYMETAL catalogues and bulletins on toilet, factory and office partitions and gravity roller hinges sent on request.



AN INSTALLATION OF SANYMETAL TOILET PARTITIONS AND TOILET ROOM SCREEN



SANYMETAL FLEXIBLE PARTITIONS FOR OFFICES AND FACTORIES

HENRY WEIS MANUFACTURING COMPANY

Toilet Compartments

FACTORY AND GENERAL SALES OFFICE
ATCHISON, KANS.

CHICAGO, ILL., 455 Peoples Gas Building
BOSTON, MASS., 24 Milk Street

NEW YORK, N. Y., 103 Park Avenue
CLEVELAND, OHIO, 1836 Euclid Avenue

SALES REPRESENTATIVES IN PRINCIPAL CITIES

Product.

WEISTEEL COMPARTMENTS for enclosing Toilets, Showers and Dressing rooms.

Weisteel Compartments.

Weisteel compartments have stood up under every condition in steel mills, industrial plants, packing plants, railway buildings, comfort stations, schoolhouses, and various institutions where a sanitary equipment of this kind is put to the hardest test.

Many of the largest industrial institutions, railway systems and schoolboards incorporate Weisteel compartments in their standard specifications and use them in all buildings.

Design.

Every sanitary requirement has been fully taken care of. All unnecessary joints have been eliminated. All parts are so shaped that water will not stand on them, and there are no projecting screws or boltheads to catch dirt or on clothing.

Being constructed of steel they will not absorb moisture nor can they be easily defaced.

WEISTEEL

TRADE-MARK

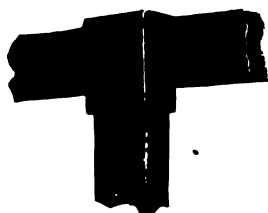
Erection.

The erection of these compartments is so simple that any handy man with ordinary tools can do the work quickly.

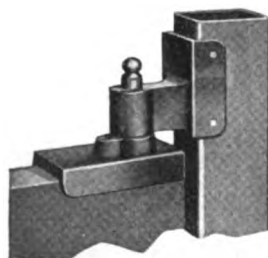
Only three bolts are required to erect the ordinary toilet compartment, and there is no drilling or fitting to do in connection with the material. Wall connections allow for variation in walls and permit setting the partitions out 1 in. from the wall, where desired. Foot casting allows for adjustable height of front post to care for any variation in floor and is fastened to the floor by concealed screw in the casting.

Units.

Weisteel compartments are built in special stock units for toilets, to suit almost every condition and can be shipped immediately from stock. Compartments are also built to suit all special conditions and for showers and dressing rooms. For toilets requiring utility or working space at the rear, space is enclosed completely with steel backs, ends and tops.



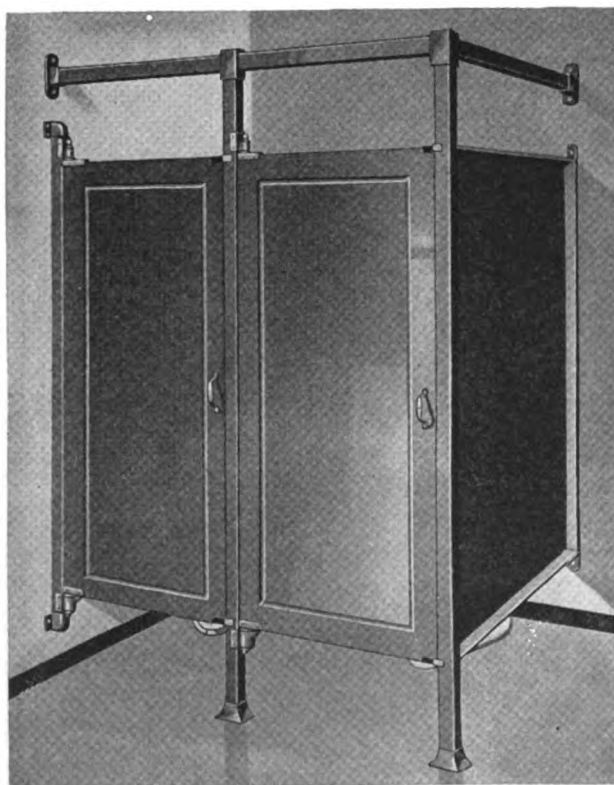
TOP FRONT POST



UPPER PIVOT BUTT



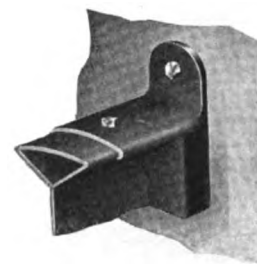
LOWER SPRING PIVOT BUTT



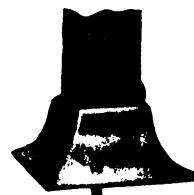
WEISTEEL COMPARTMENTS AS INSTALLED IN TOILETS, SHOWERS OR DRESSING ROOMS



BUMPER



WALL FASTENING



PHANTOM VIEW OF FOOT CASTING

Engineers' Specifications.

Partitions—Partitions with front and rear posts built in one unit of cold rolled and pickled steel sheet and consist of three members only, top and bottom rail of partition being formed from the partition sheet which is interlocked into the hollow metal posts at the front and rear and securely welded into place.

Doors—Door stiles and rails are formed of No. 22-gauge cold rolled and pickled steel having panels of No. 16-gauge cold rolled and pickled steel. Miters of stiles and rails are interlocked, countersunk and finished flush.

Castings—Malleable iron castings are furnished at the top and bottom of front post, at the wall to receive the head rail, and at top and bottom of rear post to form wall fastenings. Safety setscrews having no projections are provided for fastening head rail into top post castings.

Hardware—Every compartment is provided with a 3½-in. two-prong coat and hat hook; 4-in. bar pulls and a heavy slide

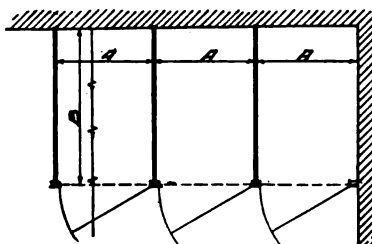
bolt steel latch. There is a malleable cast bumper stop with rubber filler at both top and bottom of door. Lawson Universal hinge is used exclusively on Weisteel compartments. This hinge can be used for doors that swing in or out of the compartment, and also for double acting doors, and can be adjusted so that the doors will stay open at any desired angle.

Wood Doors—Wood doors 1¼ in. thick may be used instead of steel when desired; in which case the standard hardware equipment is furnished with the necessary screws for attaching to wood.

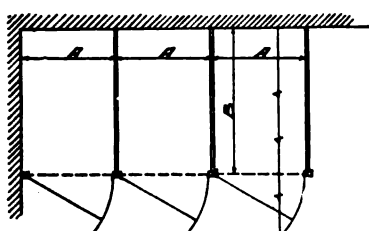
Head Rail—Rectangular tubing 1¼ by 1⅞-in. No. 16-gauge cold rolled and pickled steel.

Finish—All parts with the exception of coat hook, pull and latch are finished in either prime coat of special gray metal filler and primer, or baked-on enamel of either olive green or light gray color. All finish sprayed on under 40 lbs. pressure.

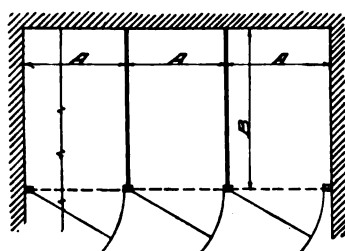
The coat hook, pull and latch are dead black, or nickelplated when desired.



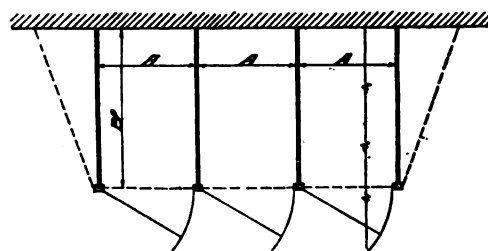
SERIES 2



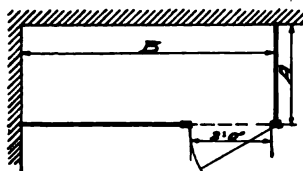
SERIES 1



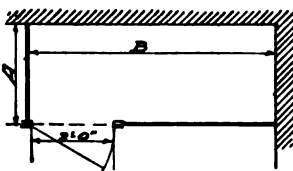
SERIES 3



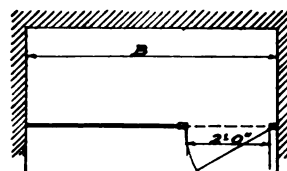
SERIES 4



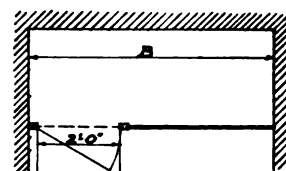
SERIES 5.



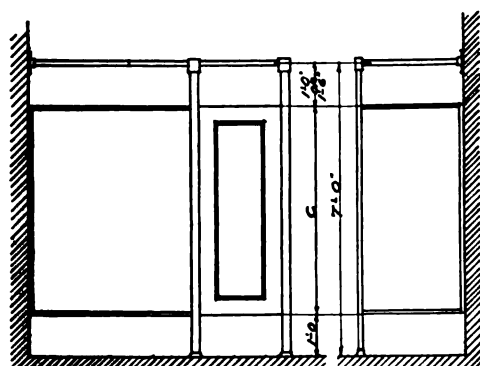
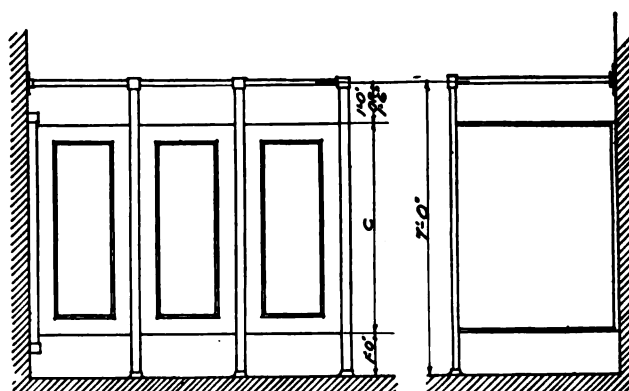
SERIES 6



SERIES 7



SERIES 8

TYPICAL FRONT ELEVATION SIDE.
SERIES 5-6-7-8 SERIES 7-8TYPICAL FRONT ELEVATIONS SIDE ELEVATION
SERIES 1-2-3-4. SERIES 1-2-4**STOCK UNITS OF WEISTEEL COMPARTMENTS**

NOTE—Series 1 and 2 are batteries of compartments where wall forms the end at right or left. Series 3 is a battery of compartments entirely between walls and where both ends are formed by walls. Series 4 is a battery of compartments having no walls at ends. In series 1, 2, 3 and 4 any number of compartments can be had in one battery. Series 5, 6, 7 and 8 are made in single compartments as shown.

DOORS—Width of doors in series 5, 6, 7 and 8 are 2 ft. 0 in. in all cases as shown. Width of all other doors in every case 2 in. less than dimension "A"; except in series 1, 2 and 3, where doors in end stalls at wall ends are 3 in. less than dimension "A."

Swing of doors may be reversed where desired. Any of the above stock units can be had without doors where desired.

DIMENSIONS OF STOCK UNITS

SERIES NOS. 1, 2, 3, 4, 5 AND 6

Dimension "A"	Dimension "B"	Dimension "C"
2'-6"	4'-0"	4'-6"
2'-8"	4'-6"	5'-0"
2'-10"	5'-0"	
3'-0"		

SERIES NOS. 7 AND 8

Dimension "B"	Dimension "C"
4'-0"	4'-6"
4'-6"	5'-0"
5'-0"	

Units without doors in Series 1, 2, 3 and 4 are also made in the following sizes for dimension "B": 2'-6", 3'-0" and 3'-6". Any stock unit can be made in special units with provision for utility or working spaces.

Urinal partitions, also shower and dressing compartments, with or without doors, can be furnished in special units of any desired size.

THE CENTRAL BRASS MANUFACTURING CO.

Manufacturers of Drinking Fountains

CLEVELAND, OHIO

Products.

"QUICKKOO" DRINKING FOUNTAINS with "PROTECTAJET" BUBBLER.

"PROTECTAJET" WALL FOUNTAINS.

"PROTECTAJET" PEDESTAL FOUNTAINS.

BUBBLERS.

For Valves, Faucets, Cocks and Bibbs, see page 941.

"Quickkool" Drinking Fountain.

Sanitary Qualities—This fountain embodies the "Protectajet" bubbler, having protected angle jet. The umbrella-shaped protector prevents contamination from mouth secretions, perspiration and germ laden dust. By a simple, ingenious device, the protector is automatically raised by the water pressure when the water is turned on. When the user's hand is taken from the lever handle of the self-closing stop cock, the protector resumes its normal position over the jet.



"QUICKKOO" DRINKING FOUNTAIN
(Patented)

Description—Bowl is cast iron, vitreous enameled. The refrigerator is lined with heavy galvanized iron. The outer shell is of black iron, both sides coated with baked-on enamel.

The water chamber is of cast iron, galvanized inside and out. Takes place of troublesome and inefficient coil.

Thoroughly insulated with compressed granulated cork.

The upper ring that binds the outer shell to the lining of the refrigerator is an iron casting. The base is

also a solid iron casting with bosses cast thereon, into which the 1-in. iron pipe legs are screwed.

Holds a 75-lb. cake of ice or more than 100 lbs. of cracked ice.

Connections—Supply, $\frac{3}{8}$ in., waste, $1\frac{1}{4}$ in., center to center, $16\frac{3}{4}$ in.

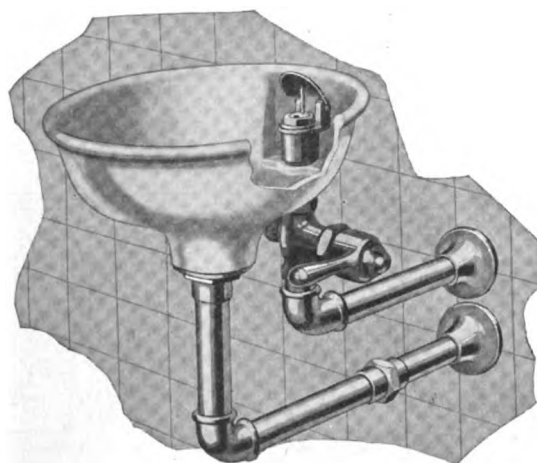
Dimensions—Diameter, 20 in. Height of bubbler from floor, $42\frac{1}{2}$ in.

Finishes—Regular finish, for top ring, base and legs is black, body and cover green. When ordered, the top ring, base and legs can be black and the body and cover white, or any other color scheme specified.

Weight—Packed for shipment, about 160 lbs.

"Protectajet" Wall Fountain.

Bubbler is the same as used on the "Quickkool"—enameled iron bowl with automatically protected angle



"PROTECTAJET" WALL FOUNTAIN



"PROTECTAJET" PEDESTAL FOUNTAIN

jet. Pipe fittings are all nickelplated brass. Supply pipe, $\frac{3}{8}$ in., waste, $\frac{1}{2}$ in., center to center, 3 in.

"Protectajet" Pedestal Fountain.

Bubbler is the same as used on the "Quickkool"—enameled iron bowl with automatically protected angle jet. Pedestal is $2\frac{1}{2}$ -in. iron pipe. Floor flange is $2\frac{1}{2}$ by $1\frac{1}{4}$ in. giving $1\frac{1}{4}$ -in. waste. Supply inlet $\frac{3}{8}$ in. Height of bubbler from floor, 40 in.

Note: Some people connect these wall and pedestal fountains to a "Quickkool" fountain, thereby having them deliver refrigerated water.

THE D. A. EBINGER SANITARY MFG. CO.

Specialists and Manufacturers of Ventilated Toilet Fixtures

COLUMBUS, OHIO

BRANCH OFFICES

NEW YORK, N. Y., 101 Park Avenue

MINNEAPOLIS, MINN., Hampshire Arms

Products.

VENTILATED INDIVIDUAL and RANGE CLOSETS; VENTILATED OCTAGON and WALL URINALS; VENTILATED VITRO PORCELAIN URINALS;



TRADE-MARK

DRINKING FOUNTAINS; LAVATORIES; STEEL TOILET ENCLOSURES.

Also manufacturers of Wash Sinks and Showers.

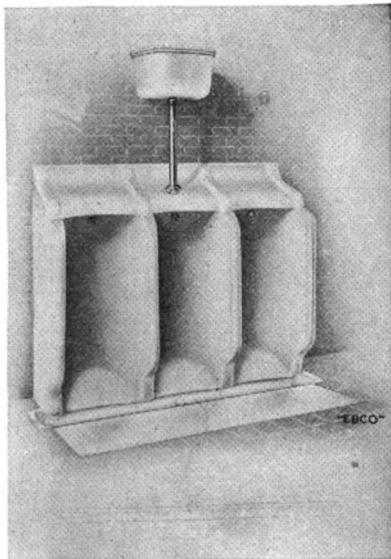
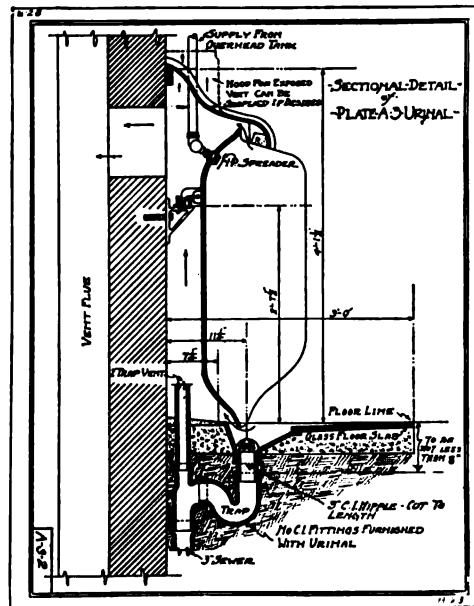


PLATE A-3
"EBCO" Vented Wall Urinal



Sectional Detail of A-3 Urinal

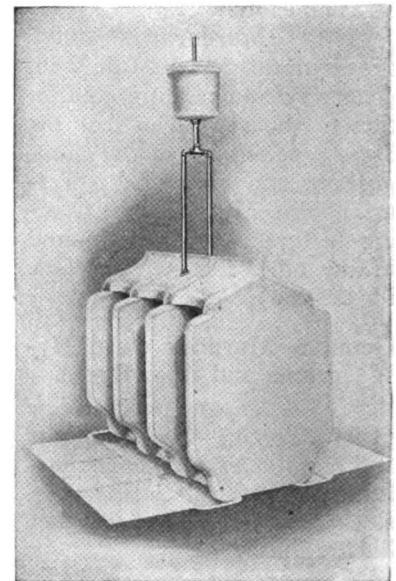


PLATE A-3-D
Same as A-3 But Stalls Are Placed Back to Back

"EBCO" VITREOUS ENAMELED VENTILATED URINALS

SPECIFICATIONS—"EBCO" vitreous enameled ventilated urinals. Concave back and partitions made in one piece. Each urinal back flushed periodically from automatic flush tank; white glass floor slabs (if desired) drain into receptor; each stall shall have two points of ventilation, top and bottom with capacity of 25 sq. in. per section



PLATE B-61
"EBCO" SPECIAL VENTILATED AUTOMATIC CLOSET

SPECIFICATIONS—"EBCO" Special ventilated automatic closet, heavy vitreous china bowl, extended front and rear, with large raised rear vent, automatic seat-operated concealed flush valve, heavily reinforced seat, open front and rear

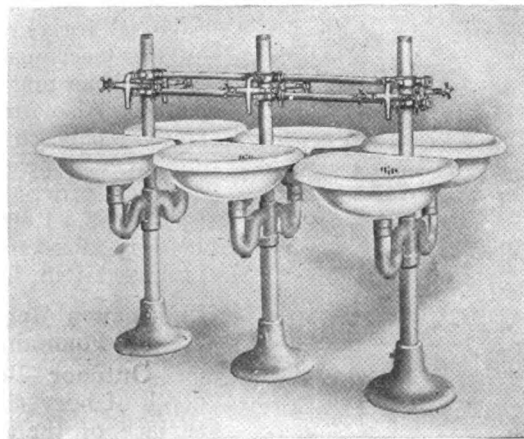


PLATE D-309
"EBCO" INDIVIDUAL FACTORY LAVATORY

SPECIFICATIONS—"EBCO" factory lavatory; vitreous enameled bowls; combination trap standard; "EBCO" combination faucets; any number of bowls may be used

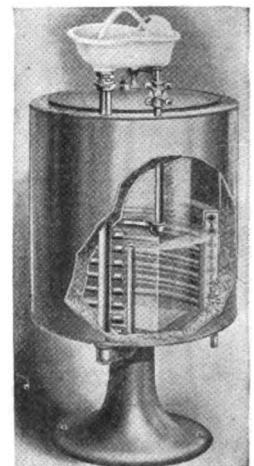


PLATE C-271
"EBCO" COOLER FOUNTAIN

SPECIFICATIONS—"EBCO" combination water cooler and fountain; tinned brass coils; vitreous enameled receptor; ice capacity 75 lbs. in one piece

Standard Specifications for "Ebco" Steel Toilet Compartments.

Panel sheets, stiles and posts shall be constructed of best quality furniture stock, three-pass, full cold rolled and patent level heavy sheet steel with all joints at intersections electrically spot-welded.

Posts shall be $2\frac{1}{2}$ by $2\frac{1}{2}$ in. square in cross section with rounded corners.

Partition panels and door sections shall be made of continuous rails or stiles all around, electrically spot-welded to panel sheet.

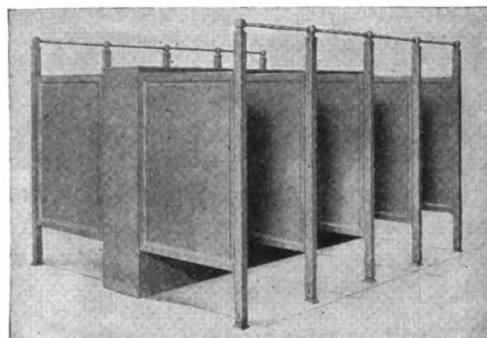
Partitions shall be secured with concealed fasteners at front edge where joined to post.

Utility chamber or vent space shall be formed of reinforced plain sheets with cap having beaded edges. One end sheet of chamber shall be held to place with screws to permit of access to chamber.

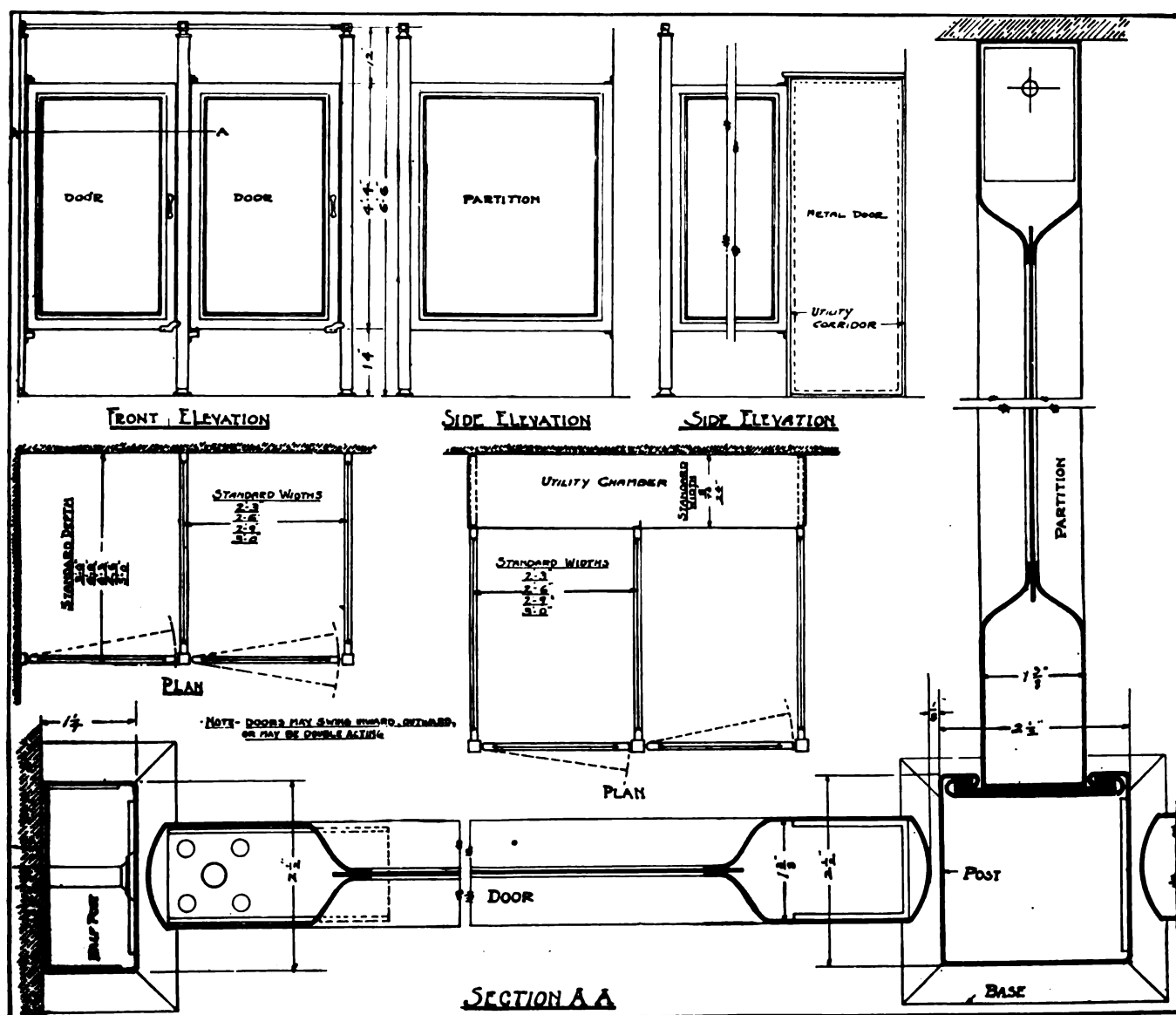
Post caps, bases and wall plates shall be of best gray cast iron. Caps and wall plates shall have concealed set screws to secure tie rails and permit of adjustment. Bases shall be secured to floor with concealed bolt and shall have adjustment to overcome any unevenness in floor. Tie rail shall be best wrought iron pipe, 1 in. outside diameter.

Finish of steel work, including caps, bases, tie rail and wall plates, consists of a filler and baked priming coat and two coats of enamel baked on at a high temperature to insure a hard smooth surface. Color shall be olive green or battleship grey (other colors can be furnished if desired).

Doors shall be hung on (doors may swing inward, outward or may be double acting) nickelplated brass incased roller bearing gravity hinges. Bumpers, pulls and latch bolts shall be nickelplated brass.



"EBCO" STEEL TOILET ENCLOSURES



DETAILS OF "EBCO" STEEL TOILET ENCLOSURES

GLAUBER BRASS MFG. CO.

Finest Brass Goods Made for Plumbing, Gas and Water Works

GENERAL OFFICES AND WORKS

CLEVELAND, OHIO

Products.

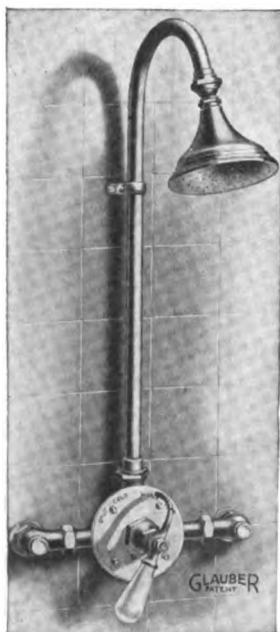
FAUCETS and COCKS of every type, as used in plumbing, water and gas installations, the items of particular interest to the industrial trade being LAVATORY and WASH SINK FIXTURES, SANITARY DRINKING FOUNTAINS and BUBBLERS, SHOWER MIXING VALVES and SHOWER BATHS.

Metal.

All Glauber products are made from a rich bronze metal containing 86% copper, 6% tin, 4% zinc and 4% lead, a formula which has been adopted almost without any changes by the water departments of ten of the leading cities in the United States, whose engineers agree with us that only rich red metal can withstand the ravages of time.

Guarantee.

All goods made by GLAUBER BRASS MFG. CO. are sold under an absolute *five-year guarantee*, fully insuring the customer against loss and annoyance inevitably encountered in the use of inferior goods.



H-25. THE "CAROLINA" EXPOSED SHOWER MIXING VALVE

5-in. shower head. Center to center of supplies, 10½ in.

Shower Mixing Valves and Shower Baths.

Glauber mixing valves are unique in that they are the only ones operating on a two-way cam principle.

Ours was originally the "Paragon" valve, of which the company purchased the patent. The opening and closing of the ports is positive.

Other mixers are built on the piston valve principle, no provision being made to take care of expansion other than a loose fit. This permits seepage, resulting in faulty control of temperatures and in frequent scaldings.

Glauber mixing valves are of such perfect mechanical construction that they can be successfully used to make hot

water out of steam and cold water when equipped with steam packings. This is of interest to many industrial concerns, where steam lines already installed may be utilized, saving the installation of a hot water system.

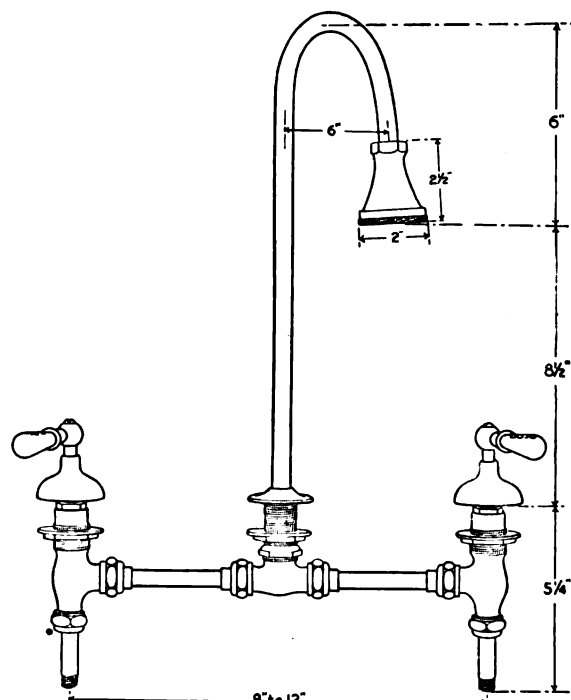


COMBINATION REGULATING STOP AND CHECK VALVE
Used in connection with Glauber shower mixing valve.

Front view of valve exposed.
Distance center to center, 10½ in.

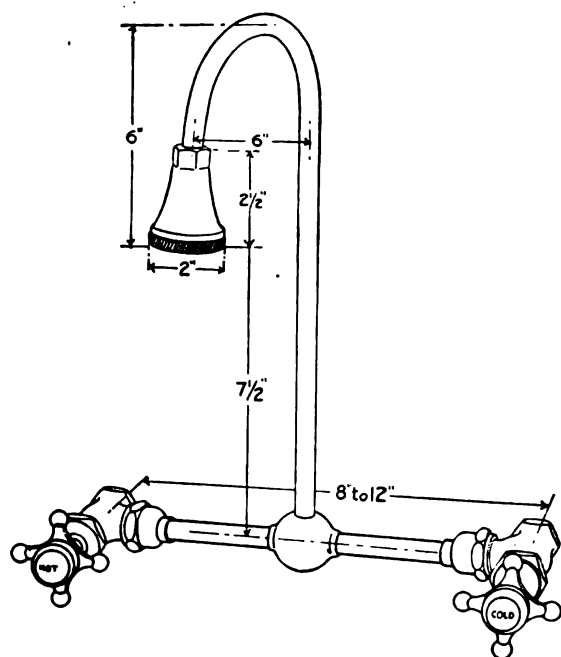
Lavatory and Wash Sink Fixtures.

Attention is called to the fact that all these fixtures illustrated embody the modern and sanitary idea of *washing in running water*. The use of chain and plug or any other type of waste is dispensed with—a beehive strainer being used instead, to compel the men to wash in running water. In this way the lavatories are kept clean and the men are not using the water more than once.



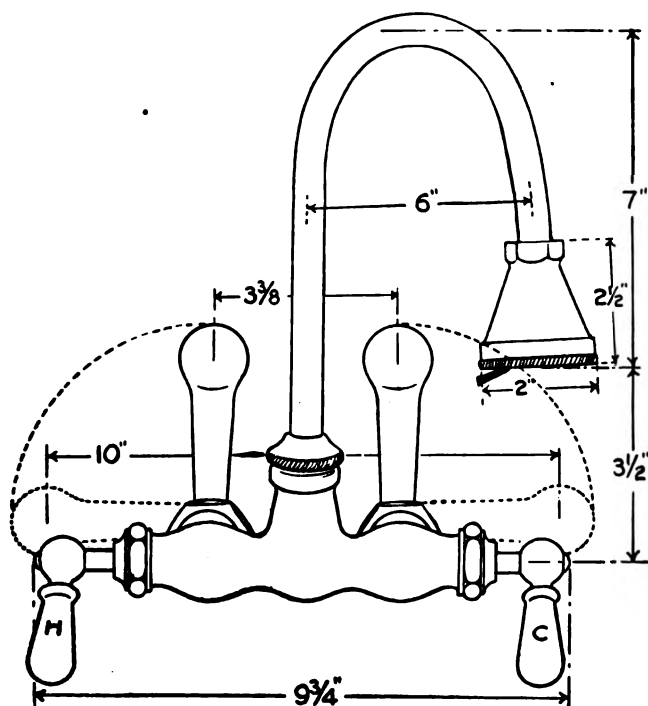
THE OVERLAND

Nu-Rapid (quick compression) combination lavatory fitting with "Carnegie" gooseneck and cast brass "No-Spread" rose spray. Fits any lavatory except those drilled for Standing or Ideal waste. Connections between valves and spout are lead pipe, providing ready adjustment of valve centers, 8 to 10 in. Exposed parts finished brass, nickelplated; parts below lavatory slab, rough brass, nickelplated, unless otherwise ordered.



THE BRISCOE

Compression combination fixture with "Carnegie" gooseneck and cast brass "No-Spread" rose spray, for installation on wall above lavatory or trough or on sink back. Connections between valves and spout embody our "lock-jaw" fittings, which combine the adjustability of slip joints with the rigidity of threaded connections. Inlets tapped female, $\frac{1}{4}$ -in. iron pipe. Loose cast brass wall flanges are furnished with each fixture.



THE JORDAN—FRONT VIEW

Nu-Rapid (quick compression) combination fixture for wash sinks. Has "Carnegie" gooseneck and cast brass "No-Spread" rose spray; has "blendo" adjustable shanks, centers variable from $3\frac{3}{8}$ to 10 in. Shanks tapped $\frac{1}{4}$ -in. iron pipe. Nickelplated, unless ordered in finished brass.

The Practicool Drinking Fountain.

A splendid means of serving employees with cool water, even during the hottest months. The fountain holds a 75-lb. cake of ice, which will last about 3 days under normal conditions. Besides being equipped with a Glauber sanitary bubbler, it is also equipped with the Coolerator, a galvanized cast iron water chamber hold-

ing 3 times as much water as a 40-ft. coil of $\frac{3}{8}$ -in. lead pipe and will therefore effect a 20% reduction. For instance, it is sufficient to reduce 40 gals. of 70° water to 50°. The fountain is durably constructed, being made of heavy iron with a galvanized iron ice chamber. Granulated cork is used for insulation. Being connected with waste and supply pipes, it requires no attention. The model illustrated is the No. 2 Practicool fountain. We also manufacture 3 other types. Write for information and prices.



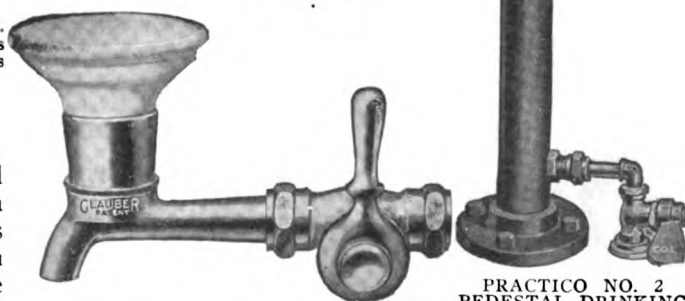
"PRACTICOOL" NO. 2 DRINKING FOUNTAIN

Sanitary Drinking Fountains.

The common fault with drinking fountains in general is that they do not prevent contact between users' lips and the jet. This fault is not found in Glauber drinking fountains and, in addition, the jet is of such design that it throws a slightly palpitating bubble, automatically cleansing the bowl every time the bubbler is used.



THE PRINCETON BUBBLER



THE GIRARD BUBBLER

PRACTICO NO. 2
PEDESTAL DRINKING
FOUNTAIN

PURO SANITARY DRINKING FOUNTAIN CO.

HAYDENVILLE, MASS.

Products.

SANITARY DRINKING FOUNTAINS.
COMBINATION DRINKING FOUNTAINS
and COOLERS.
PEDESTAL DRINKING FOUNTAINS.

PURO
TRADE-MARK

and breaks into a perfect geyser, just high enough so that a satisfying drink may be obtained.

The bowl will positively not overflow, because the fountain is so regulated that the water will not run faster than the bowl can carry off. All surplus water drains into the waste pipe.

The construction is simple and there are no parts to get out of order. Adjustment of flow can be made by a setscrew to suit pressures up to 150 lbs. There is no possibility of a sudden squirt and the consequent drenching of the user.

Development of "Puro" Sanitary Products.

The PURO SANITARY DRINKING FOUNTAIN Co. has been manufacturing sanitary drinking fountains since 1905, and has since made constant improvements and incorporated new features until the varied designs as shown herein were produced, all up-to-date as to pattern, construction and sanitary merit.

"Puro" products are designed with one end in view—to provide a clean, inviting method of dispensing drinking water, thereby eliminating the universally condemned, unsanitary, common drinking cup.

"Puro" products described herein are especially adaptable for use in industrial plants, schools, hospitals, public buildings, parks, etc. where safety is essential for all who drink.

They are cutting the costs for the greatest industries by saving about 60% of employees' time and about 35% of metered water.

"Puro" products fulfil all state health law requirements and have been approved by and are being used by many municipalities, among them Washington, New York, Chicago and Boston.

"Puro" and "Puro Junior" Drinking Fountains.

These fountains are made of heavily nickelplated cast bronze, and also of silver metal on special order. Are regularly furnished with self-closing handles; compression handles furnished to special order.

The bowl surrounding the bubbler is a protection against infection, as its construction makes it impossible to touch the bubbler with the lips.

The water bubbles about 1½ in. high

"Puro" Fountain—The "Puro" is a combination drinking fountain and faucet, the only device of its kind which replaces the old style faucet and in addition allows of a clean and easy way of drinking from a perfect bubble.

This model is for use with a sink and has two handles, one for the bubbler and the other for the faucet or pail filler.

Water inlet is threaded for ½-in. iron pipe.

"Puro Junior" Fountain—Has no faucet for drawing water as has the regular "Puro," therefore it is not necessary to install over a sink.

It has only one handle for the bubbler and is intended strictly for drinking purposes.

Water inlet is threaded for ½-in. iron pipe; waste tube for ⅜-in. iron pipe, and can therefore be connected direct to the sewer.

"Puro" Combination Cooler and Drinking Fountain.

Consists of a cork insulated sheet and galvanized iron tank containing a 40-ft. coil of galvanized pipe and is equipped with either a "Puro" or "Puro Liberty" sanitary drinking fountain.

The tank is furnished with a locking device closing on a rubber gasket, making it airtight and reducing the consumption of ice to a minimum.



"PURO" COMBINATION DRINKING FOUNTAIN AND FAUCET
Adaptable for installing over a sink



"PURO" COMBINATION COOLER AND DRINKING FOUNTAIN
Can also be equipped with "Puro Liberty" Sanitary Drinking Fountain



"PURO JUNIOR" DRINKING FOUNTAIN
For drinking purposes only

The tank will hold a 50-lb. piece of ice, *which need not be cracked.*

Tank and pedestal are finished in battleship gray. Supply and waste pipes are tapped for $\frac{3}{8}$ -in. iron pipe.

Floor to top of cup, 42 in.; diameter of base, $13\frac{1}{4}$ in.; diameter of tank, $18\frac{3}{4}$ in. Weighs approximately 140 lbs.

"Puro Liberty" Sanitary Drinking Fountains.

Drinking fountains have occupied the attention of public health officials for a number of years to determine the relative merits of the so-called sanitary fountains on the market and nearly all have been rejected for one fault or another.

The PURO SANITARY DRINKING FOUNTAIN CO., recognizing the disadvantages of these so-called sanitary fountains, developed and placed upon the market the "Puro Liberty" fountain after a number of years of exhaustive experiments and investigations, and after repeated tests of the utmost severity in the bacteriological laboratories of the United States Public Health Service in the District of Columbia.

These laboratories have unqualifiedly indorsed the "Puro Liberty" and have pronounced it *the only absolutely sanitary drinking fountain.*

The results of the above mentioned tests have shown conclusively that the "Puro Liberty" *defies contamination.*

It is impossible to contaminate the water coming from the nozzle and there is no way in which bacteria can come in contact with the stream in any ordinary usage of the fountain.

It is not possible for the nozzle to be touched by the lips or fingers, neither is it possible to easily remove parts or otherwise subject the fountain to mischievous interference.

The laboratory of the Health Department of the District of Columbia has condemned the straight jet and side stream type fountains which do not protect the tip or source of water supply from the lips, fingers or splashing from the mouth while drinking.

Various municipalities have adopted the

"Puro Liberty" and are installing it in their public schools.

The bowl of the "Puro Liberty" is made of white enameled cast iron; faucet and guard of heavily nickel-plated bronze. Regularly furnished with self-closing handles; compression handles furnished to special order.

Flow of water can be adjusted by a setscrew for all pressures up to 150 lbs. and there is no danger of the bowl overflowing.

The construction of the "Puro Liberty" is extremely simple. Unbreakable materials, rugged working parts and economical operation recommend the "Puro Liberty" fountain for installation in all places where such fixtures are subject to rough usage.

Water inlet is tapped for $\frac{3}{8}$ -in. iron pipe; waste pipe for $\frac{1}{2}$ -in. iron pipe.

"Puro" Pedestal Drinking Fountain.

Consists of an iron pedestal finished in battleship gray, mounting a "Puro" or "Puro Liberty" sanitary drinking fountain.

They are easily installed on wood or concrete floors and can be equipped with this company's antifreezing attachment.

They are provided with a quick, self-drain.

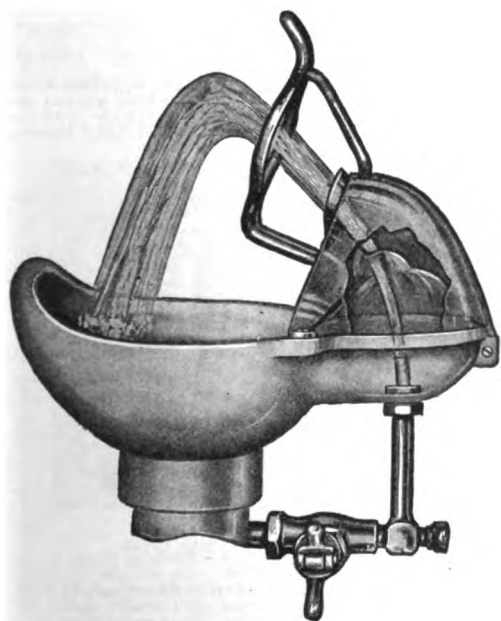
Supply pipe is tapped for $\frac{3}{8}$ -in. iron pipe; waste pipe for $\frac{1}{2}$ -in. iron pipe.

Supply and waste pipes run through the center of the pedestal and are furnished to the floor only.

Height of pedestal, 34 in.; diameter of base, $13\frac{1}{4}$ in. Weighs approximately 65 lbs.

A Few Users of "Puro" Sanitary Products.

American Brass Co.	Heywood Bros. & Wakefield Co.
American Sheet & Tin Plate Co.	Larkin Co.
American Steel Foundries	National Biscuit Co.
Beechnut Packing Co.	Norfolk & Western R. R. Co.
duPont de Nemours Powder Co.	Procter & Gamble Mfg. Co.
Eaton, Crane & Pike Co.	Proximity Mfg. Co.
General Electric Co.	Steel Co. of Canada, Ltd.
H. J. Heinz Co.	Studebaker Corporation
	United Verde Copper Co.

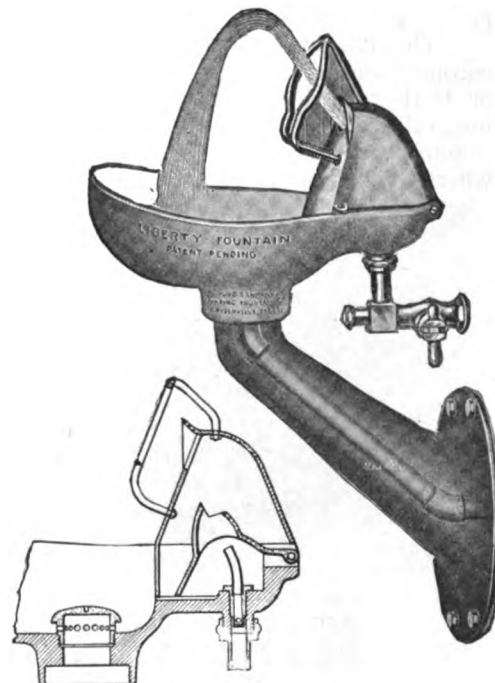


"PURO LIBERTY" SANITARY DRINKING FOUNTAIN

Adaptable for mounting on "Puro" coolers, pedestals or wall brackets, as illustrated herein



"PURO LIBERTY" Pedestal Drinking Fountain



"PURO LIBERTY" SANITARY DRINKING FOUNTAIN MOUNTED ON WALL BRACKET

RUNDLE-SPENCE MFG. CO.

Manufacturers of Drinking Fountains

MILWAUKEE, WIS.

Products.

"VERTICO-SLANT" DRINKING FOUNTAINS; DRINKING WATER SYSTEMS; DRINKING WATER COOLER SYSTEMS.

Also manufacturers of Bubbling Fountains of all styles and for all types of installations; Fountains for man, horse and dog.

Less water is used than with the average old style globe shaped drinking head.

Greatly reduced pressure automatically puts this fountain out of use before it can become a menace to life and health.

"Vertico-Slant" Drinking Fountains.

Fountains embodying the "Vertico-Slant" stream represent the latest and best from a sanitary standpoint.

Streams of decided slant are impractical to drink from on account of their "hoselike" force. Fountains with hoods afford a resting place for the corner of the mouth with consequent contamination.

The "Vertico-Slant" fountain with nozzle down in recess overcomes these objections. All the water falls to one side; none of it can fall back into the ascending column.

The copious drinking feature of the vertical stream is retained as the mouth comes in contact with the stream at a point where it loses its momentum.

A glass or cup can be as readily filled from this stream as from a faucet.

Squirting, tampering and pilfering are eliminated.

The mischievously inclined can not cause damage to the lips or teeth of the drinker as the integral nozzle is located on the sloping base of wall or recess where the lips can not touch it.



PLATE C-75 BRACKET FOUNTAIN

Extra heavy vitreous bowl with integral "Vertico-Slant" stream drinking head, aluminum bronzed iron bracket and trap, rough brass self-closing, ball bearing, 4-arm handle stop, with loose key stop



PLAN OF BOWL C-92

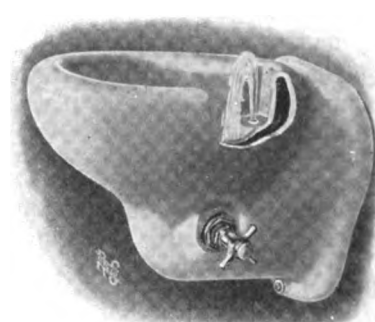
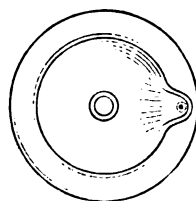


PLATE C-92 FOUNTAIN

Vitreous china one-piece fountain on concealed hanger, integral "Vertico-Slant" stream drinking head, nickelplated brass self-closing, 4-arm handle stop. Supply with volume regulator and rough brass trap concealed. Oscillating lever handle furnished instead of 4-arm handle when desired



Plate C-127



Plan of Bowl for All Fountains Shown Except C-92



Plate C-130

FOUNTAINS WITH COOLER

PLATE C-127—Vitreous china bowl with integral "Vertico-Slant" drinking head, self-closing, ball bearing, 4-arm handle stop, galvanized pipe coil through which water passes to drinking head without coming in contact with ice, galvanized waste pipe from drinking head, galvanized steel body with cast iron top, bottom and flanged standard, painted two coats. Top, bottom and shell of body insulated with cork. Foot valve control when desired

PLATE C-130—Plate C-145 fountain with Plate C-127 cooler body

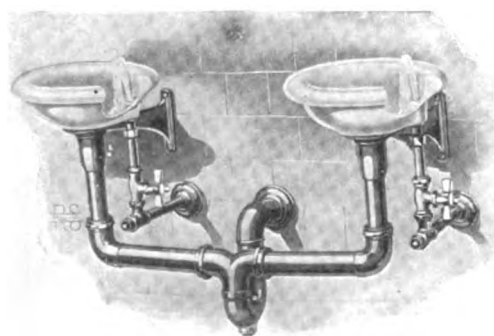


PLATE C-78 DOUBLE BRACKET FOUNTAIN

Vitreous china bowls with integral "Vertico-Slant" stream drinking heads, each with nickelplated bracket, nickelplated brass self-closing, ball bearing, 4-arm handle stop, loose key stop, nickelplated brass waste with trap

Foot valve control if desired



Plate C-151

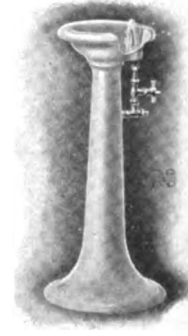


Plate C-143

PEDESTAL FOUNTAINS

PLATE C-151—China bowl with integral "Vertico-Slant" stream drinking head on 2-in. galvanized pipe pedestal; self-closing, ball bearing, 4-arm handle stop and loose key stop. Foot valve control if desired

PLATE C-143—Cast iron pedestal 15 in. across base, china bowl with integral "Vertico-Slant" stream drinking head, self-closing, ball bearing, 4-arm handle stop, loose key stop, galvanized waste and supply pipe. Foot valve control if desired

JOHN SIMMONS CO.

Plumbing Supplies

GENERAL OFFICES
102-110 Centre Street
NEW YORK, N. Y.

PLUMBING WAREHOUSE, Bush Terminal, BROOKLYN, N. Y.

Products.

PLUMBING EQUIPMENT for Factory installation.

Also, Cocks: Brass and Iron, for steam, water, gas, air, ammonia and acid; Ball, Basin and Hydrant.

For Pipe and Fittings, see page 430.

Equipment for Factory Installation.

The efficiency of the employee is governed in large measure by his surroundings. Light, cheery quarters, with plenty of fresh air, have produced amazing returns in added output. Plumbing equipment is meeting with the careful consideration of many of the foremost manufacturing concerns. They realize that proper plumbing facilities lead to cleanliness, and cleanliness to better health for their workers.

Closet Combinations.

There are many different styles of closet combinations for use in factory installation. For this kind of work a heavy "Giant" bowl with integral seat, and nickelplated flush valve with brass oscillating handle is recommended.

References—This company has completed contracts for this kind of equipment with the following concerns:

De La Vergne Machine Works
Downey Shipbuilding Corp.
E. I. du Pont de Nemours & Co., Inc.
Essex Foundry
Florida East Coast Railway
Ford Instrument Company
General Chemical Company
United Fruit Company
Vulcan Rail & Construction Co.
West Virginia Pulp & Paper Co.

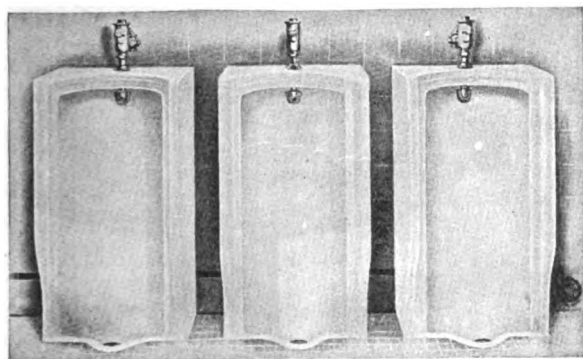


RANGE OF SOLID PORCELAIN "IDEAL" FACTORY LAVATORY BASINS WITH INTEGRAL SOAP HOLDERS

Basins are furnished either back to back or for wall support. Each basin measures 18 by 21 in. Inside measurement 15 by 17 by 6½ in. Range is supported on "Universal" cast iron floor brackets, and equipped with pipe supports, supply pipes for hot and cold water and Fuller or compression bibbs

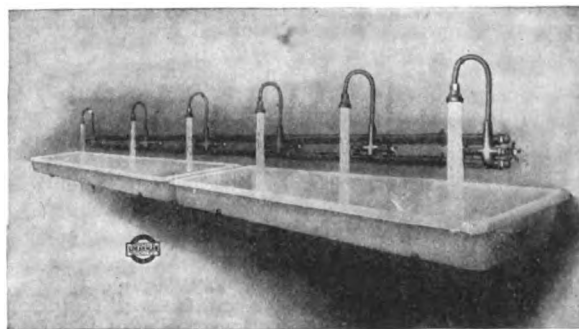
Inquiries.

JOHN SIMMONS CO. has specialized in installations of this kind, and invites inquiries.



RANGE OF SOLID PORCELAIN URINALS

Urinal is glazed all over, and is fitted with nickelplated strainer for lead or iron pipe connection, nickelplated spreader, and nickelplated flush valve, the combination making the most sanitary outfit procurable. 18, 24 or 28 in. wide



FACTORY LAVATORY OUTFIT WITH SPECIAL DOUBLE COMPRESSION FAUCETS WITH GOOSENECK AND SPRAY

HALSEY W. TAYLOR CO.

Sanitary Drinking Fountains
WARREN, OHIO

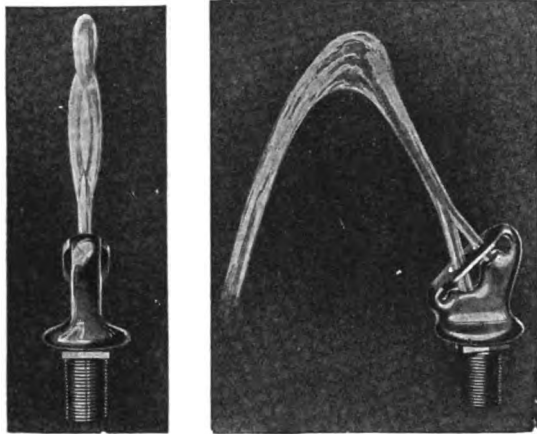
Products.

PURITAN SANITARY DRINKING FOUNTAINS (Patented).

Puritan Sanitary Drinking Fountains.

Puritan cantonment drinking fountains were designed to meet the demand of the government for better drinking equipment for use in cantonments, naval training stations, etc. They have been approved and adopted by all departments of the army and navy.

The Puritan stream projectors are recognized as superior to all others. Both sanitary and practical.



PURITAN 2-STREAM CONVERGING MOUND BUILDING STREAM PROJECTOR

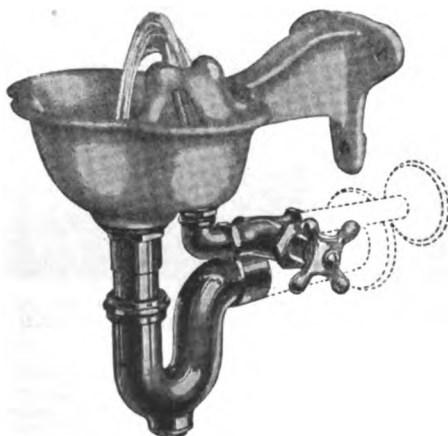
Used on fountains 562 to 579 inclusive

Puritan 566 "Cantonment" Wall Type Drinking Fountains.

Drinking fountain and glass filler combined. Bracket and receptor, cast iron vitreous enameled all over; 2-stream converging mound builder side stream projector. Nickelplated self-closing valve with volume regulator in valve; nickelplated brass strainer.

Projection from wall, 11½ in.; to center of drinking mound, 8 in.; receptor, 9½ in. over all; supply, ¾ in.; outlet, 1 in.

Price, complete.....\$20.00
Price, complete with 1¼-in. nickelplated brass trap..... 23.00



PURITAN 566 "CANTONMENT" WALL TYPE DRINKING FOUNTAIN, SHOWING CONCEALED SUPPORTING ATTACHMENTS

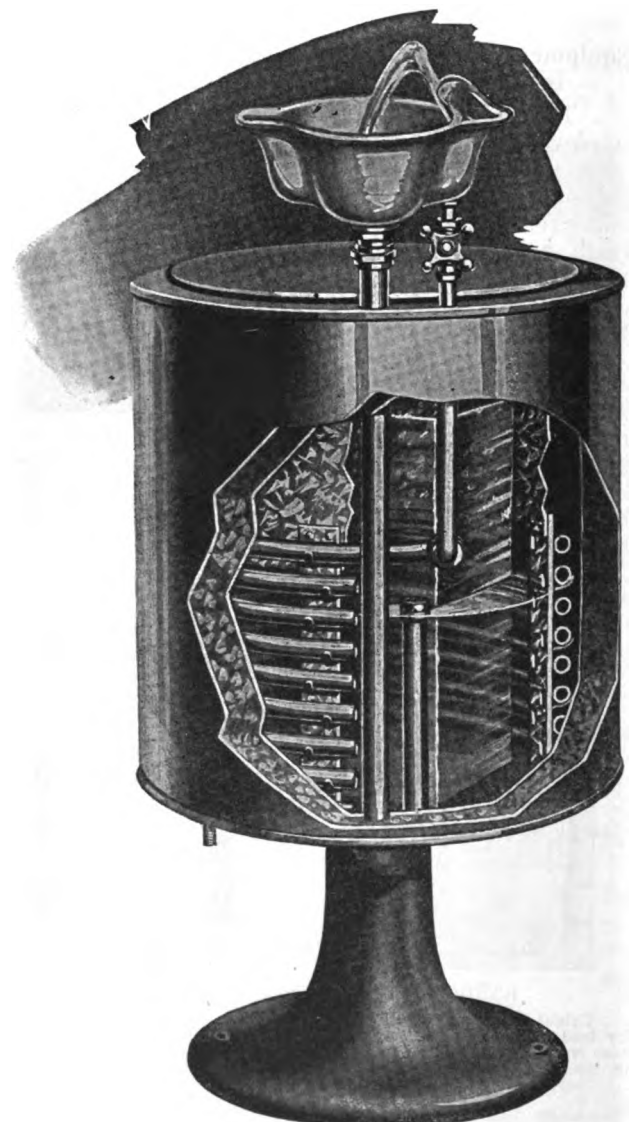
Puritan 570 "Cantonment" Cooler Fountains.

Cover, top and base made of cast iron. Body, tank and coil guard, galvanized sheet iron. Re-granulated cork insulation in side walls and pressed corkboard in bottom and cover. Cooling coil, ½ in. outside diameter. No. 20 gage seamless brass tubing, tinned both inside and outside. 2-stream converging mound builder projector. Self-closing valve and regulator.

Ice capacity, 100 lbs. cracked or 80 lbs. lump. Ice consumption, approximately 1 lb. per capita per day.

Ice chamber, 19 in. outside diameter by 19 in. high; height from floor to top of ice chamber, 32 in.; height from floor to top of bowl, 39 in.; diameter base, 14 in.; fountain receptor, 9½ in. over all; supply, ¾-in. iron pipe; waste, 1-in. iron pipe.

Price, complete as shown.....\$80.00



PURITAN 570 "CANTONMENT" COOLER FOUNTAIN INTERIOR

Puritan 562 Fountain Head.

Made from vitreous china with nickelplated brass base and projector. The projector used is the famous "2-stream converging mound building side stream projector" which produces a practical drinking mound at the highest point of projection.

This fixture is designed to replace present unsanitary bubblers on drinking fountains already installed. Price, as shown and described.....\$6.00
Price, with lever handle self-closing valve12.00

PURITAN 562
FOUNTAIN HEAD**Puritan 575 Fountain Head.**

Same as 570 fountain bowl; furnished with self-closing valve and regulator. Used to replace present unsanitary heads on coolers and pedestal fountains.

Price, complete as shown\$17.00
Price, less self-closing valve with regulator 12.00

PURITAN 575
FOUNTAIN HEAD**Puritan 568 Pedestal Fountain.**

Cast iron open base; 2½ in. outside diameter tubing; 2-stream projector and self-closing valve with volume regulator; supply, ¾ in.; waste, 1 in.

Price, 36-in. height, complete\$25.00
Price, 39-in. height, complete 26.00



568



520-68

PURITAN PEDESTAL
FOUNTAINS**Puritan 520-68 Pedestal Fountain.**

Combines the sturdy construction of 520 pedestal with sanitary features of 568 "Cantonment" fountain head.

Fountain receptor made from cast iron, vitreous enameled; equipped with "2-stream converging side jet projector," and furnished with cross handle self-closing valve and loose key regulator, which is concealed by slip base. Supply, ¾ in.; waste, 1 in.

For dimensions and other details of construction see 520.

Price, 39-in. height, complete.....\$40.00
Price, 42-in. height, complete..... 41.00

Puritan 571 Plain Cooler.

This plain cooler tank can be used in connection with fountains already installed or where it is desired to conceal cooler.

Price, complete as shown.....\$70.00

PURITAN 571
PLAIN COOLERPURITAN 573
COOLER
FOUNTAIN**Puritan 573 Cooler Fountain.**

Constructed same as 570 cooler but is furnished with 9½-in. vitreous china bowl and "4-stream angle jet projector."

Price, complete as shown.....\$80.00

Puritan 540 Wall Type Drinking Fountain.

For mills, factories, schools, railroads depots, etc. Heavy 6-in. vitreous china bowl, mounted in cast iron bracket and bowl support; "4-stream angle jet projector"; self-closing valve with volume regulator in valve. Finished in battleship gray.

Length over all, 12 in.; diameter of bowl support, 7 in.; height, 6 in.; inlet tapped, ¾ in.; waste, 1 in.; iron pipe thread.

Price, complete.....\$16.50

PURITAN 540 WALL TYPE
DRINKING FOUNTAINPURITAN 4-
STREAM ANGLE
JET PROJECTOR
(PATENTED)
Used on fountains 501
to 549 inclusive**Puritan 520 Mill Type Pedestal Fountain.**

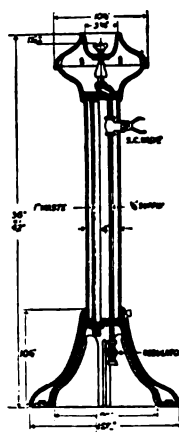
With heavy vitreous china bowl and "4-stream converging projector." A sturdy and durable fountain for use in steel mills, foundries, etc. Sanitary, convenient, foolproof. Has all the advantages of an open base pedestal, with the sanitary features of a closed base; no catch place for sweepings and other floor litter.

Made with heavy cast iron top and base with 4-in. outside diameter steel tubing standard; enclosed galvanized supply and waste pipes. Self-closing valve. Loose key regulator concealed in base.

By raising bell-shaped base (see illustration) connections can be made without disturbing floor or concrete. After connections are made, pedestal is bolted to foundation, stream adjusted, and base lowered to proper position concealing regulator.

Made in two heights, 39 and 42 in. Diameter, receptor 6 in. Diameter, adjustable base, 16½ in. Height, base, 10½ in.; supply, ¾ in.; waste, 1 in.

Price, 39-in. height, complete.....\$35.00
Price, 42-in. height, complete..... 36.00

Cross Section
Showing
Construction
and
DimensionsBase Raised for
Installing and
Regulating
Height of
Stream
Base Lowered to
Proper Position
After Con-
nections Have
Been Made

PURITAN 520 MILL TYPE PEDESTAL FOUNTAIN

"AUTOMATIC" SPRINKLER COMPANY OF AMERICA

Contractors for Fire Prevention

123 William Street
NEW YORK, N. Y.

PLANT
YOUNGSTOWN, OHIO

DEPARTMENT OFFICES

AKRON, OHIO, 232 Central Savings & Trust Building
ATLANTA, GA., 702-3-4 Candler Building
BALTIMORE, MD., 907 Calvert Building
BOSTON, MASS., 141 Milk Street
BUFFALO, N. Y., 822 Prudential Building
CHARLOTTE, N. C., 326 South Tryon Street
CHICAGO, ILL., 209 South La Salle Street
CINCINNATI, OHIO, 1817-18 First National Bank Building
DALLAS, TEX., 1608 Main Street
DETROIT, MICH., 1416 David Whitney Building
KANSAS CITY, MO., 112 West 9th Street
KNOXVILLE, TENN., 826 Holston National Bank Building

LOS ANGELES, CAL., 610 South Broadway
MINNEAPOLIS, MINN., 550-52 McKnight Building
NEW ORLEANS, LA., 525 Whitney Central Building
NEW YORK, N. Y., 123-33 William Street
PHILADELPHIA, PA., 328 Chestnut Street
PORTLAND, ORE., 628-29 Railway Exchange Building
ROCHESTER, N. Y., 130 Main Street, East
SAN FRANCISCO, CAL., 519 California Street
SEATTLE, WASH., 1906 Third Avenue
ST. LOUIS, MO., 1114 International Life Building
SYRACUSE, N. Y., 441 South Salina Street
YOUNGSTOWN, OHIO, Brittain Street

"AUTOMATIC" SPRINKLER CO. OF CANADA, LTD.

MONTREAL, QUE., 24 Victoria Square

TORONTO, ONT., 70 Lombard Street

Products.

"AUTOMATIC" FIRE EXTINGUISHING EQUIPMENTS, including Standard Sprinkler Apparatus, Wet and Dry Pipe; also Protection against special hazards, such as powder manufacturing, pyroxyline products, varnish dip tanks, oil and grease fires: Automatic Draft Stops; Automatic Water Curtains; Automatic Drainage of Hazardous Liquids; Automatic Fuel Oil Stops; Automatic Chemical Equipments for Supplying Automatic Sprinklers and Hose Standpipes Independent of Water Supplies; Sprinkler Heads, Dry Valves; Alarms, water and electric; Automatic Fire Door Releases; Deluge Valves; Sprinkler Systems, and all auxiliaries to complete systems of protection on ordinary and unusual fire hazards.

"Automatic" Service.

This company is the largest organization specializing in fire protection. Its large volume of business and efficient organization make for economy on any individual installation, yet first cost is not lowered at the expense of the service expected or of the protection acquired.

The actual basis on which fire protection can be acquired must necessarily vary according to the conditions bearing upon each case. Without expense or obligation on your part, this company will make a survey of the situation and report explicitly.

We maintain a complete inspection service in many locations with competent repair men available at any time, skilled inspectors and technical advisers.

Official Approval.

"Automatic" sprinkler apparatus has been tested and approved by the



TRADE-MARK

Underwriters' Laboratories, Inc., and accepted by the National Board of Fire Underwriters and every insurance association and company in the United States and Canada, with consequent reduction of insurance.

The Most Efficient Fire Fighters Known.

"Automatic" sprinkler systems embody the scientific supply and distribution of water immediately and automatically a fire occurs. They make the spreading of fire impossible—they do not prevent fires, but extinguish them with minimum loss.

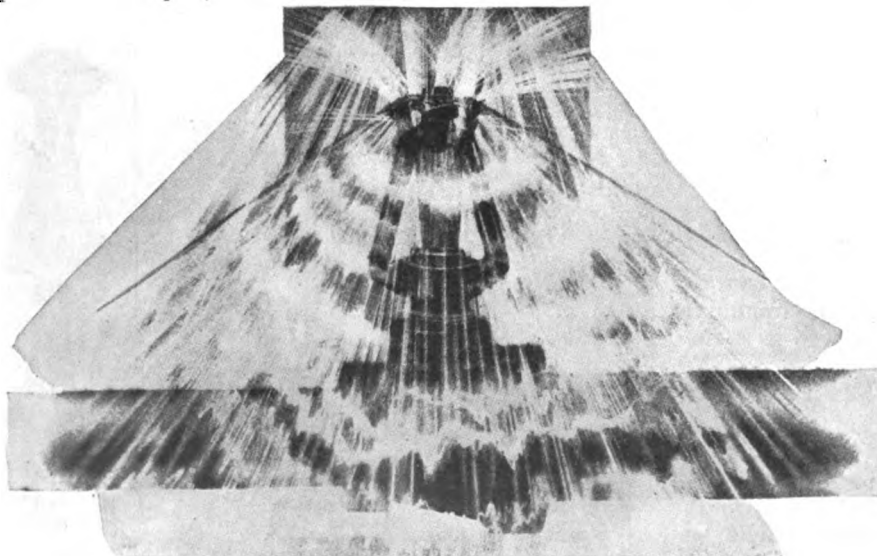
Besides reducing fire losses, they considerably reduce the cost of insurance and the risk of delay and loss of business resulting from fire.

Sprinkler Heads.

Sprinkler heads are considered to be the most thorough fire fighting device. A fire seldom opens more than a few. 85% of all fires in sprinklered buildings have been controlled by 5 heads or less. We have installed the largest equipments in the country, one plant alone requiring 120,000 sprinkler heads.

We Do Nothing But Specialize in Fire Protection.

Our sole aim is to afford customers the highest possible character of equipment designed to automatically and positively control fire. It is an utter impossibility to eradicate the occurrence of fire, but the little fire can be kept little—automatically, positively. We do nothing but specialize in fire protection—create, manufacture and install equipments which assure the automatic control of fire under whatever conditions that may exist.



"AUTOMATIC" SPRINKLER HEAD IN OPERATION

GLOBE AUTOMATIC SPRINKLER CO.

Engineers and Contractors for Fire Protection and Manufacturers of Fire Extinguishing Devices; Heating and Power Piping Equipments

2019-2035 Washington Avenue
PHILADELPHIA, PA.

FACTORIES: PHILADELPHIA, PA., WARWOOD (WHEELING), W. VA.

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BALTIMORE, MD., 531 Munsey Building
BIRMINGHAM, ALA., 701 American Trust & Savings Bank Building
BOSTON, MASS., 852 Oliver Building
CHARLOTTE, N. C., 472 Louise Avenue
CHICAGO, ILL., 1126 Association Building
CINCINNATI, OHIO, 420 First National Bank Building
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CANADIAN OFFICE: MONTREAL, QUE.

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Manufacturers of DEVICES for AUTOMATIC SPRINKLER SYSTEMS:

Automatic Systems: Dry Pipe and Wet Pipe.

Outside Systems: Cornice, Roof and Window.

Standpipe Systems: Yard Hydrants, Tanks and Mains.

DRY PIPE VALVES, ALARM CHECK VALVES, etc.

ENGINEERS and CONTRACTORS for Complete Industrial Heating and Power Piping Systems:

Low Pressure Equipment including: Steam (vacuum and gravity), Vapor and Hot Water (forced and gravity).

High Pressure Equipment including: Pipe Bends, Van Stone Joints and Welded Flanges.

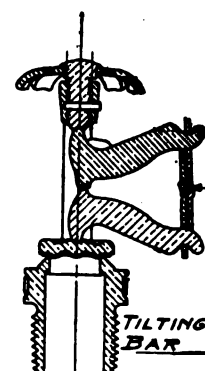
Industrial Piping for all classes of Work: Air, Water and Oil.



TRADE-MARK

of load and removing all strains from fusible metal. (2) High factor of safety due to tilting bar construction. (3) Positive and uniform fusing

due to removal of strain from solder, enabling it to function freely and instantly. (4) Dependability of operation assured through positive and instant separation of link plates, caused by tilting bar. (5) Use of die stamped parts wherever possible, insuring uniformity of manufacture, extreme and uniform strength, and maximum resistance to corrosion.



SECTION OF MODEL C SPRINKLER HEAD
Made in 4 fusing temperatures, 165°, 212°, 280°, 360°

Information and Approval.

The National Fire Protection Association in 1903 adopted resolutions providing that automatic sprinklers should only be installed by recognized automatic sprinkler companies and should not be sold for erection to those not experienced in this class of work, unless such installations be guaranteed by the manufacturers to comply with the rules of the National Board of Fire Underwriters.

The GLOBE AUTOMATIC SPRINKLER Co. guarantees its own installations; and all the devices installed are fully approved by the Underwriters' Laboratories, Inc., and all insurance bureaus in the United States and Canada.

Globe Automatic Sprinklers.

Sprinklers are simple automatic valves consisting of a bronze frame, bronze upper and lower levers, a bronze die stamped fusible link, a bronze die stamped fixed water distributor, a bronze die stamped valve and a die stamped copper gasket.

Frame is provided with a turned seat. Between this seat and valve is placed the copper gasket, which insures a tight, leakless joint when sprinkler is not in operation. Valve is held closed by a pair of levers, at out end of which is placed a link, made to fuse at different temperatures.

Special Features, Model C—(1) Perfected tilting bar construction, insuring a perfect mechanical carrying

Globe Dry Pipe Valves.

Designed for use in automatic sprinkler systems wherever it is not possible to keep piping filled with water at all times—due to absence of (or insufficient) heating facilities; or, when sprinklers are placed in cold storage vaults, open driveways, loading platforms, etc. It is simply constructed and reliable in operation. Any air pressure exceeding 12 lbs. will prevent valve from opening, regardless of water pressure in ordinary system. For technical details of application, construction, connections, and installation, write for special folder describing Globe dry pipe valves.

Globe Alarm Check Valves, Model E.

Used in connection with wet pipe sprinkler systems in buildings of every character for giving an immediate alarm upon opening of a Globe sprinkler. It is simple, reliable and positive in action; all parts readily accessible. Complete equipment consists of an alarm check valve, a retarding or variable pressure chamber, water motor for mechanical alarm, and a circuit closer for electrical alarm.

Co-operative Service.

Engineers, architects and contractors are invited and urged to avail themselves of the facilities that the GLOBE AUTOMATIC SPRINKLER Co. extends through its numerous offices to consult with its engineers, from the inception of plans to the consummation of building, that good and economical engineering may distinguish the completed structure.

Literature on request.

GRINNELL COMPANY, INC.

Manufacturers of Fire Protection Systems

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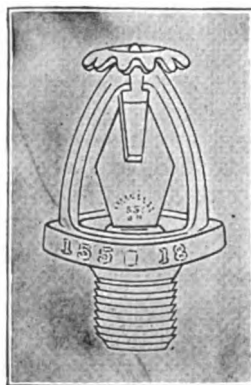
Products.

GRINNELL SYSTEMS OF AUTOMATIC FIRE PROTECTION and AUTOMATIC FIRE ALARM.

For Power Plant, Heating and Industrial Piping, see pages 425-27.

Grinnell Automatic Sprinkler System.

This system has been in successful operation for more than 40 years. Today over 20,000,000 Grinnell sprinkler heads are safeguarding business property valued at approximately three billion dollars. The average loss per fire in Grinnell protected buildings in over 22,000 recorded fires is less than \$300.00—a reduction of over 96% on the lowest average fire loss previous to the invention of this system.



SPRINKLER HEAD

Operation.

When fire breaks out, temperature at the ceiling rapidly increases and causes the fusible strut of the sprinkler head to melt. Thereupon, the glass valve, found only in the Grinnell head, is instantly thrown from its seat on the unique flexible diaphragm. This allows the water to rush out and strike the deflector, which breaks it into a heavy spray. One sprinkler head effectively drenches an area of 80 to 100 sq. ft.

The operation of the sprinkler head immediately and automatically gives the fire alarm, a water motor alarm being usually installed on the outside of the building.

Connections and Piping.

An ample supply of water is furnished, either from tanks, a fire pump or a connection with city water or a combination of two or more of these units. Often city water alone is sufficient.

From this abundant source of water a large riser or supply pipe extends from the top to the bottom of the building to be protected. Connected with this large pipe are branch lines of smaller pipe. These run near the ceiling to all parts of the building. They are carefully graded in size in order that the water everywhere

throughout the building may be under good pressure and ample in volume. At stated intervals along these branch lines (usually 8 to 10 ft.) are placed Grinnell automatic sprinkler heads.

Grinnell Dry Pipe System.

To obviate freezing in the sprinkler piping in buildings which are unheated, GRINNELL COMPANY, INC., installs a dry pipe system. In this system the water is held back of any point where it might freeze by the Grinnell dry pipe valve. The pipes in this system are filled with air under moderate pressure, but when a sprinkler head opens, the air escapes and the dry valve operates, admitting water to the system.

The system is further improved by the Grinnell dry valve accelerator, an important invention which makes dry pipe systems practically as quick in operation as wet ones.

Installation.

The Grinnell automatic sprinkler systems are factory-assembled to blue prints, fittings being made-on as far as possible by machinery. The result is that the equipment comes to the job ready for quick and botherless installation by our highly trained erecting crews. This reduces interference with usual plant operation to a minimum.

Inspection and Service.

Within the past year this company has instituted a new department whose sole duty it is to inspect Grinnell sprinkler equipments and render full reports to the owners on such inspections with practical suggestions for needed changes. A corps of expert sprinkler engineers is engaged in this work and the success with which it has already been attended is ample evidence of the necessity of this independent inspection service. The sole aim of this inspection work is to maintain Grinnell equipments in the same first class operative condition that they were when originally installed. For that reason this service is rendered on a low yearly fee basis which is practically cost.

Designs and Estimates.

Inquiries addressed to the head office of GRINNELL COMPANY, INC., or to any of the branches will immediately receive the attention of the engineering staff, who will promptly furnish expert advice with designs or estimates as required.

HARKER MFG. CO.

Manufacturers of Approved Appliances for Preventing and Retarding Fire
CINCINNATI, OHIO

Products.

"QUEEN" HAND CHEMICAL FIRE EXTINGUISHERS;
CHEMICAL FIRE ENGINES; SWINGING HOSE RACKS;
SAFETY CANS; SAFETY LADDER SHOES.

Also manufacturers of Refills for any make of Fire Extinguisher; Fire Hose, Fire Pails and Fire Axes.

"Queen" 3-Gal. Fire Extinguishers.

A thoroughly dependable and efficient fire extinguisher; among the first to be approved by the Underwriters' Laboratories, Inc. Construction, quality and workmanship are the best possible, insuring positive operation always, and lessening the possibility of deterioration. Patented bottle holding device for holding acid container. Polished copper finish. Designed especially for use in industrial plants and institutions of all kinds.

\$18.00 each. Write for discount.



3-GAL. TYPE

"Queen" Pump Type Fire Extinguishers.

Approved by Underwriters' Laboratories, Inc.

Especially designed for use on electrical fires, oil or burning grease, gasoline or celluloid. It is also recommended for use in places where the temperature becomes extremely low. This extinguisher will not freeze at 50° below zero. Made in three sizes.

No. 2-A—1 qt. capacity.....\$10.00 each
No. 2-B—1¼ qt. capacity..... 12.00 each
No. 2-C—1½ qt. capacity..... 14.00 each

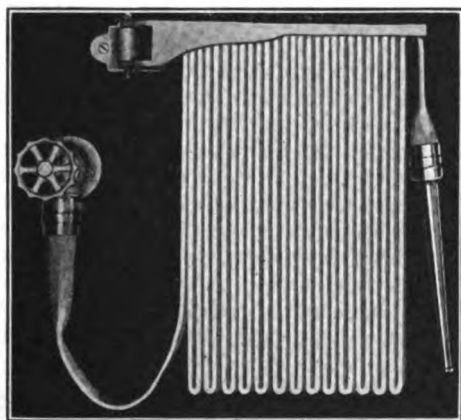
Write for discounts.



PUMP TYPE

"Queen" Swinging Fire Hose Racks.

These racks are made in three types for open or concealed pipe. Type "A" is attached to the standpipe; type "B" to the wall; type "C" swings on a nipple attached directly to the valve. Queen hose racks are designed particularly for strength and durability, and can always be depended upon.



HOSE RACK

Capacity.....	25 to 75 ft.			100 to 150 ft.		
Size of hose, in.....	1½	2	2½	1½	2	2½
Number.....	25X	25Y	25Z	10X	10Y	10Z
Japaned red, gold or aluminum bronze finish.....	\$5.00	5.00	5.00	6.00	6.00	6.00
Nickleplated finish.....	\$7.00	7.00	7.00	8.00	8.00	8.00
Solid brass, polished or nickelplated.....	\$11.00	11.00	11.00	13.00	13.00	13.00

Write for discounts.

"Queen" Chemical Fire Engines.

"Queen" chemical fire engines are made in two sizes; 40-gal. capacity and 20-gal. capacity.

These engines throw a stream exactly like a city fire department would use immediately upon their arrival at any fire.

These engines are especially adapted for large industrial plants, storehouses, etc.

Write for our free trial offer.

40-gal. capacity \$225.00
20-gal. capacity 125.00

Write for discounts.



CHEMICAL FIRE ENGINE

"Queen" Safety Cans.

Approved by Underwriters' Laboratories, Inc.

"Queen" safety cans can not explode. The most reliable safety cans for gasoline, benzine, naphtha, alcohol, turpentine and all other explosives and inflammable materials. Save 30% of the liquid.

1-qt. can.....\$2.00 each
2-qt. can..... 2.50 each
1-gal. can..... 3.00 each
2-gal. can..... 4.00 each
3-gal. can..... 5.00 each
5-gal. can..... 6.00 each

Write for discounts.



SAFETY CAN

"Queen" Safety Ladder Shoes.

"Queen" safety ladder shoes are made of heavy compressed steel, with non-slipping cork inserts, that can easily be removed. The shoes are easily attached to any ladder and hold tight to any floor. They comply with "safety first" state regulation.

\$2.00 per pair.



SAFETY LADDER SHOES

Underwriters' Approval.

"Queen" appliances are approved by the Underwriters' Laboratories, Inc.

C. A. DUNHAM COMPANY

Makers of the Dunham Radiator Trap and Other Heating Equipment

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SHANGHAI, CHINA, 6 Jinker Road

GLASGOW, SCOTLAND, 60-64 Robertson Street
BELFAST, IRELAND, 4 Ocean Building, Donegal Square, East
PARIS, FRANCE, 47 Rue de la Fontaine-au-Roi
6 Jinker Road

Products.

Specialties for use in connection with the DUNHAM SYSTEM of HEATING, known according to its several adaptable forms as the DUNHAM VACUUM SYSTEM and the DUNHAM RETURN SYSTEM. Both two-pipe systems; and the DUNHAM AIR LINE SYSTEM.

These Specialties are: The Dunham Radiator Trap; Dunham Packless Radiator Valve; Dunham Blast Trap; Dunham Medium Pressure Trap; Dunham Return Trap; Dunham Reducing Pressure Valve; Dunham Oil Separator; Dunham Strainer; Dunham Air Vent; Dunham Vacuum Pump Governor; Dunham Air Line Valve; Thompson Air Line Vacuum Pump.

Dunham Heating Service.

It is three-fold:
Organization;
Service;
Product.

DUNHAM
HEATING SERVICE

The Company—The Company, and the organization within it, is strong, the largest engaged exclusively in the manufacture of heating specialties and systems.

The Service—This is the Company's strong point. With 35 Branch and Division Offices throughout the United States and Canada, and two complete factories, efficiency service can be rendered. Our Service Departments, with their trained engineers, are at all times ready to co-operate with consulting engineers, architects, and contractors, to furnish special details and information instructive as to the best way of installing and using the Dunham products.

The Dunham Products—They are the leaders of their kind, made of the highest grades of suitable materials, by especially trained workmen, in clean, sani-

tary, well ventilated buildings. They are sold through the responsible heating trade. Each article will be briefly described.

Dunham Radiator Trap.

The simplicity of the Dunham Radiator Trap is very apparent. It comprises a body, a cover, and thermostatic disc which is secured in the cover. There are no loose parts, no sliding contacts, nothing to gum up, and no guide or pin to obstruct the valve opening. There is a flat valve and seat with liberal valve opening. The position and design of the valve is such that it is self-cleaning. The action of the disc is positive, and the valve seats squarely, like a globe valve, the tightest of all types of valves, and one presenting little opportunity for uneven wear. The body is standardized, also the cover and disc, thus giving the further advantages of interchangeable parts.

The function of the Dunham Radiator Trap is to conserve heat, and thus fuel, by keeping radiation and

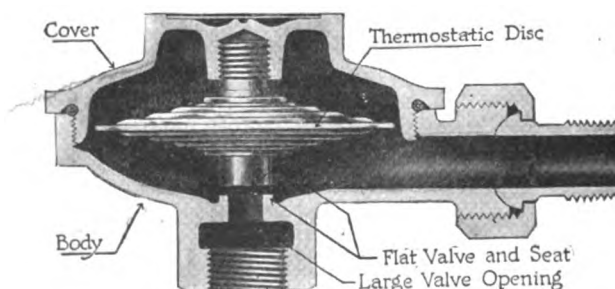


FIG. 1. DUNHAM RADIATOR TRAP

pipng at the point of maximum efficiency. To do this, the working part of the trap, the Dunham Thermostatic Disc, must be and always is fully exposed to the actual

conditions within the radiator, and it therefore responds instantly to any change taking place therein, automatically releasing air and water of condensation and closing to prevent waste of unused steam. It not only saves steam but clears the space which should be occupied by steam from air and water—enemies of high efficiency.

This trap was the first of its kind to be a commercial success, and it has maintained its leadership since 1903. It has therefore stood the test of time.

It is made in 5 sizes, and for steam pressures not to exceed 10 lbs. gage.

The No. 1 and No. 2 traps are for use principally on radiators; No. 3 for large radiators, for pipe coils, and dripping piping; No. 4 and No. 5 for large pipe coils, and dripping steam mains. To determine trap capacity for pipe coils reduce actual surface of coil to equivalent square feet of direct cast iron radiation, the unit in which all traps are rated, by multiplying by $1\frac{1}{4}$.



FIG. 2. DUNHAM NO. 4 AND NO. 5 TRAP

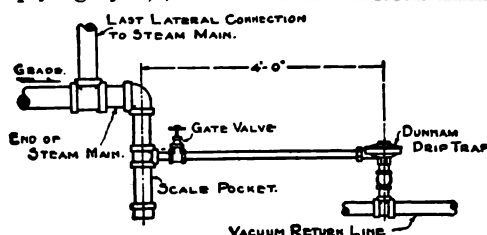


FIG. 3. METHOD OF DRAINING END OF STEAM MAIN IN DUNHAM VACUUM SYSTEM

TABLE A—DUNHAM RADIATOR TRAPS

Size	Pipe connection	Capacity, direct radiation
No. 1	$\frac{1}{2}$ in.	100 sq. ft.
No. 2	$\frac{3}{4}$ in.	350 sq. ft.
No. 3	$\frac{1}{2}$ in.	450 sq. ft.
No. 4	$\frac{3}{4}$ in.	1500 sq. ft.
No. 5	1 in.	3000 sq. ft.

Nos. 1, 2, and 3 traps made in angle, straightway, right-hand, and left-hand pattern—all made in brass and bronze; Nos. 4 and 5 in angle and straightway pattern only and made of iron.

Dunham Blast Trap.

In design and appearance the No. 6 and No. 7 Dunham Blast Traps are essentially the same as the No. 4 and No. 5 radiator traps, illustrated above. They are designed only for draining blast heating coils. In selecting

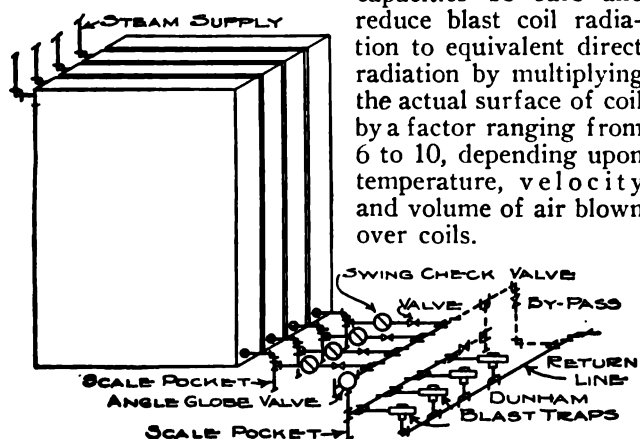


FIG. 4. METHOD OF APPLYING DUNHAM BLAST TRAPS

The No. 8 Dunham Blast Trap is intended for handling large quantities of condensation, and is especially adapted for blast coil work. It combines the Dunham

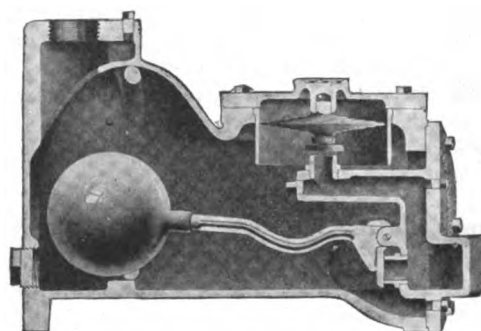


FIG. 5. DUNHAM BLAST TRAP NO. 8

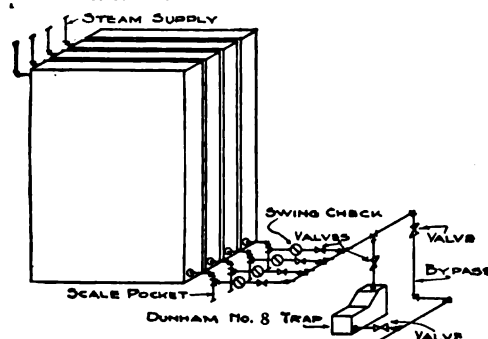


FIG. 6. METHOD OF APPLYING DUNHAM BLAST TRAP NO. 8

TABLE B—DUNHAM BLAST TRAPS

Size	Pipe connection	Capacity, direct radiation	Weight
*No. 6	$\frac{3}{4}$ in.	1500 sq. ft.	12½ lbs.
*No. 7	1 in.	3000 sq. ft.	21 lbs.
No. 8	2 in.	12000 sq. ft.	75 lbs.

*Made in angle and straightway patterns.
Made only for pressures up to 10 lbs.

thermostatic principle with the float; it has a double valve and large connections.

Dunham Air Line Valve.

The principle of operation is identical, and design similar, to the Dunham Radiator Trap. Its efficiency is high, and service in connection with air line systems invaluable. Can be furnished with either $\frac{1}{8}$ -in. or $\frac{1}{4}$ -in. radiator connection. Air piping is required in connection with its use.



FIG. 7. DUNHAM AIR LINE VALVE

Dunham Return Trap.

The Dunham Return Trap is used to separate the air and water discharged into the dry return piping by the Dunham Radiator Traps, to release the air, and to automatically return the water to the boiler without regard to the pressure, if under 10 lbs., carried in boiler or system.

It is a simple, positive acting device, with large valve areas, designed especially for high efficiencies at low heating pressures. Its working parts are protected from dust and dirt, and yet are easily accessible without removing any piping connections.

Dunham Packless Radiator Valve.

This is a bona-fide packless radiator valve and not dependent upon springs and packing rings. The Dunham disc

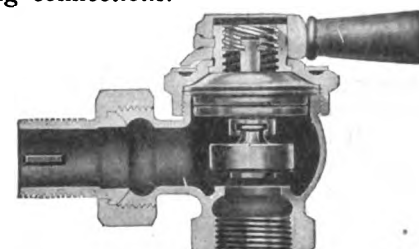


FIG. 8. DUNHAM PACKLESS RADIATOR VALVE

makes this possible. It has a low bonnet and stem and unusual lines, making it attractive in appearance. The valve can be opened or closed in seven-eighths of a turn. It is made only in the angle pattern for use in a top radiator connection. Sizes $\frac{1}{2}$, $\frac{3}{4}$, 1 and $1\frac{1}{4}$ in.

Packless radiator valves are required in all vacuum heating work.

Dunham Reducing Pressure Valve.

This product is so well known and universally accepted that no comment is needed. This valve is made only in standard weight for a pressure range of 125 lbs. down on high side, to 10 lbs. and atmosphere on low side, in straight and expanded outlet patterns.

Dunham Vacuum Pump Governor.

The function of this governor is to control the steam to a steam driven vacuum pump to operate same so as to maintain a certain vacuum in the suction piping. It is used in maintaining a predetermined amount of vacuum in the return piping of a vacuum heating system. Made in all pipe sizes from $\frac{1}{2}$ in. to 2 in., inclusive.

Dunham Medium Pressure Trap, "D" Style.

This embodies the principle so successfully used in the Dunham Radiator Trap, and is just as simple and satisfactory. It is used almost exclusively in hospitals and kitchens for dripping sterilizers and steam cooking apparatus, where steam is used at a pressure not less than 10 lbs. or more than 50 lbs. gage.

Install at least 4 ft. of connecting piping between the point to be dripped and the trap.

TABLE C—DUNHAM MEDIUM PRESSURE TRAPS, "D" STYLE

Size	Pipe connection	Capacity, water per hour	Weight
No. 13	$\frac{1}{2}$ in.	100 lbs.	4 lbs.
No. 14	$\frac{3}{4}$ in.	200 lbs.	15 lbs.
No. 15	1 in.	400 lbs.	25 lbs.

Always state operating pressure when ordering.

Dunham Air Vent.

This device is for the purpose of venting air from water that is under pressure.

It is particularly adapted to heating work where the vacuum pump is discharging water of condensation directly back to the boiler.

Capacity for 5000 sq. ft. of radiation.

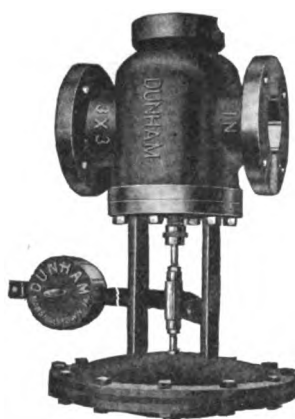


FIG. 9. DUNHAM REDUCING PRESSURE VALVE, STRAIGHT PATTERN

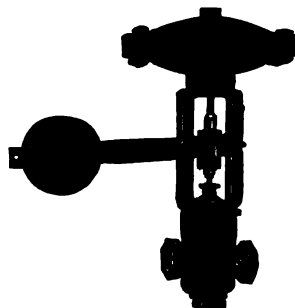


FIG. 10. DUNHAM VACUUM PUMP GOVERNOR



FIG. 11. DUNHAM "D" STYLE MEDIUM PRESSURE TRAP



FIG. 12. DUNHAM AIR VENT

Dunham Oil Separator.

The Dunham Separator made for oil separator service is very efficient.

Where exhaust steam is used for heating purposes the heating efficiency of the steam is materially increased by the use of a good oil separator. In fact, with exhaust steam, the use of an oil separator is imperative in best practice.

The Dunham Separator is made in all sizes from $1\frac{1}{2}$ to 10 in., in horizontal pattern only, with flanged ends.

Dunham Strainer.

A strainer is a necessity in protecting the vacuum pump from dirt and scale which otherwise might get into it and cause considerable damage. The Dunham Strainer with its large brass screen basket for catching and holding the dirt, and easily accessible for cleaning, at once commends itself for this purpose. It is made in all sizes from 2 to 6 in.; the 2-, $2\frac{1}{2}$ - and 3-in. sizes, with either screw or flanged ends; larger sizes flanged ends only.

The Dunham Vacuum System.

Since 1903 the Dunham Vacuum System has been a leader and it still stands at the front, easily maintaining its position because of the remarkable success as well as the high efficiency of the Dunham Radiator Trap and allied Dunham specialties.

Simplicity is the leading note of Dunham design. There is the system of steam mains and piping to supply all radiation, and the return piping to carry away the air and water of condensation. Steam may be supplied direct from boiler plant, or through reducing valve where boiler pressure is too high (over 10 lbs. gage) for direct service, or exhaust steam may be used supplemented by live steam through a reducing valve.

The returns all converge and grade to the suction inlet of a vacuum pump, which may be either steam or motor driven, automatically controlled, and which may also act as a boiler feed pump. Where exhaust steam is used or where boiler pressure exceeds 20 lbs., the discharge from the vacuum pump should go to a freely vented automatic receiver of a boiler feed pump, the vacuum pump not being used directly to feed the boiler.

How to Specify—Specify the Dunham Vacuum System using Dunham Packless Radiator Valves and Dunham Radiator Traps in the supply and return connection to and from each radiator (use hot water type radiation, preferably), No. 3, No. 4 or No. 5 Dunham Trap for dripping mains, No. 6, No. 7 or No. 8 Dunham Blast Trap for all blast coils, Dunham Reducing Pressure Valve for reducing steam pressure, or automatically supplied.

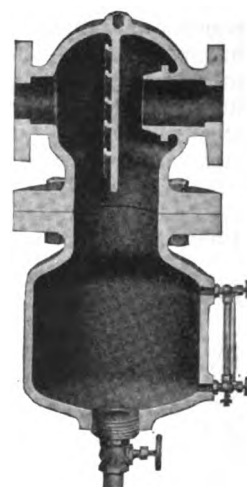


FIG. 13. DUNHAM OIL SEPARATOR

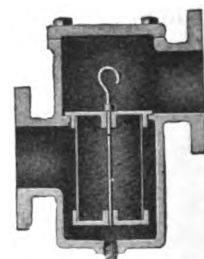


FIG. 14. DUNHAM STRAINER

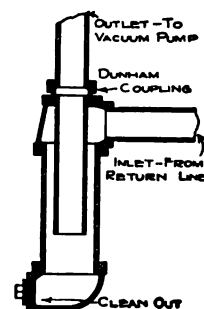


FIG. 15. CONSTRUCTION OF LIFT IN A VACUUM RETURN LINE

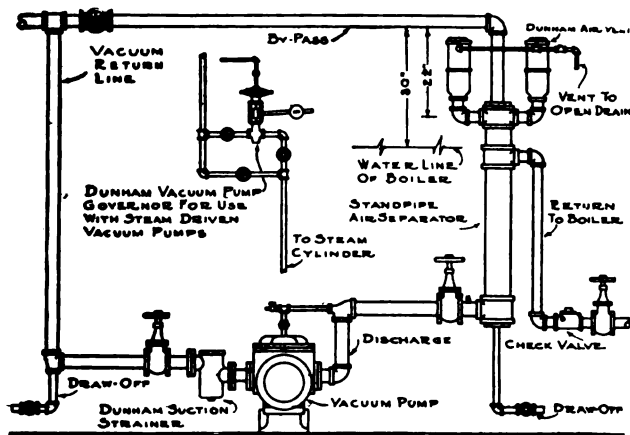


FIG. 16. METHOD OF DISCHARGING DIRECT FROM VACUUM PUMP INTO BOILER

menting exhaust steam, Dunham Oil Separator for removing oil and making exhaust steam suitable for efficient heating, Dunham Strainer for keeping dirt and scale from vacuum pump, Dunham Vacuum Pump Governor for automatically starting and stopping the steam driven vacuum pump to maintain desired amount of vacuum in return piping, and Dunham Air Vent for releasing air from the system; each and all to be installed in accordance with instructions and standard detail drawings to be supplied by the C. A. DUNHAM COMPANY.

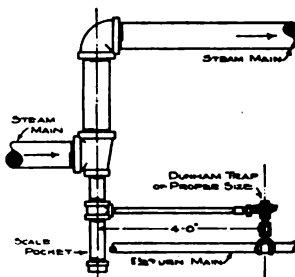


FIG. 17. METHOD OF DRIP-PING RISE IN STEAM MAIN, DUNHAM VACUUM SYSTEM

The Dunham Return System.

No design for steam heating can be more simple or more easy in operation than this, and coupled with it is the opportunity for high efficiency. Steam is conducted through one system of piping from the boiler to the radiator, where it is retained by Dunham Radiator Traps until it has given off its heat. Then, as water, it passes through the traps, together with the air, and both water and air are conducted through another set of piping back to the Dunham Return Trap, which, independent of the boiler pressure, automatically releases the air out of the system and returns the water to the boiler.

The feature of a positive return under varying steam pressures makes this Dunham System particularly adaptable to apartment houses, small hotels and medium sized commercial buildings, schools and churches. Above all, however, this system makes possible the modernizing of old one-pipe and two-pipe gravity flow systems, materially increasing their efficiency by the introduction of

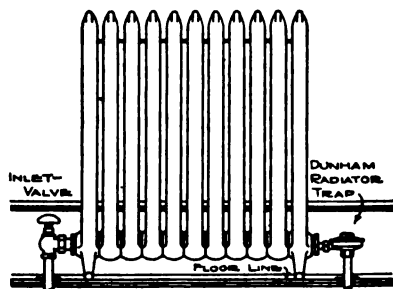


FIG. 18. BOTTOM SUPPLY CONNECTION TO RADIATOR

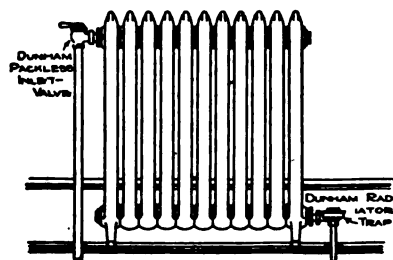


FIG. 19. TOP SUPPLY CONNECTION TO RADIATOR

the Dunham Radiator Trap at each radiator, insuring a positive circulation without loss of steam, and permitting the removal of all sputtering, leaking air valves which are such trouble makers in these old heating jobs. During these days when conservation of fuel is of such great importance, this system presents the greatest opportunity for the most efficient and effective use of steam for heating purposes, and therefore will be a fuel saver.

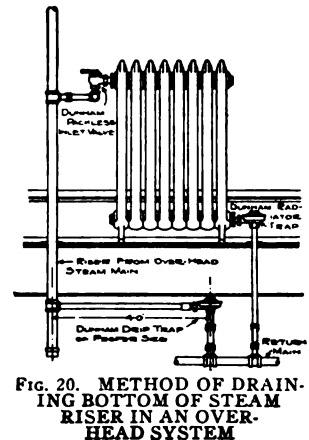


FIG. 20. METHOD OF DRAINING BOTTOM OF STEAM RISER IN AN OVER-HEAD SYSTEM

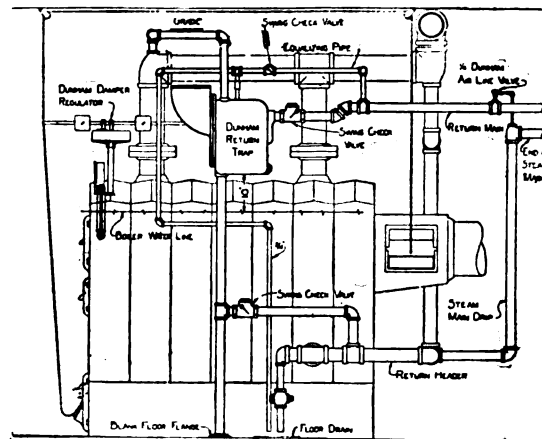


FIG. 21. METHOD OF INSTALLING DUNHAM RETURN TRAP

How to Specify—Specify the Dunham Return System using Dunham Packless Radiator Valves (except in old jobs where inlet connections are at the bottom of radiators) and Dunham Radiator Traps in supply and return connections to and from each radiator, and Dunham Return Trap for releasing air and returning water to the boiler; each and all to be installed in accordance with instructions and standard detail drawings to be supplied by the C. A. DUNHAM COMPANY.

Dunham Air Line System.

This is a one-pipe steam system, using a Dunham Air Line Valve on each radiator in place of the usual sputtering air valve, with a system of air line piping which may discharge the air by gravity, or be attached to a Thompson air line vacuum pump. This system is particularly adaptable in making old one-pipe heating systems more efficient. Easily and cheaply installed, and insures quick removal of air from radiators.

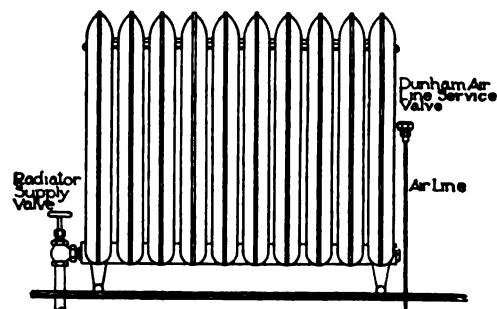


FIG. 22. TYPICAL RADIATOR CONNECTIONS, DUNHAM AIR LINE SYSTEM

Bulletins.

Bulletins with detailed information covering all products, including roughing in dimensions, will be supplied on request.

JOHNSON SERVICE COMPANY

Temperature Regulation and Humidity Control

MILWAUKEE, WIS.

BRANCHES

BOSTON, MASS., 35 Hartford Street
 BUFFALO, N. Y., 2 Erie County Bank Building
 CHICAGO, ILL., 177 North Dearborn Street
 CINCINNATI, OHIO, 405 Gwynne Building
 CLEVELAND, OHIO, 2028 East 22nd Street
 DENVER, COLO., 517 Boston Building
 DES MOINES, IOWA, 210 Masonic Temple
 DETROIT, MICH., 42 Montcalm Street, West
 INDIANAPOLIS, IND., 111 Pembroke Arcade
 KANSAS CITY, MO., 411 East Tenth Street
 MILWAUKEE, WIS., 149 Michigan Street

LOS ANGELES, CAL., 605 Van Nuys Building
 MINNEAPOLIS, MINN., 308 Third Avenue, South
 NEW YORK, N. Y., 18 East Twenty-eighth Street
 OMAHA, NEBR., 609 Paxton Building
 PHILADELPHIA, PA., 1521 Sansom Street
 PITTSBURGH, PA., Century Building
 PORTLAND, ORE., 404 Failing Building
 SALT LAKE CITY, UTAH, 301 Templeton Building
 SAN FRANCISCO, CAL., 314 Rialto Building
 SEATTLE, WASH., 452 Colman Building
 ST. LOUIS, MO., 14 North Twelfth Street

CANADIAN REPRESENTATIVE

JOHNSON TEMPERATURE REGULATING COMPANY OF CANADA, LIMITED

OFFICES

CALGARY, ALTA, 605 Second Street, West
 VANCOUVER, B. C., 550-6th Avenue, West

MONTREAL, QUE., 284 Beaver Hall Hill

TORONTO, ONT., 118 Adelaide Street, West
 WINNIPEG, MAN., 259 Stanley Street

Products and Services.

Manufacturers of THERMOSTATS and Other APPARATUS for the CONTROL of TEMPERATURE and HUMIDITY, including:

Pneumatic Room and Insertion Thermostats and Humidostats.

Electric Room and Insertion Thermostats and Humidostats.

"Sylphon" Metal Diaphragm and Rubber Diaphragm Valves.

Low Pressure, Limited Capacity, Electric Air Compressors.

Low Pressure, Limited Capacity, Hydraulic Air Compressors.

Air and Water Reducing Valves.

Pneumatic Switches or Push Buttons.

ENGINEERS and CONTRACTORS for the CONTROL of TEMPERATURE or HUMIDITY for any purpose and over every range used in manufacturing purposes or buildings, furnishing and installing:

Temperature Controlling Apparatus for any and all kinds of heating and ventilating systems.

Temperature Controlling Apparatus for any industrial process requiring the medium of heat.

Control of Humidity in industrial processes requiring artificial humidity.

Temperature Control of hot water tanks and all liquids.

Control of Temperatures of refrigerating and cold storage plants.

Thermostatic Control of electric motors on automatic refrigerating.

Specific Applications of Temperature Control.

Bake ovens for enamels, japans, etc.

Core drying ovens.

Drying room for paint, varnish, patent leather, etc.

Storage room for tobacco, rubber or similar goods.

Cold storage rooms, fur vaults, etc.

Canning machinery, cookers, exhausters, processors.

Corn and oats drying apparatus.

Fruit-drying apparatus.

Johnson Positive Acting Metal Diaphragm Thermostat.

The only thermostat on the market provided with positive snap action for closing and opening the radiator valve quickly, positively and fully, which is necessary with steam heat.

Indicator and Cut-off—

It is the only thermostat having an indicator which shows at a glance whether the thermostat has the heat turned on or off. A cut-off is provided for shutting the heat off permanently when desired.

Johnson Graduated Acting Thermostat.

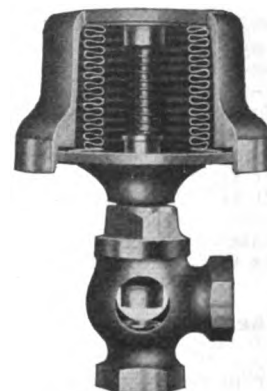
For controlling the temperature of rooms heated by steam, hot blast or hot air furnaces. It controls a mixing damper located at the plenum chamber. The damper, which is furnished, together with the thermostat, etc., is operated by a diaphragm damper motor, connected with the thermostat in such a way that the damper blades will automatically assume the correct intermediate position necessary to deliver the right mixture of hot and tempered air to the room and to maintain a constant and proper temperature therein.

Johnson Electric Room Thermostat.

This thermostat is designed and adapted for use in connection with an electric switch, for the control of temperature in electrically heated rooms; for the regulation of temperature in small refrigerators cooled by electrically driven ice machines; for the control of electrically driven centrifugal pumps used for cooling or heating purposes; for the control of motor driven heating, cooling or ventilating fans such as are used in fur vaults, etc.

Johnson Electric Insertion Thermostat.

For insertion in brine systems of electrically driven ice machines, to regulate the temperature of brine by the control of the motor; for insertion through wall of refrigerator, to regulate temperature of cooled space by the control of motor; for regulation of temperature in electrically heated



"SYLPHON" METAL DIAPHRAGM VALVE



POSITIVE THERMOSTAT
Showing inside mechanism

water system or tank, by control of heater; for regulation of temperature in electrically heated compartment, by control of the heater.



ELECTRIC INSERTION THERMOSTAT

Johnson Pneumatic Insertion Thermostat.

Designed to control temperatures within closed air chambers or ducts. The body of thermostat is a dust-proof case containing the two working parts and extending outside the chamber.

This thermostat is made either positive or graduated acting.

Applications — Adaptable for use in bake ovens for enamels, japans, etc.; drying rooms for paints, varnishes, patent leather, etc.; storage rooms for tobacco, rubber or similar goods; sterilizers or pasteurizers; cold storage rooms, fur vaults, etc.; refrigerator machine control; humidity control for air washers; flue gas temperature control; hot blast heating plants; combination tempered ventilation and hot blast systems; greenhouses, turkish bath rooms, etc.; tempered ventilation for buildings.



PNEUMATIC INSERTION THERMOSTAT

Johnson Calibrated Thermostat.

This is an especially high grade insertion thermostat for use where it is desired to change frequently the adjustment to operate at different temperatures. It is operated by compressed air at 15 lbs. per sq. in., and used to control temperatures of liquids and air by automatically opening and closing a diaphragm valve or damper. Graduations made to meet requirements, limited to a total range of 60° and to minimum space of 2½°.

CALIBRATED THERMOSTAT
Graduated-acting pneumatic type

Pressure Reducing Valves.

No. 1—This valve will meet the most exacting service requirements. Being small, well proportioned and having a reasonably large range of action, it is especially

suited for small compressed air or hydraulic machinery. When desired, this valve is provided with a cut-out handle which permits high pressure to instantly pass through the valve without reduction.

This valve is tight when closed, will not let pressure creep up on the low pressure side, and allows free passage of air or water without causing appreciable drop in pressure on low pressure side when valve is subjected to sudden and heavy service.

The materials used are the very best considering durability and utility.

No. 2—Larger and heavier than No. 1 valve; has more parts and therefore costs more. Has a more finished adjusting screw provided with black japanned wood palm piece. Also provided with extra catch bowl at the bottom, with drain plug for catching and removing dirt from valve. In all other respects description of No. 1 valve applies to No. 2.

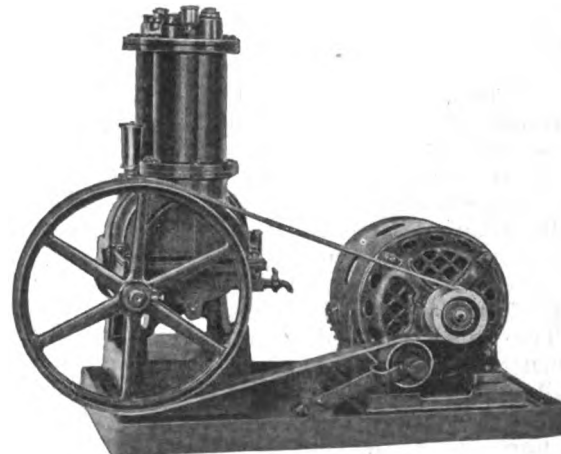
No. 3—A positive shut-off valve, identical in design and construction with No. 2 valve, but built heavier and for larger pipe sizes. Cap screws replace round headed screws on No. 2 valve.

NO. 1 PRESSURE
REDUCING
VALVE
No. 1-A for air
No. 1-W for waterNO. 2 PRESSURE
REDUCING
VALVE
No. 2-A for air
No. 2-W for waterNO. 3 PRESSURE
REDUCING
VALVE
No. 3-A for air
No. 3-W for water

Time Valve Control.

Simple device for automatically and periodically opening and closing a diaphragm valve.

Has many applications, such as periodically flushing of toilets, etc. Being simpler and more powerful in action, it is much superior to float tanks. Eight-day clock valve mechanism operates diaphragm valve on water supply by means of compressed air. Valve may be operated from 1 to 4 times per hour and for periods of 15 seconds to 5 minutes.

ELECTRIC AIR COMPRESSOR FOR OPERATING JOHNSON
THERMOSTATS

WILLIAM S. HAINES & COMPANY

Manufacturers of Steam Heating Specialties

Twelfth and Buttonwood Streets
PHILADELPHIA, PA.

Products.

HAINES VACUUM HEATING SYSTEMS and AUTOMATIC VAPOR SYSTEMS, consisting of Vento Automatic Valves and Traps, Automatic Air Traps, Graduated Supply Valves, Suction Strainers, Safety Valves, Vacuum Pump Governors, Damper Regulators, Low Pressure Gages, and all Specialties used in the systems.

Vacuum Systems of Steam Heating.

This company believes that the engineer and architect are sufficiently familiar with the principle, operation and general piping arrangement of this system to make it unnecessary to detail them here. It is generally conceded that a vacuum system of steam heating, properly installed and equipped, is the most efficient and economical heating system that can be used in connection with large buildings of any description.

Vacuum systems of heating, however, have not always proved successful, due not to any fault in the principle of the system, but almost entirely to poorly constructed automatic valves; in fact, the automatic valve is so important a feature that, regardless of all other perfections, any system of vacuum heating would be a failure without an equipment of positive and reliable automatic valves.

Vento Automatic Valves and Traps.

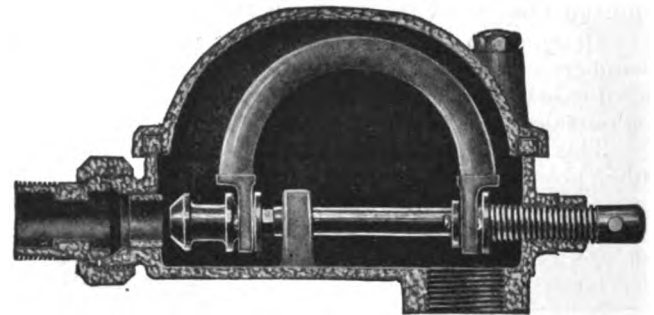
This company is the sole manufacturer of the Vento automatic valves and traps (four illustrated herewith), in all of which the operating power consists of the Haines specially designed thermostatic tube. This member is not new or untried, as the company has been using it in connection with its automatic valves and traps for 25 years, and during this entire period the principle of the thermostatic tube has not been changed a particle.

Construction—The Vento automatic valves and traps are all constructed on one principle, with some slight difference in design to meet different conditions. In all cases the operating power consists of a specially designed Haines thermostatic tube mounted vertically on a horizontal valve motion. The thermostatic tube has forked or bifurcated ends made to fit a groove in the valve head at one end and a groove in the guide stem at the opposite end. The guide stem is set permanent, so that the movement or travel of the tube is confined to the opposite end in such a way as to automatically open and close the valve. To eliminate friction and remove any possible chance of the valve sticking, the hole in the valve stem is round, whereas the end of the guide stem on which it is mounted is square, which insures a free and perfect movement.

The valve mechanism in all the Vento automatic valves and traps is mounted horizontally. This permits scale and foreign matter to drop clear of the valve and seat at each operation; and as the construction of the thermostatic tube is such as permits a long range of movement, the chances of the valve fouling

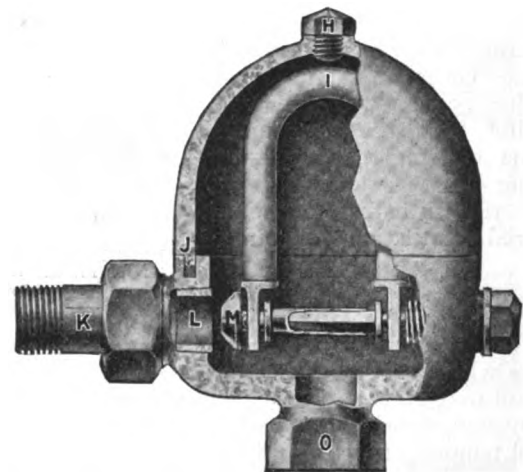
with scale or foreign matter is reduced to a minimum.

Guarantee—The Vento automatic valves, when used in connection with vacuum or vapor heating systems, are guaranteed absolutely for a period of 5 years; that is, should any of the valve parts become defective through usage during said period, all such will be replaced with new ones free of cost.



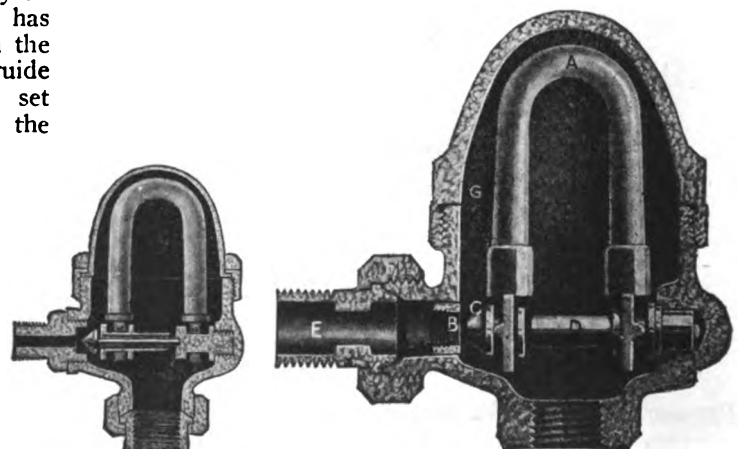
VENTO BLAST COIL TRAP

In addition to all classes of blast coil work, it can be used with any class of work employing from 1 to 50 lbs. pressure



VENTO (1911) TYPE RETURN LINE VALVE

Recommended for all coil work and drip points with low pressure heating Controls extra large valve area



VENTO AIR LINE VALVE

VENTO RETURN LINE VALVE
Recommended for use with cast radiation with low steam, not exceeding 10 lbs.

P. BANNON PIPE CO.

Manufacturers of Conduits and Expansion Pipe Supports

ESTABLISHED 1852

836 South Thirteenth Street
LOUISVILLE, KY.

Products.

Manufacturers of BANNON'S PATENT LIDDED CONDUIT and EXPANSION PIPE SUPPORTS.

Also manufacturers of Sewer Pipe, Hollow Brick, Fire Brick, Glazed Brick, Flue Lining, Hollow Fire-proof Blocks, Paving Blocks.

Bannon's Patent Lidded Conduit.

This conduit is a separable, strong, effective, indestructible, vitrified, salt glazed, fire clay and shale product for enclosing iron steam and hot water pipes (all sizes up to 20-in. outside diameter), single or plural (2 to 7), used for any purpose underground.

Construction—Built in circular or oval form, in separate sections, some of which containing the pipe supports are called rest pieces; each rest piece is used every 10 ft. in line of pipe, and intermediate sections have no ribs or pockets. Each section is divided into upper ("lid") half and lower half. Bannon conduit construction permits rapid assembling on the job, damp-proofing, thermal insulation, drainage and the interior installation of safe, permanent supports of the pipes under any degree of expansion and contraction. For one or more pipe lines the construction of conduit is the same (Fig. 2020).

Salient Features—Heavy conduit wall; reinforced parting lines between the halves of conduit; dipping open scores or grooves; reinforcing ribs with accurately cut pockets for pipe support ends; exterior shelves along parting lines, for holding cement joints; ample drainage space within conduit, etc.

Expansion Pipe Travel—Taken care of by any size of supports, to any degree (0.017 in. to 4 in. or more) required by practice and experience.

Supports—The saddle, cradle, roller, rod and other parts of pipe supports are patented and free from defects. Made in single or double lines according to number of pipes carried. Pipes entirely covered at supports; enameling of supports prevents electric cur-

rents from passing through them to pipes, and supports hold pipe and any kind of pipe covering high and dry in free, dead air space.

Expansion Bend Keepers—Apparatus providing for longitudinal travel of pipe at neck of a pipe bend. Particulars on request.

Sizes of Conduit—Bannon's conduits are made 6 to 30 in. inside diameter with fittings. Length of separable section or rest, 2 ft., 6 to 24 in.; 2½ ft., 30 in.

Installation—Conduit is shipped whole, in rest lengths; rapped into halves on job; lower half laid in alignment and cemented with hydraulic cement; supports are placed, pipe laid and covered; "lid" (upper half) portions are assembled on companion lower halves and heavily cemented at hubs and along parting lines; dipping scores retain waterproofing, open scores facilitate separation of parts; shelves retain cement in position and make a strong joint.

References.

Sent on application.

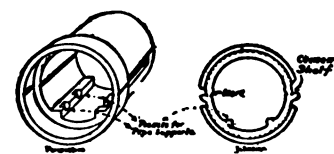


Fig. 70. VIEWS OF A SUPPORT SECTION OF THE CONDUIT
Intermediate sections have no support pocket ribs

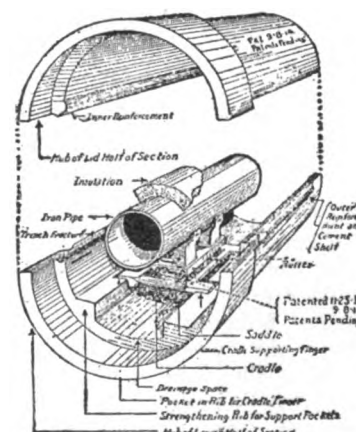


Fig. 75. DETAIL, LIDDED CONDUIT

One support section, separated, with lower half in service position, and upper half (lid portion) suspended to give unobstructed view of section of iron pipe resting in patented expansion supports. Cradle is resting in anchoring pockets made in ribs of conduit

SINGLE AND DOUBLE IRON PIPE LINES "B. P. L. C." WILL CARRY ON COMMON ROD AND PIPE ROLLERS

Conduit, interior diameter, in.	6	8	10	12	15	18	20	24	30
Single line, iron pipe size, in.	2	3	5	6	8	10	12	15 I.D.	20 O.D.
Double lines, iron pipe sizes, in.	1½ and ¾	2 and 1½ 1½ and 1½	2½ and ¾ 2 and 2 2 and 1	4½ and 1 3 and 3	6 and 1½ 5 and 2 4 and 4	7 and 2 5 and 5	8 and 2½ 5 and 5	10 and 3 9 and 5 7 and 7	12 and 4½ 9 and 9½

The largest sizes of coupled, standard covered pipe that will go in are given; smaller sizes may be substituted; smaller mains than given on the double lines permit larger returns. Write for further information.

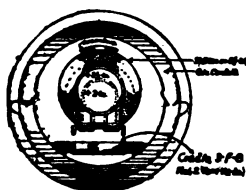


Fig. 8—8 in.

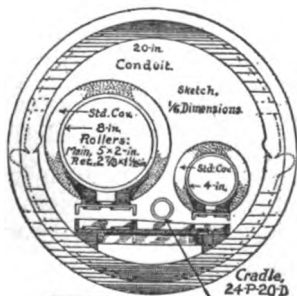


Fig. 2020—20-in.

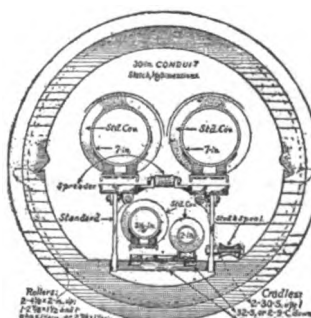


Fig. 30-q—30-in.

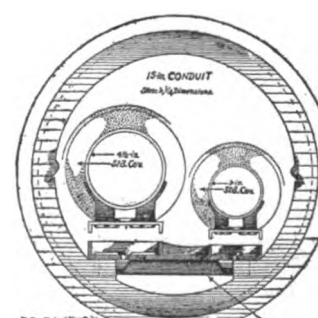


Fig. 1515—15-in.

DETAILS OF LIDDED CONDUITS AND EXPANSION PIPE SUPPORTS

THE RIC-WIL COMPANY

Manufacturers of Heat Insulating Products

CLEVELAND, OHIO

Products.

RIC-WIL UNDERGROUND CONDUIT and RIC-WIL UNDERGROUND PIPE COVERING used in the "RIC-WIL METHOD" of Insulating Underground Steam and Hot Water Pipes.

Description.

The RIC-WIL METHOD of insulating underground steam and hot water pipes to prevent heat losses, presenting practical advantages in the utility and ease of construction, appeals to every engineer and large steam user. After the trench is dug and the levels determined, it is usual to begin the RIC-WIL METHOD with a concrete foundation on which the base drain is to be laid. The concrete foundation is of such a character that the levels are easily maintained.

Base Drain—The base drain is both a base for supporting and aligning the conduit, and a drain for carrying away the water which might otherwise accumulate around it. It has, in all cases, ample free drainage area and is made the same length as the conduit, but the joints of base drain and conduit alternate, thus making an interlocking construction which preserves conduit alignment. The joints of the base drain are not sealed, but are left open, and crushed rock or coarse gravel is banked up along each side to act as a filter and keep dirt from entering the base drain and thereby prevent drainage by clogging it up. The base drain is connected at various intervals with a sewer or other free outlet. The base drain is the most important single factor in the success of the RIC-WIL METHOD.

Conduit—The conduit is sectional, vitrified, salt glazed tile—the upper half being provided with a projecting lip to protect the longitudinal joint—in which is moulded before shipment a pipe covering of high efficiency, same prepared from a highly siliceous natural mineral. The conduit is readily split lengthwise on the job before installing same. RIC-WIL is the only sectional underground pipe covering manufactured where the waterproof casing and insulation are integral.

Generally, further insulation is provided with RIC-WIL Filler when a steam pipe or a number of pipes conveying fluids at different temperatures are installed in the same conduit. This loose insulating material is packed around the pipe or pipes to entirely fill the hollow space between same and the insulation which is moulded to the inside of the tile. When properly installed, filler will not settle or shrink and is sufficiently elastic not to interfere with free expansion or contraction of the iron pipes. The insulation around the inside of the tile, together with the filler that is inserted, makes a continuous and efficient insulation.

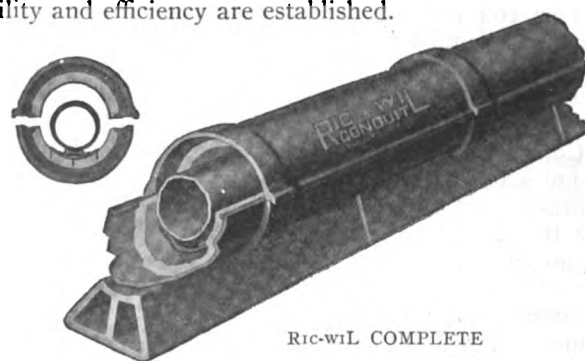
Pipe Supports—Are usually placed 12½ ft. apart, entirely enclosed in the conduit, and are of a practical

RIC-WIL
METHOD
TRADE-MARK

and strong design, consisting of a malleable iron guide with pockets supporting steel spindles, on which rustproof rollers are free to turn. Guide has a large bearing surface and projecting pins which insure keeping the same in its proper relation to pipes and conduit.

Cement—Cement for sealing longitudinal joints of conduit is Portland in all cases; the bell joints may be either Portland or RIC-WIL Elastic and Waterproof.

Installation—RIC-WIL METHOD is complete; it is the easiest underground system to install and its durability and efficiency are established.



Ric-Wil COMPLETE

Sizes.

Conduits are made in sizes from 4 to 22 in. inside diameter; sizes up to and including 20 in. carried in stock, larger size made to order only. All sections of conduits are 2 ft. 6 in. long, except the 4-in. and 6-in. sizes which are 2 ft. long.

Base drain made in 3 sizes: small for conduits 4 and 6 in. in diameter; medium for conduits 8 to 14 in. in diameter, inclusive; large for conduits 16 in. and up.

Fittings.

RIC-WIL insulated fittings are carried in stock in all sizes up to and including 14 in. inside diameter of tile in the form of elbows 45° or 90°, reducers or increasers and tee branches. Larger sizes and other shapes made to order.

Shutters.

Specially designed RIC-WIL shutters are used to close the ends of the conduit when entering buildings, manholes and anchor boxes.

Specification Data.

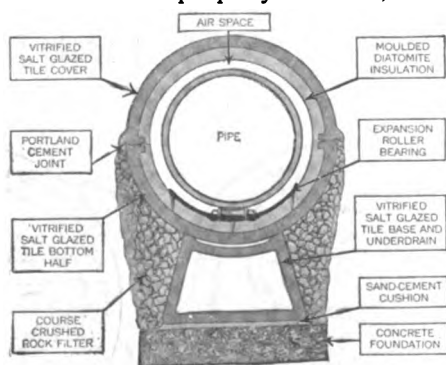
In preparing subdivision of heating specifications which embraces conduit and insulation, it is recommended that the engineer communicate with this company in regard to:

Sizes of conduit and standard equipment therefor, which will allow installation of certain size pipe combinations required for work contemplated. State conditions under which pipe system is to be operated, whether steam, hot water or oil transmission; and if the former, state pressure and if any superheat is to be carried, and, if so, how much. It would be well to state clearly kind of service for which each pipe is intended and if position of any pipe or pipes is definitely fixed in relation to any other pipes.

With the foregoing information to hand valuable suggestions based on a wide range of observation, contact and experience will be given. Representative will be sent, if desired.

Catalogue.

Complete catalogue which explains the RIC-WIL METHOD will be sent on request.



Ric-Wil CLASS DA
Cross section showing principle of construction

ESTABLISHED 1855

A. WYCKOFF & SON CO.

Manufacturers of Improved Steam Pipe Casing

MAIN OFFICE AND FACTORY

ELMIRA, N. Y.

BRANCH OFFICES

PITTSBURGH, PA., JOHNSON-PETER Co., Pittsburgh Terminal Warehouse
 SCRANTON, PA., VALLEY SUPPLY Co., Coal Exchange Building
 ATLANTA, GA., H. H. WHITE, Fourth National Bank Building

Products.

Manufacturers of WYCKOFF'S IMPROVED STEAM PIPE CASING, for underground or for exposed steam and hot water pipe.

For Wyckoff's Wood Stave and Solid Bored Wood Pipe (machinemade), for water works systems, power plants, etc., see pages 406-407.

Wyckoff's Improved Steam Pipe Casing.

Casing is composed of selected and carefully inspected staves of cypress. The 2-in. staves for the inner shell are drawn together by heavy tension into the form of a tube, and firmly bound with galvanized steel wire, wound spirally with extra wrappings at each end. This is effected by bending over about 1 in. of the end of the wire, which is driven into the wood about 2 in. from the end of the casing. The spiral winding is then carried to the end of the casing, back over itself, and then to the other end of the casing, where it is again wrapped back over itself for about 2 in., and the final end of the wire securely fastened down by means of staples.

The next operation is placing 4 layers, 4 in. wide, of asphaltum packing on each end of the casing. This material is drawn around the casing as tightly as possible, and fastened. It is finished, by putting on the outside another casing of 1-in. cypress jointed staves, which is bound with heavy galvanized steel wire, the same as the inner shell, thus making 2 casings of cypress wood, the inner shell 2 in. thick and the outer shell 1 in. thick, with a $\frac{1}{4}$ -in. dead air space extending the entire length of the casing, between the shells, except the 4 in. on each end. This makes a combination of non-conductive materials which absolutely prevents the radiation of heat.

From our experience it has been found that asphaltum packing will absolutely prevent drain water from getting in between the two shells of cypress.

For underground use, the covering is completely coated on the outside with Montezuma asphalt and then rolled in sawdust, the sawdust acting as a binder, to prevent the coating from being scraped off in transit.

When used overhead, the coating is furnished painted on the outside with black asphaltum paint.

The covering is made in lengths of from 4 to 12 ft. The lengths are connected by tenon and socket joint and have to be driven together, thus making a watertight joint.

This improved covering is made to slip on over the pipes while they are being connected up. It can not be opened to apply on pipes already in place.

For opening casing to apply on pipes already in place, see our catalogue No. 40, pages 10 and 11.

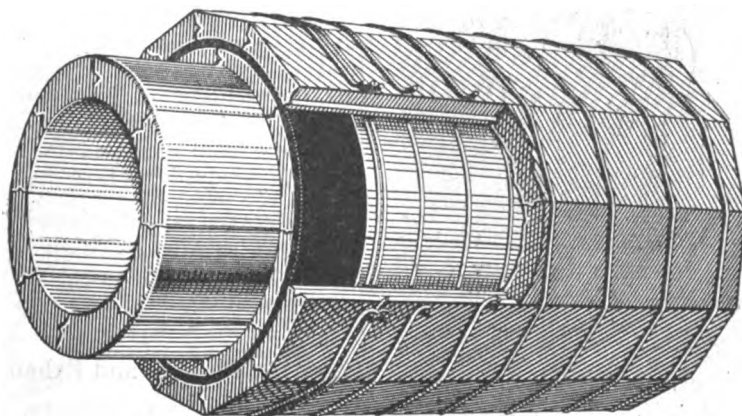
For pipes conveying steam, where the pressure is more than 5 lbs., to keep a more uniformly high temperature in the line, and also more efficiency to protect the pipe, the covering is lined with AAAA charcoal tin.

Where the tin lined covering is used, no matter how high the steam pressure, the extra thickness of the inner cypress shell will positively remove the danger of collapsing.

Prices.

Prices will be quoted for any size or quantity needed.

In naming size wanted, be sure and make allowance for slipping the covering over the couplings on the pipe to be covered. Also state the approximate steam pressure to be carried.



WYCKOFF'S IMPROVED STEAM PIPE CASING

Improvements: cypress used; doubling thickness of inner wood shell; increasing dead air space 50%. Used for high pressure steam lines
 Coating omitted to show construction

AMERICAN BLOWER COMPANY

DETROIT, MICH.

WORKS: DETROIT, MICH.; TROY, N. Y.; WINDSOR, ONT., CANADIAN SIROCCO Co.

BRANCH OFFICES AND AGENCIES

ATLANTA, GA., Atlanta Trust Co. Building
BOSTON, MASS., 10 High Street
CHARLOTTE, N. C., ISAAC HARDEMAN 816 Realty Building
CHICAGO, ILL., Marquette Building
CLEVELAND, OHIO, Swetland Building
DENVER, COLO., HOWARD H. FIELDING (Heating and Ventilating), Boston Building
DETROIT, MICH., 1450 David Whitney Building
INDIANAPOLIS, IND., Lemcke Annex Building

KANSAS CITY, MO., Interstate Building
LOS ANGELES, CAL., Hollingsworth Building
MINNEAPOLIS, MINN., 501 South 6th Street
NEW YORK, N. Y., 141 Broadway
PHILADELPHIA, PA., 1328 Chestnut Street
PITTSBURGH, PA., Empire Building
ROCHESTER, N. Y., Insurance Building
SAN FRANCISCO, CAL., 667 Mission Street

SALT LAKE CITY, UTAH, 616 Newhouse Building
ST. LOUIS, MO., 1221 Boatmen's Bank Building
WASHINGTON, D. C., 301 Southern Building
CALGARY, ALTA., 605 West 2nd Street
MONTREAL, QUE., McGill Building
VANCOUVER, B. C., Credit Foncier Building
WINDSOR, ONT., McDougall and Banwell Streets
WINNIPEG, MAN., 567 Banning Street

Products.

Manufacturers of AIR WASHERS; HEATING, VENTILATING, PURIFYING, COOLING, HUMIDIFYING, DEHUMIDIFYING and DRYING EQUIPMENT; "SIROCCO" FANS; MECHANICAL DRAFT and BLAST APPARATUS; FANS and BLOWERS for all purposes; VERTICAL SELF-OILING ENGINES; TILTING STEAM TRAPS ("DETROIT" SYSTEMS); DRY KILNS for Timber Products.

Fans and Blowers.

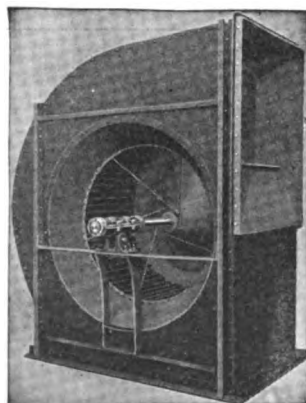
The AMERICAN BLOWER COMPANY's lines of fans and blowers include a type of machine to meet every air handling problem, from a small office fan to a complete ventilating or heating system for the largest factories and public buildings. The superiority of these fans is proved by their adoption in the world's largest plants.

"ABC" fans are adapted to heating, ventilating, exhausting, purifying, cooling, humidifying, dehumidifying and drying equipment in office, public, educational and industrial buildings.

"Sirocco" Fans.

"Sirocco" fans in all sizes are regularly constructed with full housings; larger fans are built, however, with seven-eighths housings. Housings being small for any given capacity, it is usually possible to use full housed fans.

Full housed fans, up to and including No. 6, are adjustable as to discharge, it being possible with the same fan to change the discharge to any direction desired and to shift the pulley from one side of the fan to the other. This can not be done with the seven-eighths housed fans, each fan being constructed to meet the requirements of individual installation. If desirable, double discharge fans can be furnished.



SINGLE INLET AMERICAN "SIROCCO" FAN

Full housed. Left hand. Top horizontal discharge, inlet side

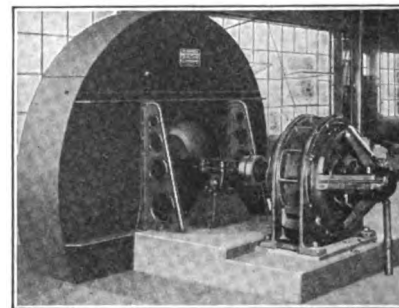
Single inlet fans are constructed with either overhung wheel or pulley, as conditions require. Double inlet fans can not be built with overhung wheels.

"Sirocco" fans may be engine, motor or turbine driven, either direct connected or by belt.

Pressure Blowers and Exhausters.

PRESSURE BLOWERS—Blowers of this type are especially designed and constructed for delivering air at high pressures.

They are built in standard sizes, which are suitable for all purposes for pressures up to 16 ozs. per sq. in.; and special blowers are built to give a pressure up to 24 ozs. per sq. in. The speeds at which the standard blowers operate are generally too high to permit of driving by direct connected motors, but special blowers are built for such requirements.



SPECIAL TYPE P BLOWER WITH D. C. MOTOR

Pressure blowers are particularly adapted for supplying the air blast for cupolas and forges; for blowing heating and melting furnaces for plates, billets, rivets, etc., using either oil, gas, coal or coke for fuel; for furnishing air for cooling the moulds in glass plants; blowing scale from dies and forging hammers; glass blowing, and kindred applications.

EXHAUSTERS—Designed and built especially to withstand strains of high pressure duty, such as in pneumatic systems, metal mine and tunnel ventilation, gas exhausting, etc.

Cast Iron Blowers and Exhausters.

Installed as exhausters, these fans are especially adapted to handling gritty dust, such as comes from emery wheels, tumbling barrels, rattlers, etc., which quickly cuts into and destroys sheet steel. The sandy

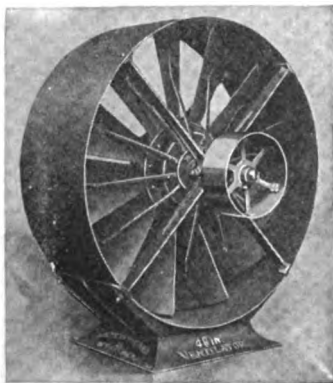
exterior of cast iron, however, gives a certain amount of protection.

They are also adapted to the removal of smoke from forge fires, steam from cooking vats or kettles, in dye works, breweries, packing houses or rubber factories; blowing coal dust or powdered coal into rotary kilns or other furnaces; ventilating toilet rooms in public buildings; in fact, they are adapted to any work within their capacity.

As blowers, they are particularly adapted for furnishing the blast for heating plates, rivets, etc., in furnaces burning coal or coke; for blowing of forge fires; for supplying draft to steam boilers; and for use in connection with mechanical stokers.

Disc Ventilating Fans.

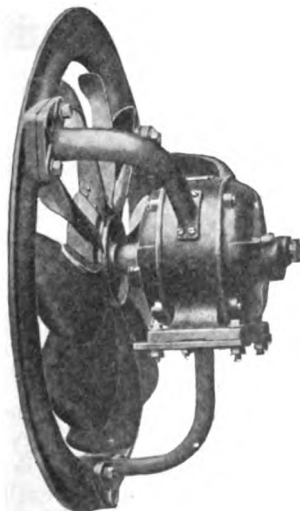
Adapted to ventilation of all types of buildings, for removal of smoke, noxious fumes and gases, steam and dust; to heating and drying in connection with heating apparatus, either furnaces or steam coils. Also more economical and effective than aspirating coils frequently employed to assist draft in ventilating shafts or eduction flues in large public buildings.



TYPE D FAN WITH STANDARD BASE AND PULLEY

Ventura Disc Ventilating Fans.

Ventura disc ventilating fans handle large volumes of air freely, or against pressures, up to 1-in. water gauge. They have 10 broad blades riveted to a large central disc, which absolutely prevents a back flow of air through the center when working against pressure.



VENTURA FAN—WALL TYPE, MOTOR DRIVEN
Pulley outfits can also be furnished

For ventilating rooms and buildings; for ventilating small mines or at any mine where a disc fan (engine or motor driven) can be used, with capacities of 650 to 100,000 cu. ft. per minute, resistance not exceeding 1-in. water gauge.

Mechanical Draft.

"Sirocco" multiblade fans have met with unprecedented success in this class of work. Many of the largest and speediest warships afloat are equipped with "Sirocco" fans to supply draft.

Two of the largest power plant boilers in the world are supplied with draft from "Sirocco" fans. For very high speed high pressure work, reinforced "Sirocco" wheels are available.

ADVANTAGES—The advantages that can be derived from the use of artificial draft are many, though largely dependent upon one another. Being so interwoven, to enlarge upon each one separately apparently involves repetition, yet the distinctive features are present and very evident. The points of superiority of mechanical draft produced by centrifugal fans as compared with chimney draft are as follows:

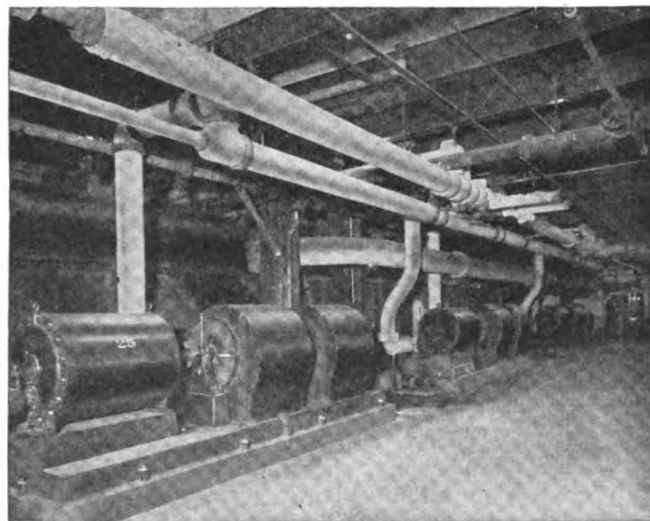
Lower first cost; smaller operating expense; cheaper fuel; increased and improved combustion; smaller boiler plant; more thorough utilization of waste gases; absolute independence of atmospheric conditions; better regulation; economy of space; smoke prevention; greater adaptability.

INDUCED DRAFT—A few of the important advantages of induced draft over forced draft are as follows:

Draft Not Shut Off While Firing—It is never necessary to shut off the draft when firing, as there is no pressure in the combustion chamber to force scorching gases and dust out of the firing doors when they are opened. The ash pit can be cleaned at any time without shutting off draft.

Boiler Room Ventilated—Air drawn into furnaces from boiler room is replaced by fresh outside air. Forced draft has a tendency to force smoke and ill-smelling gases through crevices in boiler setting. No injurious gases can escape, as all crevices are under a suction.

Cleaner Boiler Flues—Boiler flues can be kept cleaner, as there is less lifting effect at fire and consequently ashes and dirt are not carried in suspension and deposited in places where velocity of gases is lowered, to same extent as is the case with forced draft.



"SIROCCO" TURBINE DRIVEN BLOWERS
Supplying forced draft for two 2365 h.p. boilers, the largest in the world

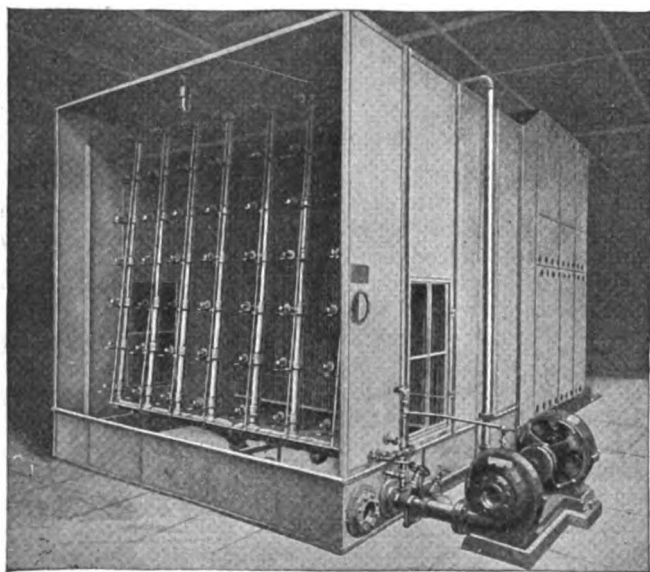
Boilers Uninjured—Liability of boilers being injured is reduced to a minimum with induced draft, being no greater than with natural draft.

FORCED DRAFT—Whenever the greater portion of resistance offered by a boiler system to the flow of air is encountered at the furnace, it is advisable to use forced draft. This is particularly the case when hollow blast grates or underfeed stokers are used, as under these circumstances, if an induced draft fan were employed, the high suction which would have to be maintained throughout the entire system would result in excessive leakage.

Air Purifiers or Washers.

All the improvements made in air washers for the past 18 or 20 years are embodied in the "Sirocco" purifier. The nozzles are adjustable, and can be flushed while in operation without affecting the cleansing effect of the machine. The scrubbing and eliminator surfaces are arranged so as to create low resistance through the purifier; hence, low operating cost.

They are built in sizes with capacities of 3,500 to 300,000 cu. ft. of air per minute.



"SIROCCO" PURIFIER

One of the eight recently installed by the Ford Motor Company

Humidifying Systems.

The contract department of this company is prepared to undertake the work of installing complete systems for humidifying textile mills, bakeries, rubber drying, or similar work requiring accurate and automatic control of the atmospheric conditions in manufacturing processes.

Cooling, Dehumidifying or Temperature Drying Systems.

The AMERICAN BLOWER COMPANY is prepared to furnish complete installations on a guarantee of results for low temperature drying or other cooling work including refrigerating equipment. Some of the largest and most successful work of this kind in the country has been done by the company and includes match drying rooms, cheese storage houses, capsule drying systems, film drying, chocolate dipping and coating processes in biscuit plants, fermentation rooms, drying materials susceptible to injury at high temperatures.

SWEET'S CATALOGUE

"ABC" Unit Heater.

This compact, portable apparatus provides an ideal method for heating factories of all kinds, particularly small or medium sized buildings. One or more units can be placed in a room where heat is most desirable. As extensions to the plant are made, additional units can be installed. The fan is driven by a motor, turbine or a pulley.

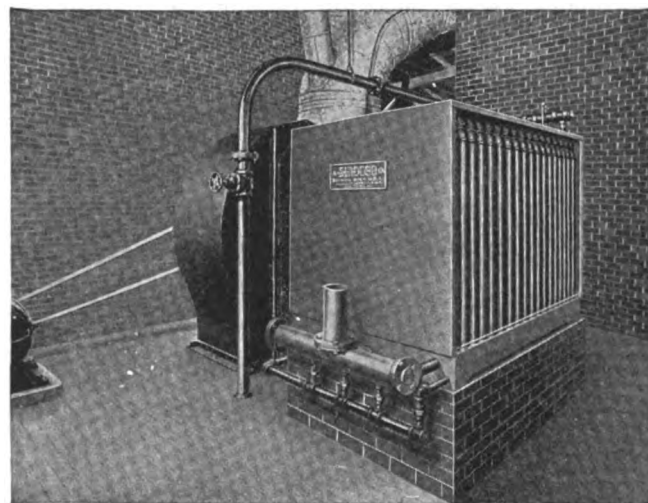
"ABC" Heaters.

"ABC" pipe coil heaters are admirably adapted for heating and ventilating factories and all occupied buildings requiring a large volume of air freshly warmed by steam or hot water. "ABC" heaters are also well adapted for drying and cooling purposes.

The capacity of "ABC" heaters is extremely flexible, as they are made in sizes up to 40 pipes wide, and from 2 ft. to 12 ft. high.



"ABC" UNIT HEATER



"ABC" PIPE COIL HEATERS ON FACTORY HEATING SYSTEM

Vertical Steam Engines.

"ABC" vertical enclosed self-oiling steam engines are built in 3 types, with or without automatic speed control:

Type "A" single cylinder up to 60 h. p.

Type "E" double cylinder up to 120 h. p.

Type "X" cross compound up to 120 h. p.

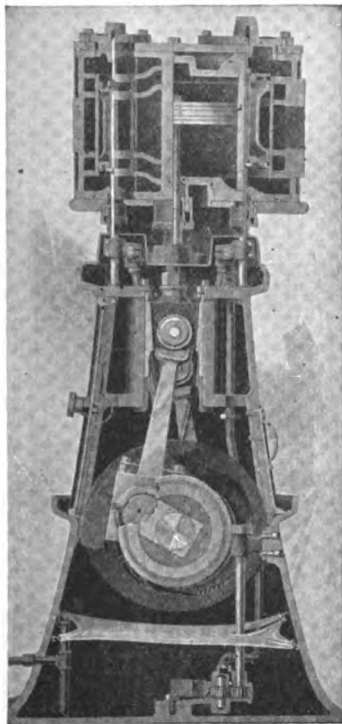
"ABC" engines are adaptable for direct connection to centrifugal pumps, electric generators, stokers, fans and blowers.

With variable speed attachment they are successfully used to drive paper mill machinery.

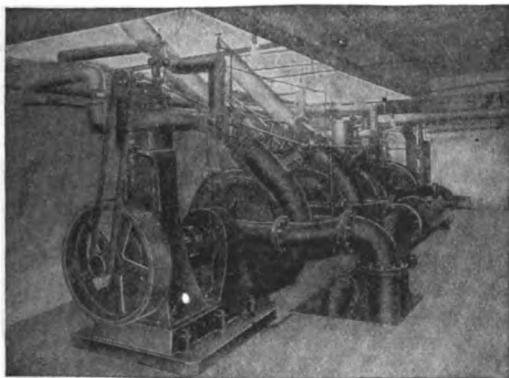
They operate without noise or vibration. Oil is not forced, but flows by gravity, each bearing surface being individually supplied with its proper proportion.

Continued on next page

"ABC" engines have run continuously from 6 months to 1 year, without adding new oil to original supply or making an adjustment.



TYPE X ENGINE—VERTICAL
Showing arrangement of interior lubricating mechanism



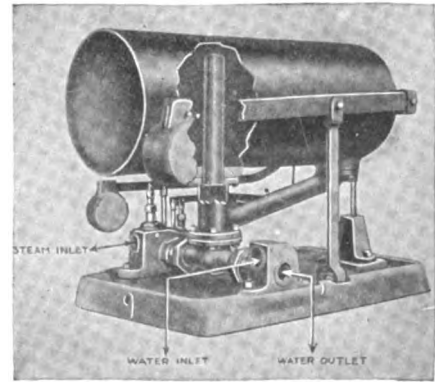
"ABC" TYPE A ENGINES DRIVING CENTRIFUGAL PUMPS
Used for barometric condenser service

"Detroit" Systems for Handling Condensation.

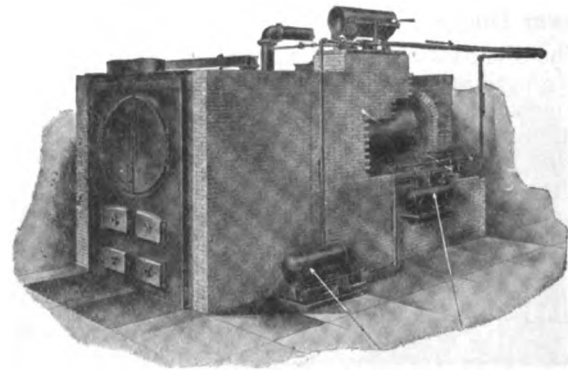
Designed to automatically return condensation directly to boiler without loss of heat units. To meet various conditions, these systems are manufactured and used as required according to the following types:

(1) Single system, used when steam pressure at receiving tank is sufficient to raise water to return trap above boiler. (2) Double system, used when steam pressure on return lines is insufficient to raise water to trap above boiler, as in exhaust steam heating. (3) Combination system, used when a wide variation in steam pressure exists, as exhaust in daytime and live steam at night. (4) Metering system, used when feed water is to be measured. (5) Boiler feed system, used to feed boiler

in place of a boiler feed pump. (6) Vacuum system, a double trap installation, used when desirable that vacuum, or lower trap, receives condensation by its vacuum and lifts it to return trap on top of boiler. (7) Lifting or pumping systems, used for raising water from one level to another. (8) Systems for handling condensation in low pressure heating installations.



DETROIT RETURN TRAP
No working parts inside the tank



THE "DETROIT" DOUBLE SYSTEM
Method of connecting up "Detroit" return traps for double trap system.
Arrow indicates direction of flow of condensation

Special Drying Systems.

"ABC" dryers can be designed to meet the requirements of almost every material. "ABC" engineers have designed successful systems for drying such material as glue, enamel on metal surfaces, cereals, leather, salt, soap, pottery, varnish, cloth, asbestos, ginger, starch, tobacco, paper, cocoa, sugar, powders, etc.

Dry Kilns for Timber Products.

Built in 2 types: Forced circulation (with fan); natural circulation (without fan). For drying all kinds of woods and wood products.

"ABC" kilns are equipped with the new and improved *straight pipe* heating coils. "ABC" kilns produce a first class product, free from checks, stains, and other imperfections. "ABC" kilns dry uniformly, eliminating the possibility of case hardening. Controllable under all outside weather conditions.

Engineering Service.

If those parties considering the installation of ventilating or heating systems will communicate with the Engineering Department of this company, as to their plans along these lines, this department will suggest the kind of equipment best fitted for the plans which they have in mind. The company's sales engineers are located at points shown on page 964, or information may be secured direct from the Engineering Department at the home office.

BAYLEY MANUFACTURING CO.

Builders of Heating, Ventilating and Drying Apparatus

732-748 Greenbush Street

MILWAUKEE, WIS.

Products.

PLEXIFORM FANS; PRESSURE BLOWERS, FANS for Forced and Induced Draft; CHINOOK HEATERS; STEAM ENGINES; LEATHER DRIERS; ALFALFA DRIERS; SHAVINGS EXHAUST FANS.

Also manufacturers of Steam Traps and Blast Gates.

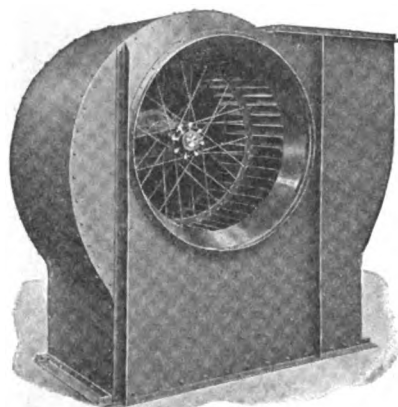
Plexiform Fans.

The Plexiform fan is of a design that makes for great strength in construction, lightness and efficiency. Its characteristics and distinguishing features are:

The maximum air from the minimum of housing.



BLAST WHEEL FOR PLEXIFORM FAN



PLEXIFORM FAN

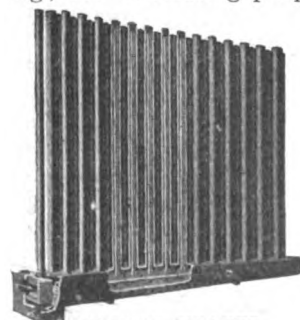
Large and practically unobstructed inlet and outlet openings.

Free and noiseless delivery of air, without the use of arbitrary cut-offs.

A type of construction adapted for handling high temperature as well as low temperature gases, and for double width, double inlet fans as well as single width, single inlet fans.

Suitable for practically all applications where maximum of air (at low or medium pressures) is desired, and especially where space conditions limit and where horsepower expenditure is a prime factor.

It is used generally as a component part of indirect systems of heating and ventilating for schools, churches, theaters, hospitals, penal institutions, industrial buildings; for forced and induced draft applications; for drying; for ventilating purposes, and for the handling of dust laden air, etc.



CHINOOK HEATER

Chinook Heaters.

A staggered tube, indirect heater, built without the use of return bends, elbows, nipples or left-hand threads. The circulation is accomplished by the use of a pipe within a pipe. The Chinook heater is not subjected to the ravages of unequal expansion

and contraction, as each tube is independent of any other.

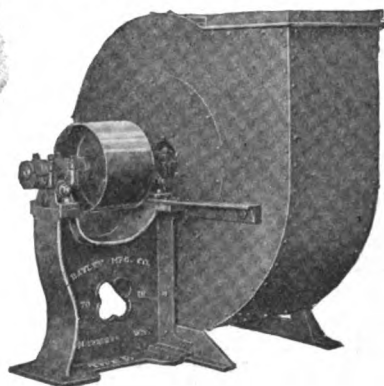
It is used principally in connection with the Plexiform fan for heating and ventilating public buildings, and for drying. It is also used as indirect radiation independent of fans, for cooling water and for condensing exhaust steam.

It is shipped set up or knocked down, depending on size and installation conditions.

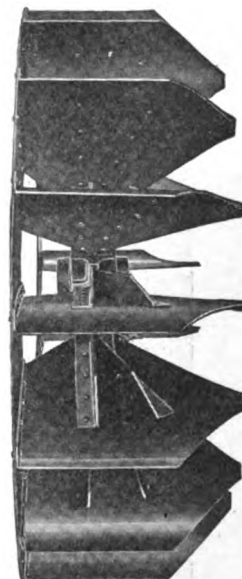
Shavings Exhaust Fans.

Type "B" shavings exhaust fans for handling refuse from sawmills, planing mills, cotton gins, woodworking establishments of all kinds.

Type "B" shavings exhaust fan is designed to reach its highest efficiency at a medium speed. Peculiar, in that its blast wheel is of the multiple bladed type and that its construction permits of repair.



TYPE "B" FAN



TYPE "B" BLAST WHEEL

Steam Engines.

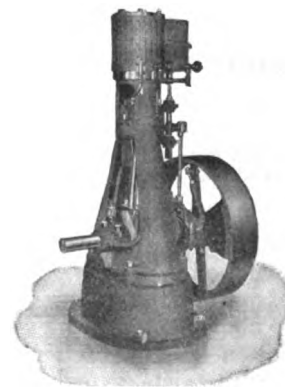
Vertical and horizontal steam engines for high and low pressures, built for direct connection to fans and generators, and for belt connections.

Leather Driers.

Both loft and tunnel systems for drying wet stock, and tunnel systems for re-drying finished leather.

Alfalfa Driers.

A continuous tunnel system for curing alfalfa directly from the mower and delivering the cured hay to the grinder. Also adapted for the drying of hemp, clover, hops, etc.



VERTICAL ENGINE

COPPUS ENGINEERING & EQUIPMENT CO.

Manufacturers of Blowers, Fans and Turbines

340-350 Park Avenue
WORCESTER, MASS.

For Branch Offices, see Page 732

Products.

TURBO BLOWERS, Propeller and Centrifugal Types, for Undergrate Draft, Ventilation and other purposes.

For Turbo Boiler Feed Pumps and Steam Turbines, see page 832.



selection. One can not afford *not* to take advantage of this company's wide experience, as this experience, more than mere calculations, will solve all blower problems.

Write for data sheet and send the necessary data so that conditions can be studied from every angle and a report will be furnished with this company's recommendations.

Coppus Turbo Blowers, (Type C).

Built with either single- or double-stage impulse turbine, entirely enclosed, on the same shaft with a propeller fan.

Coppus construction insures quiet operation and high economy at the most efficient fan speeds. Turbine is provided with convenient hand valves for individual nozzle control. The steam chamber is small, yet of ample cross section to prevent condensation.

The life of the machine depends largely upon the life of its bearings, and the life of the bearings is largely determined by their lubrication. It is very essential to give a great deal of attention to proper lubrication of the bearings on turbo undergrate blowers on account of the severe conditions under which they operate. The Coppus lubricating system is designed to take care of these exacting requirements. It is absolutely dustproof, requires little attention, can not get out of order with ordinary neglect and abuse, and no matter if any oil is used up, a constant oil level will be maintained in the upper chamber of the motor bushing.

The Coppus turbo blower is the only blower in which the fan does not overhang the bearing and in which the exhaust steam is discharged into the fan casing when desired, where it mixes thoroughly with the air. All stuffing boxes have been eliminated.

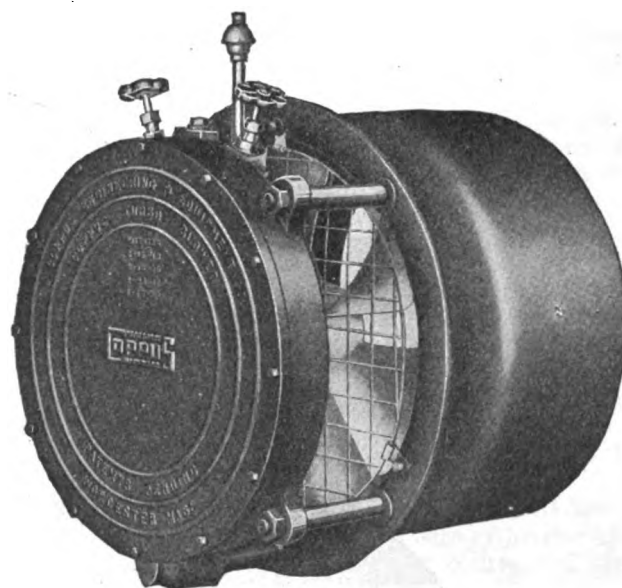
It delivers more air, size for size, at any specified pressures and uses 25% to 75% less steam than any other turbo blower made. This claim can be proved by comparative tests.

Special attention has been given to the fan casing in order to insure the highest efficiency. The casing hugs the fan and is expanded immediately beyond, relieving the choking effect on the air by the casing, greatly eliminating friction and preventing the formation of eddy currents. This feature (Patent No. 1,308,982) has gone through all the tribunals of the United States Patent Office, during 4 years of interference proceedings and this company has been awarded priority of invention of the expanded casing to the exclusion of all others.

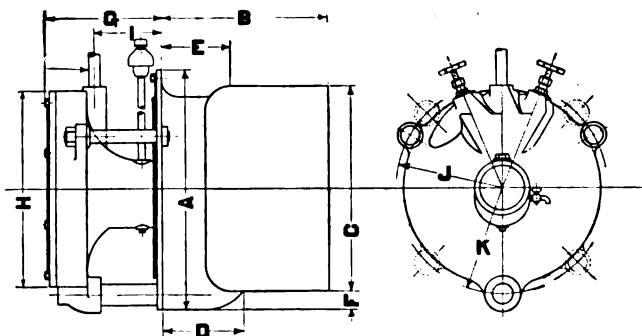
For low steam consumption, high air delivery, simplicity of operation, low cost of upkeep and reliability, the Coppus turbo blower has proved a generally accepted leader.

How to Choose the Size Blower Best Adapted to Any Boiler.

This company's advice is, do not try; let the Coppus engineers do it. This will save considerable time and will avoid trouble and disappointment. It is not only a question of blower capacity, but the conditions under which the blower must operate that enter largely into its



COPPUS TURBO BLOWER, TYPE C



DIMENSION DIAGRAM OF COPPUS TURBO BLOWER, TYPE C

Size, fan	Size, turbine	Steam inlet	Number of nozzles	All dimensions are in inches											
				A	B	C	D	E	F	G	H	I	J	K	
10	9	$\frac{1}{2}$	1	14 $\frac{1}{2}$	15	*12 $\frac{1}{2}$	6 $\frac{3}{4}$	5 $\frac{1}{4}$	1	9 $\frac{1}{2}$	10 $\frac{5}{8}$	5	6 $\frac{1}{8}$	6 $\frac{1}{8}$	
12	12	$\frac{3}{4}$	2	18	15	*14 $\frac{1}{2}$	6 $\frac{3}{4}$	5 $\frac{1}{4}$	1 $\frac{1}{8}$	9 $\frac{1}{4}$	14 $\frac{1}{8}$	4 $\frac{7}{8}$	7 $\frac{1}{2}$	7 $\frac{1}{2}$	
14	12	$\frac{3}{4}$	2	20	15	*16 $\frac{1}{2}$	6 $\frac{3}{4}$	5 $\frac{1}{4}$	1 $\frac{1}{8}$	9 $\frac{1}{4}$	14 $\frac{1}{8}$	4 $\frac{7}{8}$	7 $\frac{1}{2}$	8 $\frac{1}{2}$	
16	16	1	3	21 $\frac{1}{2}$	15	*18 $\frac{5}{8}$	7 $\frac{1}{4}$	6 $\frac{1}{4}$	1 $\frac{1}{8}$	10 $\frac{1}{2}$	17 $\frac{1}{4}$	6 $\frac{1}{8}$	9 $\frac{1}{2}$	9 $\frac{5}{8}$	
18	16	1	3	23 $\frac{1}{4}$	15	*20 $\frac{3}{8}$	7 $\frac{1}{4}$	6 $\frac{1}{4}$	1 $\frac{1}{8}$	10 $\frac{1}{2}$	17 $\frac{1}{4}$	6 $\frac{1}{8}$	9 $\frac{1}{2}$	10 $\frac{1}{8}$	
20	20	1	3	26	15	*23 $\frac{3}{8}$	7	6 $\frac{1}{4}$	1 $\frac{1}{8}$	10 $\frac{1}{2}$	21 $\frac{3}{4}$	6 $\frac{1}{8}$	11 $\frac{1}{2}$	11 $\frac{1}{2}$	
22	20	1 $\frac{1}{4}$	3	28	15	*26 $\frac{3}{8}$	6 $\frac{3}{4}$	6 $\frac{1}{4}$	1 $\frac{1}{8}$	10 $\frac{1}{2}$	21 $\frac{3}{4}$	5 $\frac{1}{8}$	12 $\frac{3}{4}$	12 $\frac{3}{4}$	
24	20	1 $\frac{1}{4}$	3	30 $\frac{5}{8}$	15	*30 $\frac{1}{4}$	6	6 $\frac{1}{4}$	1 $\frac{1}{8}$	10 $\frac{1}{2}$	21 $\frac{3}{4}$	5 $\frac{1}{8}$	12 $\frac{3}{4}$	13 $\frac{1}{4}$	

*May be made smaller if lack of space demands it.

†Drawing shows 2 studs, exhaust pipe being the third support. Dagger indicates 4 studs as shown in dotted lines.

BUCKEYE BLOWER COMPANY

COLUMBUS, OHIO

Products.

FANS of all types.

Buckeye Disc Fans.

Disc fans are recommended for moving large volumes of air at low pressures, but should not be installed with any great length of duct work.

Buckeye disc fans are strongly built, self-contained ventilating units, easily installed and easily moved. Being built with broad overlapping blades they successfully operate against much higher pressure than ordinary disc fans. They are correctly designed and built with the same care as the large centrifugal fans.

BUCKEYE

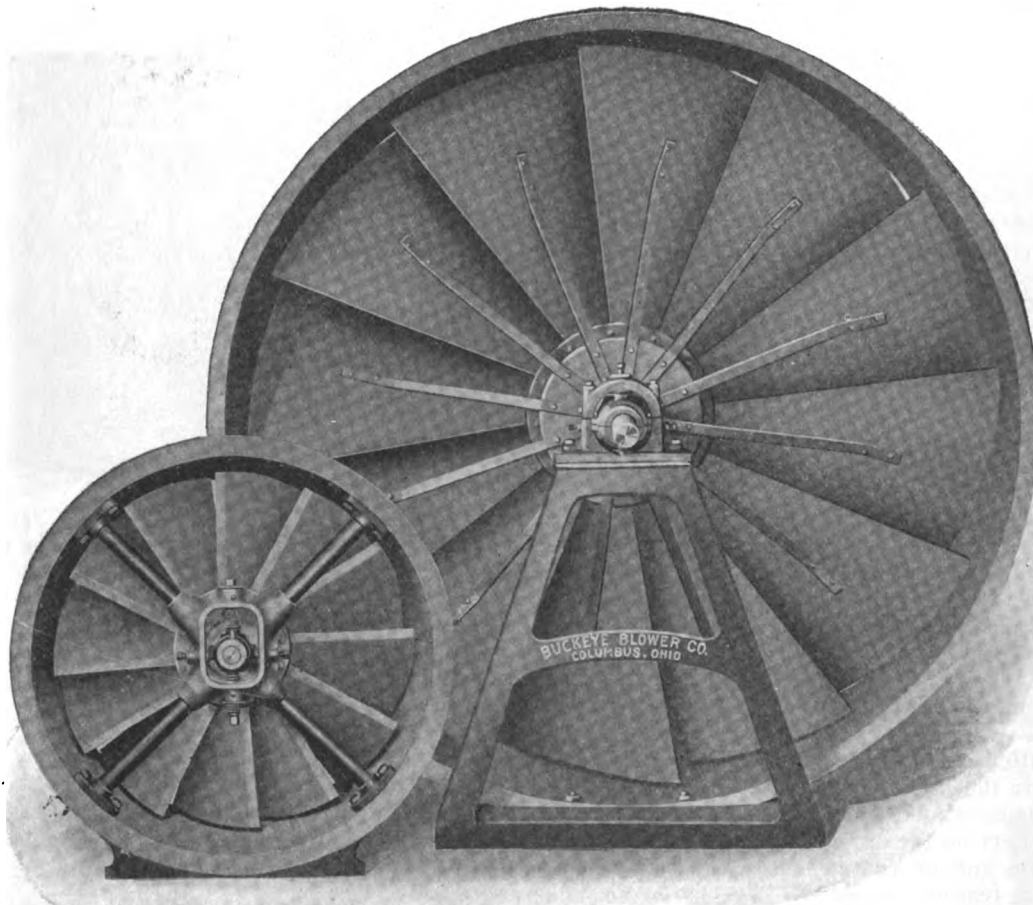
TRADE-MARK

The purchaser has the choice of self-aligning Hyatt roller bearings; or self-aligning, ring oiled, babbitted bearings, giving a continuous automatic lubrication.

Buckeye disc fans are built to withstand the most severe service in the industrial and mining fields.

Portable direct connected motor driven units, chain or gear drive, are features of Buckeye Service.

Buckeye disc fans are manufactured in quantity under expert supervision and only the best commercial grades of material enter into their construction. They are practically indestructible. No disc fan on the market today compares with these sturdy little ventilating boosters.



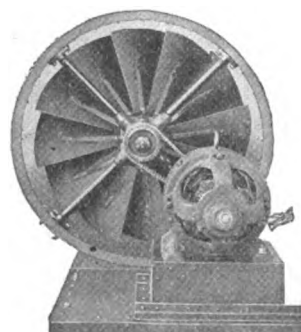
TWO RUGGED TYPES FOR DEPENDABLE SERVICE



TYPE "A," BELT DRIVE



TYPE "B," BELT DRIVE



TYPE "A," CHAIN DRIVE



DIRECT MOTOR DRIVE

SWEET'S CATALOGUE

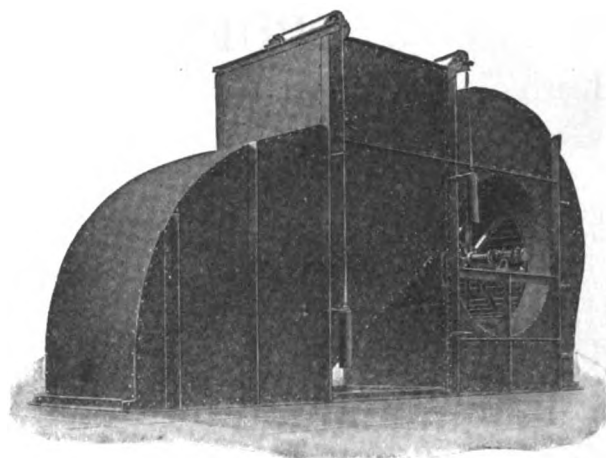
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Buckeye Centrifugal Fans.

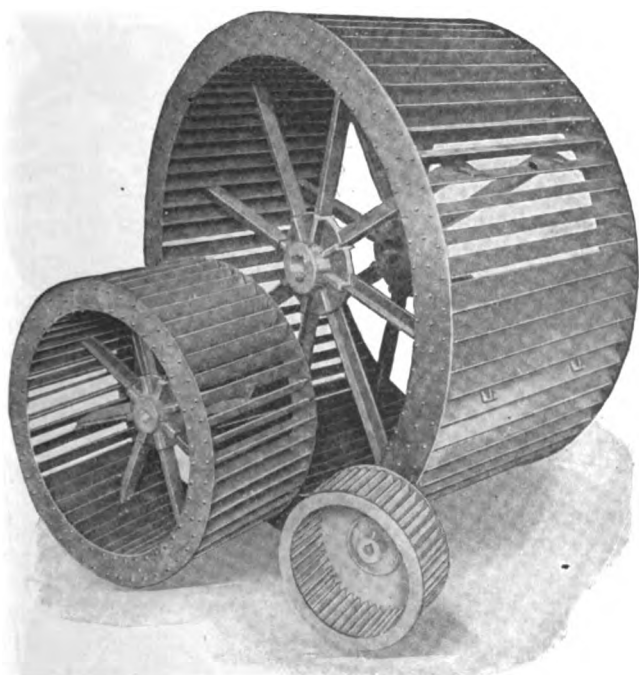
Buckeye multiblade and steel plate fans are built for general ventilating installations, forced or induced draft, dry kilns and similar service.

Multiblade fan wheels, except in the smallest sizes, are built on steel spiders; this design best adapting itself to a well balanced and reasonable light construction for maximum strength and stiffness. These strong rigid wheels are the secret of the quiet operation of multiblade fans. All wheels are carefully balanced by expert operators on a ball bearing balancing machine before mounting.

The purchaser has the choice of Hyatt flexible roller bearing pillow blocks of the spherical, self-aligning



REVERSIBLE BUCKEYE MULTIBLADE MINE FAN



BUCKEYE MULTIBLADE FAN WHEELS

type, or the Buckeye ring oiling babbitted bearing of the self-aligning trunnion type. Roller bearings are not recommended for high speeds.

Buckeye centrifugal fans are regularly built with an overhung pulley. The overhung fan wheel assembly for exhaust fans affords easier access to the bearings. For handling hot gases this type of mounting with water cooled bearings is regularly furnished. Direct con-

nected, geared, and chain driven units are special features of Buckeye Service.

Reversible fans for mine ventilation may be changed from blowers to exhausters while running, by swinging a balanced damper. Explosion doors are furnished on these fan housings when desired.

Service.

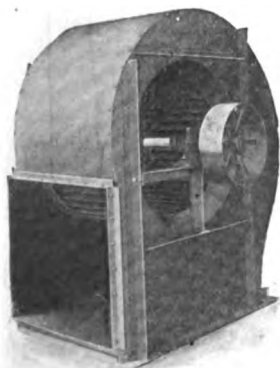
Space is too limited to completely describe or illustrate Buckeye fans. Whatever the problem write our Service Department about it. To enable our engineers to make recommendations on fan installations that will best meet the client's conditions and requirements, the following information is necessary:

- (1) The volume of air the fan is to deliver (both present and future).
- (2) The resistance or static pressure it will operate against; or the length and average size of longest air duct, the number of bends in the air course and the velocity of air required.
- (3) Temperature of air if over 100° Fahr.
- (4) It is also advisable to state:
 - (a) Type of motive power to be used.
 - (b) Any restrictions as to power consumption.
 - (c) Any restrictions as to space for fan or power.

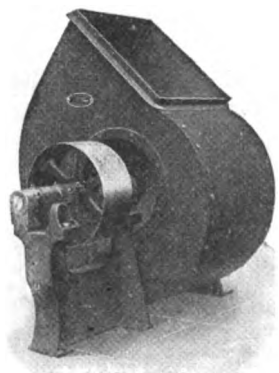
The more clients tell us about their problems, the better our engineers can advise them.

Bulletins.

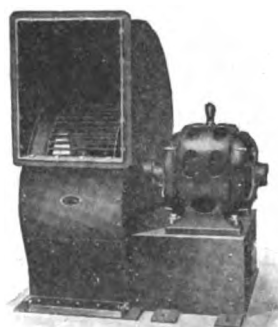
Write for our bulletins. They give complete condensed information on sizes, air capacities, speeds and power consumption. They should be in your files for ready reference.



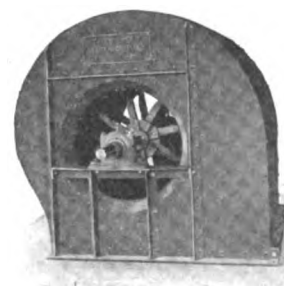
OVERHUNG PULLEY,
BELT DRIVE



OVERHUNG FAN WHEEL,
WATER COOLED BEARINGS



DIRECT MOTOR DRIVE



OVERHUNG PULLEY,
BELT DRIVE

BUFFALO FORGE COMPANY

Heating, Ventilating, Mechanical Draft Equipment; Forges, Punches and Shears
BUFFALO, N. Y.

BRANCH OFFICES

NEW YORK, N. Y., 39 Cortlandt Street
PHILADELPHIA, PA., 1303 Land Title Building
PITTSBURGH, PA., 917 Union Arcade
BOSTON, MASS., 88 Broad Street
CLEVELAND, OHIO, Rockefeller Building
WASHINGTON, D. C., 501 Loan & Trust Building
CHICAGO, ILL., 562 West Washington Boulevard
CINCINNATI, OHIO, 607 Mercantile Library Building
NEW ORLEANS, LA., 534-536 Bieuville Street

DETROIT, MICH., COON DE VISSER Co., 1924-1925 Ford Building
ST. LOUIS, MO., 1214 Chemical Building
ATLANTA, GA., 618 Hurt Building
DENVER, COLO., STEARNS ROGER MFG. Co.
LOS ANGELES, CAL., 636 H. W. Hellman Building
SEATTLE, WASH., POWER EQUIPMENT Co.
PORTLAND, ORE., Lewis Building

Products.

HEATING and VENTILATING EQUIPMENT:

Heaters
Centrifugal Fans
Exhaust Fans
Blowers
Disk Fans

FORGES

MACHINE TOOLS:

Bar Cutters
Punches and Shears
Drill Presses

B Volume Blowers and Exhausters.

These blowers and exhausters are used for pressures up to 6 oz. For removing fumes or gases, in connection with dust and refuse removal, in organ blowing, in forge and furnace blowing and all similar work they are supreme.



B VOLUME BLOWER

Buffalo Heating System.

The Buffalo heating system consists of three elements: the heater, the fan, and a system of distributing ducts.

Buffalo Heaters—The heater is in sections, each consisting of four rows of vertical 1-in. pipe screwed into a cast iron base. The coils are tightly enclosed on top and sides by a sheet steel casing through which the fan draws air.

Buffalo Fans—The fan is a Buffalo conoidal or planoidal of size selected for the particular service required in each case.

Ducts—The ducts distributing the warm air are usually of sheet metal, overhead, but may be incorporated into the building construction, or be placed underground.

Advantages—The advantages of the Buffalo fan system of heating lie both in its flexibility of operation and economy. Equipped with direct radiation a building heats up slowly and with no uniformity. This is especially true of a high building, where the chimney action draws all the warm air up under the roof and allows the heat to escape through the roof.

A fan system with the proper amount of reserve can heat a building quickly, and the arrangements of the duct outlets throws the warm air down into the working area.

The chief points of the Buffalo system may be summarized as follows:

(1) Perfect ventilation regardless of exterior conditions. (2) Uniform and proper distribution of heat. (3) High efficiency of heating surface (3 to 5 times that of direct radiation). (4) Greatest economy in operation. (5) Utilization of exhaust steam.

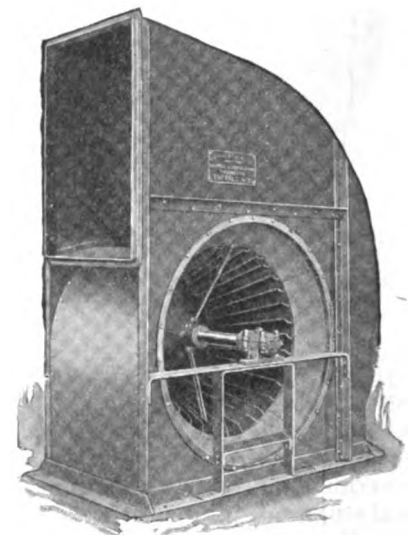
(6) Prevention of drafts by production of a plenum. (7) Independent regulation of heating and ventilating effects. (8) Great flexibility in operation to suit varying conditions, affording maximum economy. (9) Ease of control, which prevents overheating. (10) Great compactness, affording an economy of space and reducing the cost of steam connections.

(11) Perfect drainage, making less repairs necessary and giving a lower rate of deterioration than with direct radiation. (12) Lower cost of installation.

(13) The entire apparatus is easily portable and is, therefore, a permanent asset. Catalogue No. 401 and others.



NIAGARA CONOIDAL WHEEL

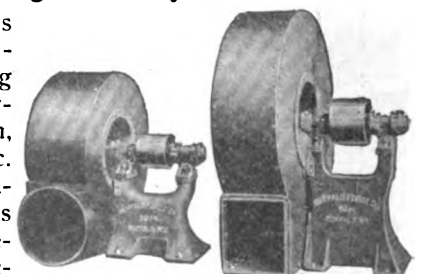


THREE-QUARTER HOUSING, NIAGARA CONOIDAL FAN

Buffalo Slow Speed High Efficiency Mill Exhausters.

These machines are designed especially for conveying and removing shavings, sawdust, grain, cotton, dust, bark, etc. They are built to withstand hard continuous service and are reversible for any direction of discharge.

Catalogue No. 410.

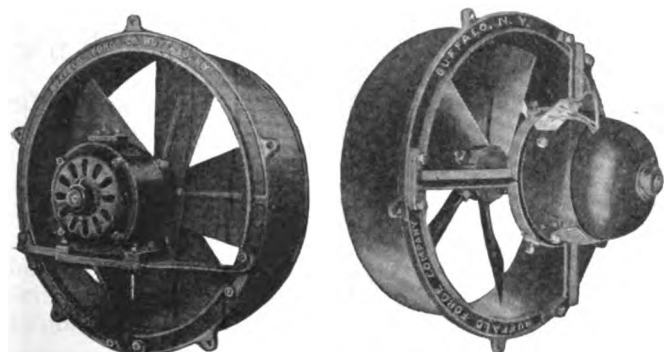


STANDARD EXHAUSTER

SLOW SPEED HIGH EFFICIENCY EX-HAUSTER

Buffalo Electric Disk Fans.

Produce the greatest results at lowest cost in cooling workshops, loft buildings, restaurants, kitchens and for carrying off smoke and fumes when no ducts are needed. Their operation is noiseless and no attention, except occasional oiling, is required.



DISK FAN (SMALL SIZE)

DISK FAN (LARGE SIZE)

Buffalo Combination "Armor Plate" Punches and Shears.

These machines are built up of plates of steel with a tensile strength of 75,000 lbs. per sq. in. Since this is more than seven times as strong as cast iron, it makes possible a large capacity machine of light weight. They are built up in various styles to meet individual requirements.

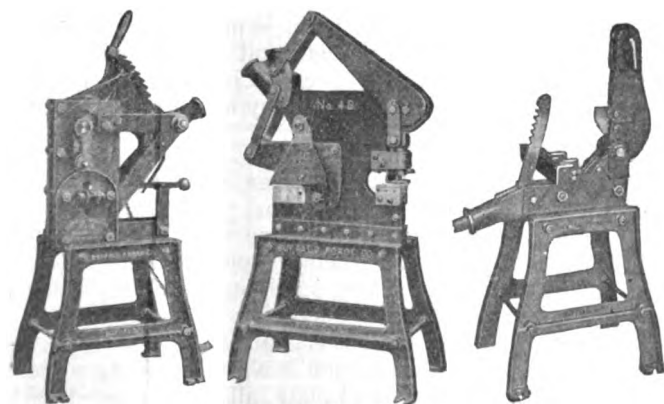
Catalogue PS gives complete data.

Buffalo No. 10 Bar Cutter.

This machine weighs 300 lbs. and is especially favored by contractors for construction work on buildings because of its portability. It is built up of two steel plates (tensile strength 75,000 lbs.), bolted and riveted together. All working parts enclosed. Stripper on side prevents metal binding and roller prevents dulling of knives.

Buffalo Open Throat Angle Shears.

Buffalo open throat angle shear is a compact machine. Its big feature is the open throat, which permits entering the material from the front of the machine instead of inserting through the sides.



NO. 10 CONTRACT-O'S BAR CUTTER

NO. 4-B COMBINATION PUNCH AND SHEARS

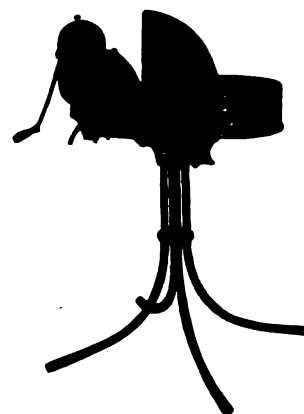
NO. 2. OPEN THROAT ANGLE SHEAR AND TEE CUTTER

Forges.

Buffalo rivet forges for rivet heating on structural work are light, compact and strong and will stand a large amount of rough handling.

Blacksmith forges of both the portable and stationary types and for every conceivable purpose make selection of this type of equipment a simple matter.

Catalogues Nos. 100 and 108 give detailed information on all sizes.



NO. 210 RIVET FORGE
Largest capacity, quickest heat, easiest operation

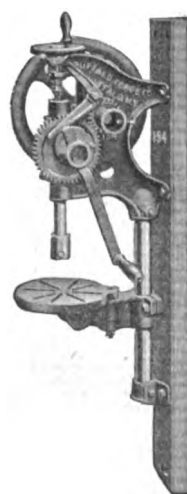


BUFFALO NO. 332-H STEEL CONTRACTORS FORGE
Equipped with Buffalo No. 200 silent blower and "Vulcan" tuyere

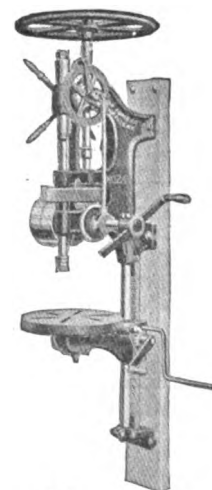
Buffalo Drills.

Buffalo drills are designed in a large variety of styles and sizes to meet every conceivable need.

Catalogue No. 210 gives complete data on other styles.



NO. 615 DRILL



NO. 124 CAPSTAN LEVER DRILL

CARLING TURBINE BLOWER CO.

104 Harding Street
WORCESTER, MASS.

BRANCH OFFICES

BIRMINGHAM, ALA.
BOSTON, MASS.
CHICAGO, ILL.

CLEVELAND, OHIO
DENVER, COLO.
HARTFORD, CONN.

LOUISVILLE, KY.
NEW YORK, N. Y.
PHILADELPHIA, PA.

SAVANNAH, GA.
ST. LOUIS, MO.
WASHINGTON, D. C.

Products.

STEAM and ELECTRIC TURBO UNDERGRATE BLOWERS for boilers and furnaces; VOLUME BLOWERS and EXHAUSTERS for gas producers and industrial uses; PRESSURE BLOWERS for oil burning systems; STEAM POWER TURBINES.

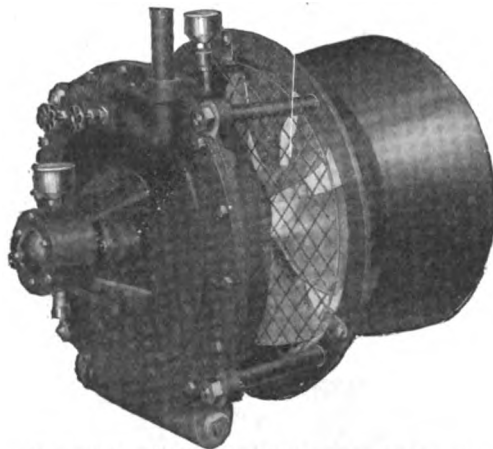


TRADE-MARK

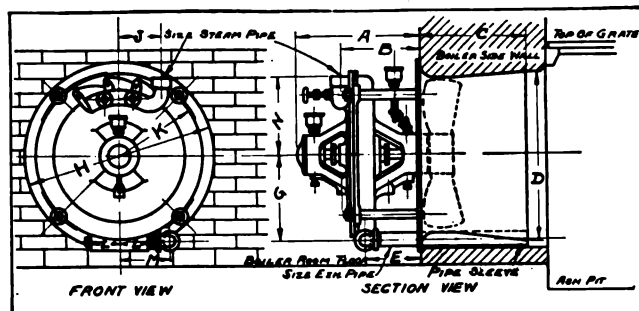
Carling Turbo Undergrate Blower.

Supplies the necessary air volume and pressure for successfully burning the lowest grades of fuel, effecting savings of 10% to 30%. All the heat value can be obtained from screenings, culm, coke breeze, lignite and similar grades. Exhaust steam from turbine is mixed with air from fan, cutting down clinker formation. With high grade bituminous coal, better combustion is obtained than is possible with chimney draft and 100% to 200% more steam can be obtained, as the blower produces desired draft independent of chimney and weather conditions.

One or more blowers may be operated from one



CARLING TURBO UNDERGRATE BLOWER



DIMENSION DIAGRAM, CARLING TURBO UNDERGRATE BLOWER
All dimensions are in inches

Size	A	B	C	D	E	F	G	H	J	K	L	M	N	Size		Net weight, lbs.
														Steam	Exhaust	
12	13 3/4	7 1/2	15	15 1/4	5	8	18 1/4	37 1/2	8	3	6	7	3 1/2	1 1/4		190
14	13 3/4	7 1/2	15	17 1/4	5	8	20 1/4	37 1/2	8	3	7 3/4	7	3 1/2	1 1/4		210
16	17	10 7/8	15	19 3/4	7 3/4	10	22 1/4	43 1/2	10	4	6 3/4	9	3 1/2	1 1/2		340
18	17	10 7/8	15	21 1/4	7 3/4	10	24 1/4	43 1/2	10	4	6 3/4	9	3 1/2	1 1/2		360
20	18	10 7/8	15	23 3/4	7 3/4	12	26 1/4	63 1/2	12	6	8 1/2	11	1	1 1/2		420
22	18	10 7/8	15	25 1/4	7 3/4	12	28 1/4	63 1/2	12	6	9 1/2	11	1	1 1/2		430
24	18	10 7/8	15	27 1/4	7 3/4	12	30 1/4	63 1/2	13 1/4	6 1/2	11	11	1 1/4	2		450

regulating valve, thus giving automatic control. This feature also maintains a steady steam pressure. Peak loads are easy to overcome, as the blower will rapidly increase the rate of combustion, making the work much easier for the fireman.

Built in standard sizes with normal capacities from 50 to 500 b. h. p. for continuous operation at 100% above rating. Usual steam consumption of this type of blower is from 1% to 2%.

Construction—Design is substantial and construction is heavy. Turbine rotor and fan are larger in diameter than is found in usual practice. Ball bearings are the only parts in metallic contact and subject to wear. These may be quickly replaced with Carling patent construction at slight expense. Fan and turbine are designed as a unit, mounted on one common shaft. Lubrication is practically automatic and is the only point of attention necessary in operation. Three nozzles are supplied on the turbine with valves which may be regulated for increasing or decreasing speed and air pressure. Turbine rotor is made of bronze and buckets of cupro nickel, eliminating corrosion. Fan wheel is of the propeller type, cast in one piece of aluminum bronze. Fan casing is made on the Venturi principle, giving an easy flow of air at highest efficiency. Operation is very quiet, as turbine is enclosed and fan housing has been especially designed to eliminate air noise through the wheel. Blade spacing in all rotors is 110 or more per inch of diameter. Blades have been especially designed for this work in accordance with the latest practice, giving a maximum of steam economy. Construction of turbo unit as a whole is superior for durability and each machine is guaranteed against defects for one year.

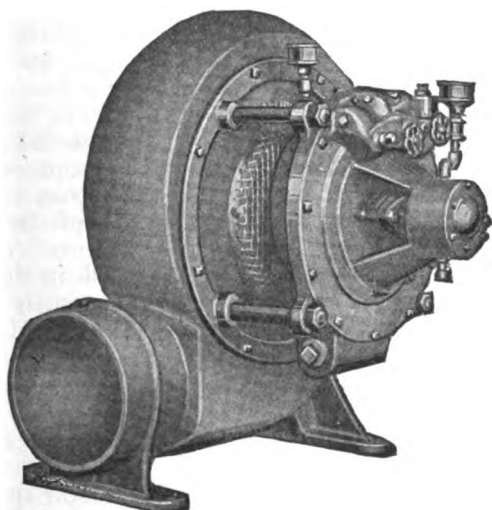
Installation—The Carling undergrate blower is easy to install, as it is shipped all set up, ready to run. Usually set in side wall of boiler or may be placed in front center wall or at rear of boiler with a duct extending through the bridge wall. When set in front center wall with Carling air ducts and dampers, 2 boilers may be operated from 1 blower. Cost of installation is low and can be made by almost any one in a few hours.

Carling Volume Fans.

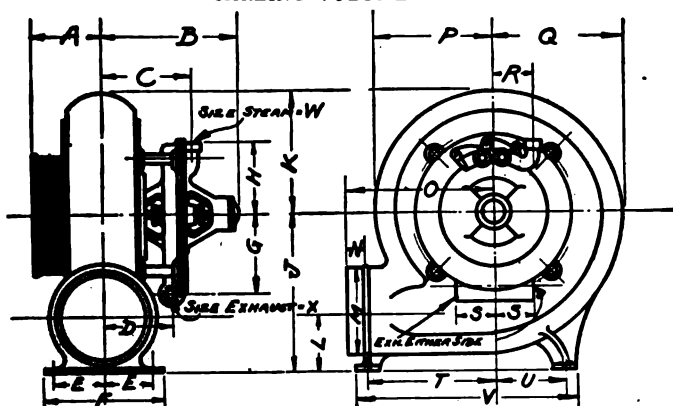
Designed for delivering large volumes of air at pressures ranging from 1/4 to 6 oz. Supplied either as blowers or exhausters. This type of fan has a wide range of industrial uses, being especially adapted for gas producers and furnaces, small stokers, installations, low pressure oil systems, conveying materials, etc.

Standard arrangement is right-hand bottom horizontal. Standard construction is with fan casing of cast iron and fan wheel of steel plate, all parts painted with acid resisting paint. Removable side plates on fan casing give quick access for inspection. Fan wheel is mounted direct on one common shaft with the turbine, eliminating couplings and belt troubles. Speed may be varied by regulating valves. Only 2 bearings need be oiled and practically no attention is required. Unit may be placed in any position on account of perfect balance.

Built other than standard for special requirements. Casing and wheel can be constructed of aluminum, bronze or other material for acid fumes.



CARLING VOLUME FAN



DIMENSION DIAGRAM, CARLING VOLUME FAN

All dimensions are in inches

Size	A	B	C	D	E	F	G	H	J	K	L
3-BV-12	6	16 $\frac{3}{4}$	10 $\frac{1}{2}$	7 $\frac{3}{4}$	4 $\frac{1}{2}$	11	8	7	14	10 $\frac{1}{8}$	5 $\frac{5}{8}$
4-BV-12	7	16 $\frac{3}{4}$	10 $\frac{1}{2}$	7 $\frac{3}{4}$	4 $\frac{1}{2}$	12	8	7	15 $\frac{1}{2}$	12	6
5-BV-16	8	21	14	10 $\frac{3}{4}$	5 $\frac{1}{4}$	13	10	9	18	13 $\frac{3}{8}$	7
6-BV-20	9	21	14	10 $\frac{3}{4}$	5 $\frac{1}{4}$	14	12	11	20 $\frac{5}{8}$	16 $\frac{1}{4}$	7 $\frac{1}{2}$
7-BV-20	10	21	14	10 $\frac{3}{4}$	7 $\frac{1}{4}$	18	12	11	23 $\frac{1}{2}$	18 $\frac{1}{4}$	8 $\frac{3}{8}$

Size	M	N	O	P	Q	R	S	T	U	V	W	X	Net weight, lbs.
3-BV-12	7 $\frac{1}{2}$	2 $\frac{1}{2}$	13 $\frac{3}{8}$	10 $\frac{1}{4}$	11 $\frac{1}{2}$	3 $\frac{1}{2}$	3	10 $\frac{1}{2}$	4 $\frac{1}{2}$	18	3 $\frac{1}{2}$	1 $\frac{1}{4}$	260
4-BV-12	8 $\frac{1}{2}$	2 $\frac{1}{2}$	14 $\frac{1}{2}$	11 $\frac{1}{4}$	12 $\frac{1}{2}$	3 $\frac{1}{2}$	3	11 $\frac{1}{2}$	8 $\frac{1}{2}$	23 $\frac{1}{2}$	3 $\frac{1}{2}$	1 $\frac{1}{4}$	300
5-BV-16	10 $\frac{1}{2}$	2 $\frac{1}{2}$	17 $\frac{1}{2}$	12 $\frac{1}{4}$	14 $\frac{1}{2}$	4 $\frac{1}{2}$	4	14 $\frac{1}{2}$	6 $\frac{1}{2}$	23 $\frac{1}{2}$	3 $\frac{1}{2}$	1 $\frac{1}{4}$	420
6-BV-20	11 $\frac{1}{2}$	2 $\frac{1}{2}$	19 $\frac{1}{2}$	15 $\frac{1}{4}$	11 $\frac{1}{2}$	6 $\frac{1}{2}$	6	17 $\frac{1}{2}$	10 $\frac{1}{4}$	30 $\frac{1}{4}$	1	2	600
7-BV-20	14	2 $\frac{1}{2}$	22 $\frac{1}{2}$	18 $\frac{1}{4}$	19 $\frac{1}{2}$	6 $\frac{1}{2}$	6	19 $\frac{1}{4}$	10 $\frac{3}{4}$	33 $\frac{1}{4}$	1	2	900

AIR PRESSURE CAPACITIES, SPEEDS AND HORSEPOWERS OF CARLING VOLUME BLOWERS

Size	$\frac{1}{2}$ oz.=.87 in. water			1 oz.=1.73 in. water			2 oz.=3.47 in. water		
	R.p.m.	C.f.m.	H. P.	R.p.m.	C.f.m.	H. P.	R.p.m.	C.f.m.	H. P.
3-BV-12	980	438	.098	1387	621	.310	1965	888	.987
4-BV-12	859	585	.130	1216	828	.414	1724	1174	1.300
5-BV-16	776	837	.186	1098	1185	.593	1556	1688	1.870
6-BV-20	635	1185	.263	898	1677	.839	1274	2382	2.650
7-BV-20	582	1372	.305	823	1941	.971	1168	2752	3.060
8-BV-20	499	1986	.440	706	2810	1.405	1001	3983	4.430
9-BV-24	411	3299	.783	581	4668	2.334	824	6641	7.300
10-BV-24	309	4488	.997	494	6350	3.175	702	9003	9.900

Size	3 oz.=5.20 in. water			4 oz.=7 in. water			6 oz.=10.40 in. water		
	R.p.m.	C.f.m.	H. P.	R.p.m.	C.f.m.	H. P.	R.p.m.	C.f.m.	H. P.
3-BV-12	2414	1090	1.615	2794	1261	2.29	3436	1551	3.86
4-BV-12	2119	1447	2.135	2452	1667	3.03	3015	2051	5.13
5-BV-16	1912	2071	3.08	2212	2397	4.36	2721	2948	7.37
6-BV-20	1563	2923	4.33	1809	3382	6.15	2225	4160	10.40
7-BV-20	1434	3377	5.00	1660	3208	7.10	2041	4806	12.00
8-BV-20	1229	4888	7.25	1422	5656	10.20	1748	6957	17.40
9-BV-24	1012	8150	12.10	1171	9431	17.10	1440	11598	28.90
10-BV-24	861	11050	15.00	966	12786	27.90	1225	15726	27.00

Carling Pressure Blower.

Of the same general construction as the volume fan.

It does not deliver as much air, but has a pressure range up to 1 lb. and is used mostly on oil burning systems, forge fires and other requirements for high pressures.

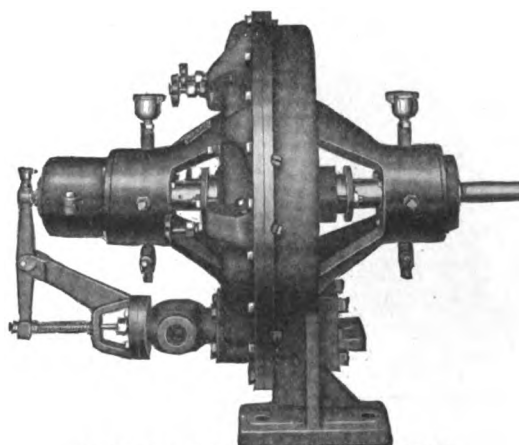
Carling Steam Power Turbine.

Especially designed to meet the demand for small steam turbines. Built in sizes from 1 to 50 h. p.; speed ranges from 1200 to 5000 r. p. m., with 12-, 16-, 20-, and 24-in. single or double stage rotors, with or without constant speed governor. For ordinary conditions, two 12A turbines will develop up to 8 h. p.; 16A up to 15 h. p.; 20A up to 30 h. p. and 24B up to 50 h. p. Carling reduction gears supplied for various speed ratios. All parts interchangeable.

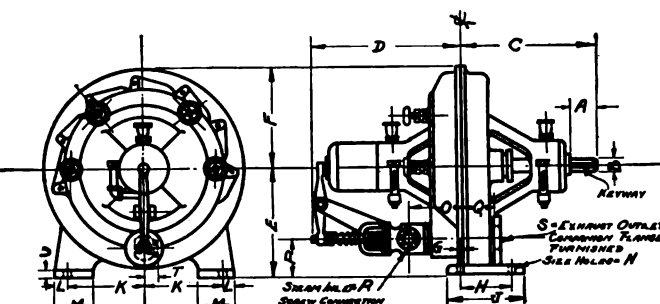
Rotors are of bronze and buckets of cupro nickel, designed for highest steam economy. Shaft is of heavy section, mounted on 2 ball bearings, the latter held in place by the Carling patent method, so that they may be replaced quickly at little expense.

Carling turbines can be supplied with coupling for direct connection to pumps, generators, blower fans and similar drives; supplied with a pulley for belt connection or made to operate in a vertical position. Special designs built for particular requirements.

Briefly the advantages of the Carling turbine are: high efficiency for power developed; great economy in the use of oil; only 2 bearings to lubricate; freedom from repairs; no reciprocating parts; even drive rotation; exhaust steam contains no oil; can be placed in any position; no special foundations required; perfect balance; requires little space and practically no attention.



CARLING STEAM POWER TURBINE

DIMENSION DIAGRAM, CARLING STEAM POWER TURBINE
All dimensions are in inches

Size	A	B	C	D	E	F	G	H	J	K	L	M
12-A	2 $\frac{1}{2}$	1 $\frac{1}{4}$	11 $\frac{1}{4}$	12 $\frac{3}{4}$	8	7 $\frac{1}{2}$	1 $\frac{1}{4}$	4 $\frac{1}{4}$	6 $\frac{1}{4}$	5 $\frac{1}{4}$	1 $\frac{1}{4}$	3
16-A	4	1 $\frac{1}{4}$	16 $\frac{1}{4}$	16 $\frac{3}{4}$	10	9 $\frac{1}{4}$	1 $\frac{1}{4}$	5	7 $\frac{1}{2}$	7 $\frac{1}{4}$	1 $\frac{1}{4}$	4
20-A	4 $\frac{1}{4}$	1 $\frac{1}{4}$	16 $\frac{1}{4}$	16 $\frac{3}{4}$	12	11 $\frac{1}{4}$	1 $\frac{1}{4}$	6	8 $\frac{1}{2}$	9	1 $\frac{1}{4}$	4 $\frac{1}{4}$

Size	N	O	P	Q	R	S	T	U	Key-way	Net weight, lbs.	Shipping weight, lbs.
12-A	3 $\frac{1}{4}$	4 $\frac{1}{4}$	2 $\frac{3}{4}$	3 $\frac{3}{4}$	1 $\frac{3}{4}$	2	2	1 $\frac{1}{4}$	1 $\frac{1}{4}$	160	220
16-A	7 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{1}{4}$	1 $\frac{1}{4}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	1	1 $\frac{1}{4}$	330	400
20-A	3 $\frac{1}{4}$	5 $\frac{1}{4}$	3 $\frac{3}{4}$	3 $\frac{3}{4}$	1 $\frac{1}{4}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	1	1 $\frac{1}{4}$	410	480

CENTRIFUGAL FAN COMPANY

9-15 Seventeenth Avenue
NEWARK, N. J.

Products.

EXHAUST FANS and BLOWERS.

WIND PROPELLED ROOF VENTILATORS.

"Four Leaf Clover" Exhaust Fans.

These fans have a distinct construction of their own embracing high efficiency, rigidity and perfect balance. They are especially adapted for use in removing foul air, smoke, gases, acid fumes, etc., are especially useful in connection with duct work and have proven very efficient in all cases where installations have been made.

Their high efficiency is due to the arrangement of the double blades, which set up a powerful centrifugal force, pulling the air toward the center of the blade units and discharging it in a circle through the planes of the blades. The inner blade splits the air, reducing compression against the outer blade.

The motor is kept out of the line of the exhaust in both vertical and horizontal types, making these fans especially adapted for exhausting acid and combustible fumes, smoke, etc. In the vertical type, the motor is

protected by the fan disk, also by an extra disk which is placed between the fan disk and the motor, providing a complete and separate housing for the motor. In the horizontal type, the motor is kept outside of the building and housed entirely separate.

Owing to the use of the circular disk in the construction of "Four Leaf Clover" fans, especially in the horizontal type, the wind resistance is reduced and power consumption lowered.

"Four Leaf Clover" Window Exhauster—Furnished for A. C. and D. C. and can be installed in the center or either corner of a window pane or can be made a part of the frame or sash.

Made of aluminum with a standard motor attached.

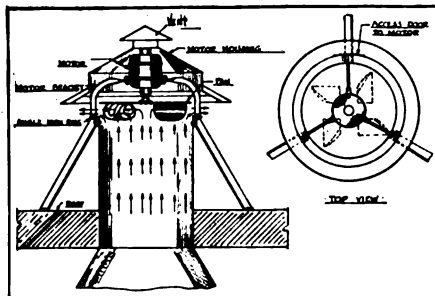
Weights 5 lbs. complete. Fan is 6 in. in diameter; frame, complete, 8 in.

Will handle 5000 cu. ft. of air per hour, consuming about 10 watts or 1/80 h.p.

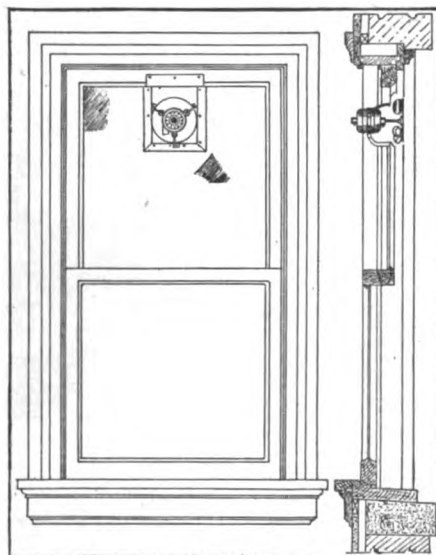
Automatically the fan disk is opened and closed and can be applied on all sizes.



"FOUR LEAF CLOVER" VERTICAL EXHAUST FAN



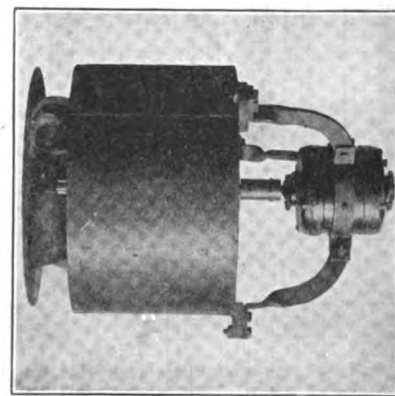
DETAIL OF "FOUR LEAF CLOVER" VERTICAL EXHAUST FAN



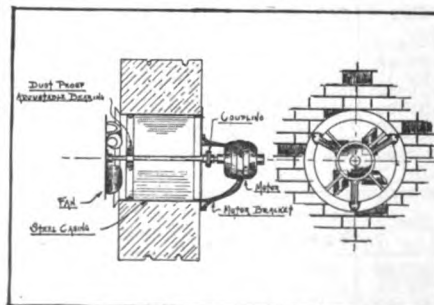
APPLICATION OF "FOUR LEAF CLOVER" WINDOW EXHAUSTER

APPROXIMATE OVER ALL DIMENSIONS OF
"FOUR LEAF CLOVER" EXHAUST FANS
(From top of angle iron ring to top of motor housing)

Size fan, in.	12	18	24	30	36	42	48
Width, in.	19 1/2	32	43 1/2	49 1/2	59	67 1/2	76
Height, in.	12 1/2	22 1/4	29 1/4	31	37	41	45



"FOUR LEAF CLOVER" HORIZONTAL EXHAUST FAN



DETAIL OF "FOUR LEAF CLOVER" HORIZONTAL EXHAUST FAN

TEST OF "FOUR LEAF CLOVER" VERTICAL AND HORIZONTAL EXHAUST FANS SHOWING AIR REDUCTION AND POWER REQUIRED

Diam., in.	R. p. m.	400	450	500	550	600	650	700	800	900	1000	1100	1200	Diam., in.	200	250	300	350	400	450	500
12	Cu. ft. per min.					466	493	538	582	654	725	807	897	42		8198	9980	10931	12361	14312	15487
	H.p.					.03	.035	.04	.05	.06	.08	.10	.12			.50	.75	1.00	1.40	1.80	2.25
18	Cu. ft. per min.			1327	1417	1650	1890	2140	2396	2710	3024	3338	3652	48	9181	14301	16303	17661	19307	21841	25606
	H.p.			.03	.05	.06	.075	.10	.15	.20	.25	.30	.35		.30	.50	.90	1.40	2.00	2.75	3.50
24	Cu. ft. per min.		2392	2582	2870	3153	3425	3876	4332	4838	5481			60	17341	21177	25609	30210	34245		
	H.p.		.04	.06	.08	.13	.25	.38	.53	.75	1.10				1.00	1.75	3.00	4.20	5.75		
30	Cu. ft. per min.	4392	4934	5616	6275	7021	7628	8180	8834	9876				72	29570	37733	48059	57105			
	H.p.	.15	.20	.30	.56	.78	1.00	1.35	1.85	2.25					2.25	3.75	5.25	6.75			
36	Cu. ft. per min.	9145	10115	11358	12608	13889	15169	16370													
	H.p.	.45	.65	.90	1.20	1.75	2.50	3.25													

"Four Leaf Clover" Incased Blowers and Exhausters.

"Four Leaf Clover" blowers and exhausters represent a new departure in blower construction, having been placed upon the market after extended and thorough investigations and tests.

They have a wide range of application for all blower and exhaust work, and, due to the scientific construction of the blast wheel and housing, are unsurpassed for efficiency, large capacity, rigidity, durability and positive action.

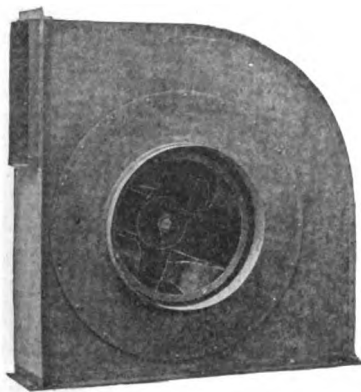
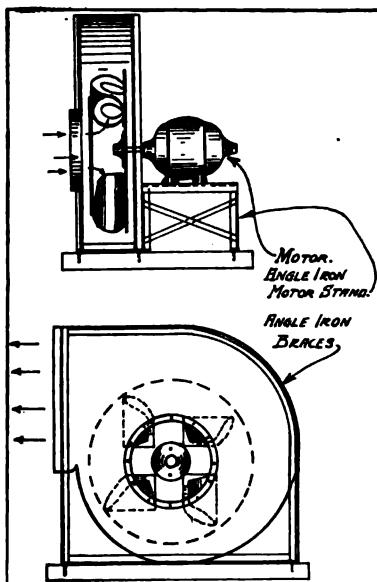
Greater efficiency with reduction of power consumption for a given amount of air handled is one of their salient features.

Blast wheel is accurately balanced to prevent vibration, resulting in a true, smooth running machine.

Casing is of steel plate, securely riveted and of such thickness as to withstand pressures for which these blowers are designed.

Built for volume or pressure, with bottom horizontal, top horizontal, up-blast and down-blast discharge, for belt drive or direct connection to motors, steam turbines or high speed engines.

There is a size for every requirement. Capacity tables and complete data sent on request.

**"FOUR LEAF CLOVER" BLOWER****DETAIL OF "FOUR LEAF CLOVER" BLOWER****APPROXIMATE OVER ALL DIMENSIONS OF "FOUR LEAF CLOVER" BLOWERS**

Size fan, in.	12	18	24	30	36	42	48	60	72
Height, in.	19	28 1/4	35	43 1/2	52 1/2	60	69 1/4	86 1/2	104
Length, in.	19 1/4	27	36	45	54	63	72	90	108
Width, in.	48	60 1/2	72 1/4	96 1/2	108 1/2	132 1/2	156	192	228

"Four Leaf Clover" Wind Propelled Roof Ventilators.

"Four Leaf Clover" wind propelled roof ventilators furnish a positive ventilating medium for removing hot air, steam, gases, fumes, smoke, etc., from any structure.

They are remarkably simple and durable in construction, and absolutely noiseless and positive in action regardless of weather conditions.

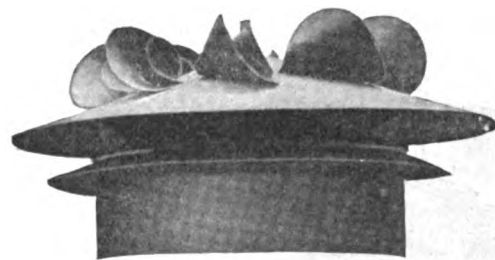
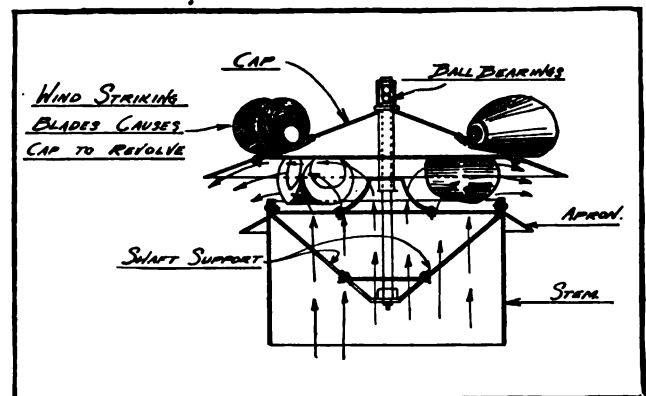
Their great efficiency lies in the fact that they discharge under all reasonable conditions. They have a free area when there is no wind, there being no storm bands or cones to retard the air.

There is no mechanism to get out of order; no loose parts; no maintenance cost.

The cap is propelled by the vanes on top of it, causing a centrifugal action of the blades beneath the cap, which creates a partial vacuum in the stem at all times regardless of temperature conditions, thus eliminating reverse action or back draughts, so common in many other types of ventilators.

The cap revolves upon two balls enclosed in a race on top of the stationary shaft. These bearings require no lubricants or attention whatever, and there is no danger of the balls becoming flat at any point due to 3-point contact.

Ventilator bases can be furnished when desired with an additional charge.

**"FOUR LEAF CLOVER" WIND PROPELLED ROOF VENTILATOR****DETAIL OF "FOUR LEAF CLOVER" WIND PROPELLED ROOF VENTILATOR****OVER ALL DIMENSIONS OF "FOUR LEAF CLOVER" WIND PROPELLED VENTILATORS**

Size, in.	12	18	24	30	36	42	48	60	72
Height, in.	19	23	27	32	40	47	54	66 1/2	81
Width, in.	19 1/4	28 3/4	38 1/4	47 3/4	57 1/4	66 3/4	76 1/4	95 1/4	115 1/4

*** CAPACITY OF "FOUR LEAF CLOVER" WIND PROPELLED ROOF VENTILATORS IN CUBIC FEET OF AIR PER MINUTE**

Wind velocity, miles per hour	Size of ventilator, in.									
	12	14	16	18	20	24	30	36	40	48
5	340	525	600	765	942	1360	2120	3050	4085	5880
10	480	740	855	1085	1335	1925	3000	4325	5335	7680
15	790	1210	1400	1785	2195	3170	4949	7120	7536	10854
20	1017	1565	1810	2295	2826	4075	6360	9150	11304	16280
25	1243	1914	2210	2800	3450	4980	7770	11187	13816	19890

* Test made by Mechanical Laboratory, Pratt Institute.
Test on larger sizes sent on request.

CLARAGE FAN COMPANY

Porter and North Streets
KALAMAZOO, MICH.

BRANCH OFFICES AND AGENCIES

NEW YORK, N. Y., 149 Broadway
BALTIMORE, MD., Light Street and Key Highway
CLEVELAND, OHIO, 511 Meriam Building
DETROIT, MICH., 315 Murphy Building
BOSTON, MASS., 120 Milk Street

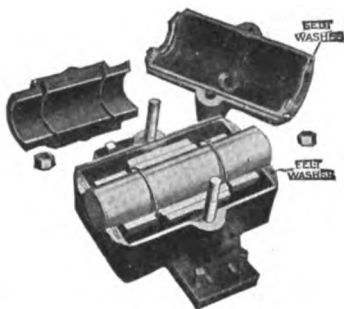
ST. LOUIS, MO., 2211 Olive Street
CHICAGO, ILL., 111 West Washington Street
ROCHESTER, N. Y., 437 Mercantile Building
MINNEAPOLIS, MINN., 305 Metropolitan Bank Building
PITTSBURGH, PA., Park Building

Products.

Manufacturers of HEATING and VENTILATING APPARATUS, FANS, BLOWERS, EXHAUSTERS, AIR WASHERS, PIPE COIL HEATERS and STEAM ENGINES.

Clarage Standard Fan and Blower Bearings.

In any centrifugal machine the bearings receive, by far, the greatest amount of wear. Much unnecessary wear is caused by dust and dirt entering the bearing case and destroying the inner sleeves. Aside from the fact that Clarage standard bearings are self-oiling, and self-aligning in every plane, they have felt washers at each end of the bearing case which keep the dirt and dust out and the oil in. (See illustration.) These felt washers are an exclusive Clarage feature, found on no other fan bearing. SKF ball bearing can be furnished if desired. They have Clarage bearing cases with felt washers.



CLARAGE FAN BEARING
OPEN FOR INSPECTION

Clarage Multiblade Fans.

The Clarage multiblade fans are guaranteed to be equal, if not superior, to any fans built for handling large volumes of air against comparatively low pressures.

For heating or ventilating installations in public building, factory, mine or tunnel, these fans are especially suitable. The unusually high efficiency obtained, quietness of operation, small space required and adjustable features of the design, are all points in which they have been found superior to other types. Every wheel is guaranteed to be amply strong for working against static pressures even as high as 5-in. water gage.



CLARAGE MULTIBLADE
FAN WITH OVERHUNG
WHEEL

This arrangement leaves inlet unobstructed

For convenience in specifying, these fans are numbered according to the approximate diameter of the wheel in feet: No. 1, 1-ft. wheel; No. 2½, 2½-ft. wheel, etc. Sizes up to and including the No. 10.

Full-housed fans, up to and including the No. 3 size, are built with cast iron side plates, and therefore, adjustable and reversible for hand and discharge; 16 different di-



rections of discharge can be obtained with one fan.

Multiblade fans are built in full-housed and ¾-housed arrangements.

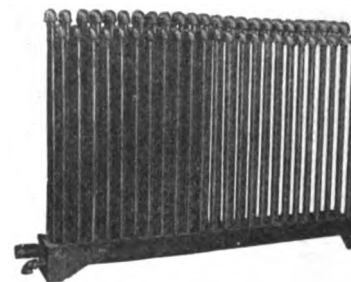
Single width fans are furnished with either overhung wheel or with overhung pulley. Double width fans can not be built with wheel overhung.

Clarage multiblade fans can be motor, engine or turbine driven, either by belt or direct connected.

Pipe Coil Heaters.

Clarage pipe coil heaters consist of a cast iron base, which forms a steam reservoir on one side of the partition wall and condensation reservoir on the other, and 1-in. pipes rising in pairs connected at the top with elbows and a short nipple.

These heaters are well adapted for heating all types of buildings requiring large volumes of warm air. They can be used with success in drying and evaporating installations.



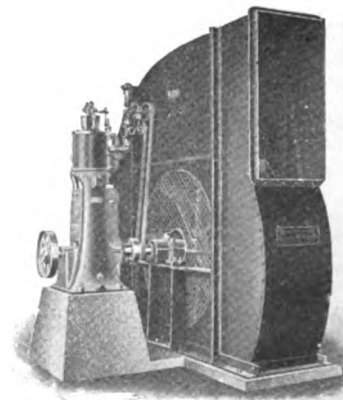
CLARAGE PIPE COIL HEATER

Steel Plate Fans and Blowers.

Especially designed and constructed for furnishing mechanical draft, either as forced or induced draft fans; built unusually heavy to stand the strain of continuous operation. They are also adaptable for heating and ventilating, exhausting fumes and gases or in any installation, where large volumes of air are handled at low pressures or at pressures 3- to 6-in. water gage.

Built in either full-housed or ¾-housed arrangements and with any angle of discharge. Fans are regularly constructed either single or double inlet. The single inlet fans are required where it is not desirable to draw the air or gases over the pulley, motor or engine. Sizes Nos. 25 to 300. The sizes No. 80 and smaller are reversible and adjustable for 16 different directions of discharge.

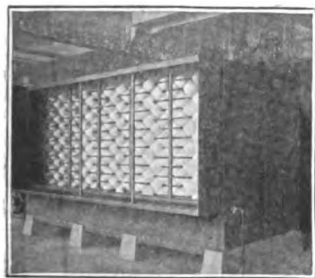
Steel plate fans can be motor, engine or turbine driven, by belt or direct connected.



CLARAGE STEEL PLATE FAN FOR
FORCED DRAFT

Driven by Clarage steam engine

Air Washers.



CLARAGE-SPRACO AIR WASHER

The efficiency of any air washer depends mainly on the quality of the spray. The bronze, center jet nozzle, used in Clarage-Spraco air washers, is simple in design yet produces a spray entirely different from and very superior to that of any other type of nozzle. On account of the special nozzles, the air is handled at a maximum velocity of 720 ft. per minute. This velocity is higher, than usual practice, and results in a more compact apparatus than could otherwise be possible. Clarage-Spraco air washers are built of good, heavy materials, need very little attention, and owing to simplicity of design are practically foolproof. Capacities 2,800 to 10,300 cu. ft. of air per minute.

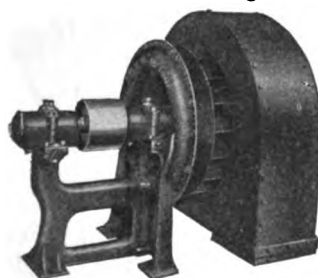
Standard Exhaust Fans.



CLARAGE STANDARD "SP" EXHAUST FAN

Clarage standard "SP" exhaust fans are built heavier and more rugged than most exhaust fans. These fans are used for elevating and conveying sawdust, shavings and blocks as encountered in the lumber mills; dust and lint from polishing and emery wheels; cotton, wool or grain; smoke vapors or air alone. They are particularly suitable, however, where the heavy materials pass directly through the fan and where strength and rigidity of construction are necessary to withstand the wear and tear of such service.

Sizes Nos. 25 to 160. Fans in sizes No. 80 and smaller are reversible and adjustable for 16 different directions of discharge. Belt or direct motor driven.



CLARAGE STYLE "C" EXHAUST FAN

Multiblade wheel partly removed from housing

Style "C" exhausters are furnished with high efficiency, multiblade wheels which run at lower speeds and save power. Used for exhausting and conveying, in installations where the materials *do not pass directly* through the fan. Built in sizes Nos. 30 to 60, reversible and adjustable for 16 different directions of discharge. Belt or direct motor driven.

Cast Iron Fans.



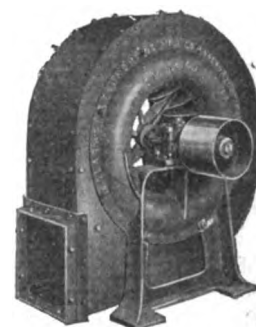
CLARAGE CAST IRON FAN, INLET SIDE

In almost every manufacturing plant Clarage Type C.I. fans can be used to advantage; either as single inlet exhaust fans or as double inlet blowers. Four sizes, Nos. 5, 6, 7, and 9, the number indicating the diameter in inches of the inlet or outlet. Built reversible and adjustable in every way.

For handling explosive or poisonous gases cast iron fans are built airtight; furnished with flanged connections for inlet and outlet.

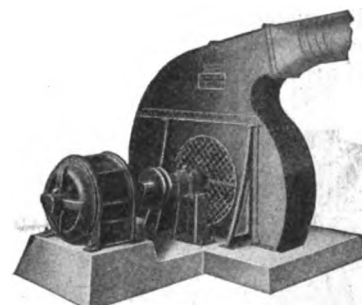
Pressure Blowers.

Clarage style "C" pressure blowers are suited for operation at comparatively high speeds and against pressures up to 12-oz. water gage. Furnished with multiblade wheels, with peculiarly shaped blades, these fans are exceedingly efficient. Adaptable for furnishing air under pressure to oil burning furnaces, foundry cupolas and forges. Built in sizes No. 30 to 60. Reversible and adjustable for 16 different directions of discharge. Belt or direct motor driven.



CLARAGE STYLE "C" BLOWER ARRANGED FOR BELT DRIVE

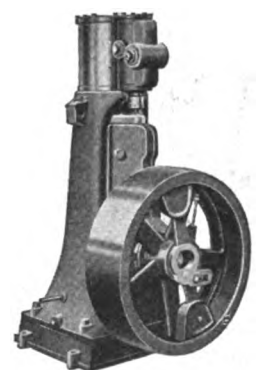
Special pressure blowers are designed for operation against high pressures (8 to 30 oz.) and for direct connection to standard speed electric motors. Bearings are supported independently of housing, thus eliminating vibration. Each fan is built for the duty specified, with any angle of discharge. First cost is about one-third cost of rotary blower for the same duty; the maintenance cost is negligible, and satisfactory performance is guaranteed.



CLARAGE SPECIAL PRESSURE BLOWER

Vertical Self-oiling Steam Engines.

Clarage steam engines are entirely enclosed. Built for continual operation at high speeds. Adaptable for belt drive or direct connection to fans, blowers, stokers, air compressors, pumps, motor generators, etc. Furnished in two types—throttling and automatic. Gravity feed lubrication or automatic forced feed lubrication as conditions require. Engines are built in four classes to operate on different steam pressures from 10 to 250 lbs., capable of developing up to 80 h.p.



AUTOMATIC HIGH PRESSURE ENGINE

Vento Heaters and Accessories.

In connection with the Clarage fans this company is prepared to furnish cast iron vento heaters and in fact any accessories necessary or desirable for a complete fan or blower system.

Clarage Service.

The Engineering Department of the CLARAGE FAN COMPANY has compiled elaborate data covering capacities, etc., for each Clarage product.

The department will gladly co-operate with engineers in supplying this information, and by recommending, without obligation, the proper Clarage Equipment to use.

Catalogues are available on every type of equipment. Write the nearest branch office.

ESTABLISHED 1879

GARDEN CITY FAN COMPANYTELEPHONE:
HARRISON 5296332 South Michigan Avenue
CHICAGO, ILL.
WORKS AND FOUNDRY: NILES, MICH.**Products.**

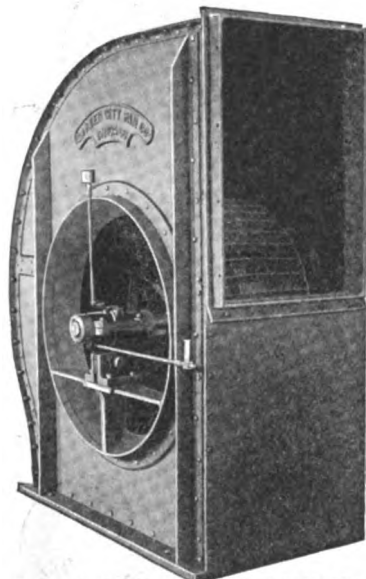
Patentees and sole manufacturers of CYCLOIDAL MULTIVANE FANS; STANDARD STEEL PLATE FANS; SLOW SPEED CYCLOIDAL SHAVINGS EXHAUSTERS; POSITIVE BLOWERS; CENTRIFUGAL PRESSURE BLOWERS; DISC VENTILATING FANS, and FORGE BLOWERS.

Also manufacturers of Pipe Coil Heaters, Air Washers, Induced and Forced Draft Fans, and Special Fan Apparatus for all purposes.

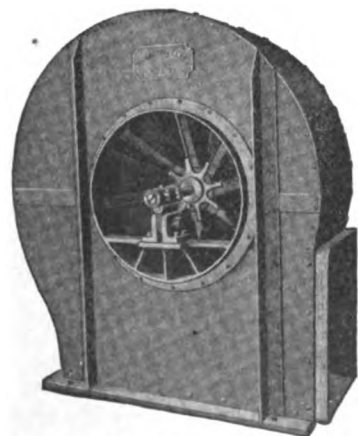
Cycloidal Multivane Fans.

The Cycloidal multivane fan was developed after many years' experience in the manufacture of fans. The vanes, which are curved forward, are also set at an angle to the shaft, which permits an unrestricted flow of air from the inlet across the entire width of the wheel.

The steel spider carrying the vanes is cast integral with heavy gray iron hub. Each outer disc of the wheel is substantially reinforced by angles, and the entire wheel is rigid, strong and durable. Total weight of wheel is less than other wheels, thus reducing dead weight and friction load on bearings. The Cycloidal multivane is designed for heating, ventilating, drying and many other purposes, and is positively the best the market affords.



R. H. T. CYCLOIDAL MULTIVANE
FAN
(Patented May 26, 1908)



STANDARD STEEL PLATE FAN

Slow Speed Cycloidal Exhausters.

For conveying materials of all kinds. Designed for use in connection with exhaust systems for sawdust,

shavings, grinding and buffing dust, sandblast exhaust, and collecting or conveying materials of every description, including cotton, hair, wool, feathers rags, paper, cereals, powdered fuel, etc.

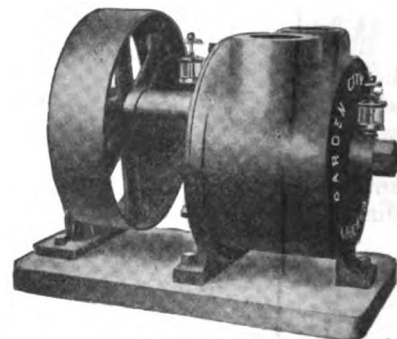
The scientific construction of the Cycloidal wheel permits the air and materials to pass through the fan without coming into direct impact with the entire surface of the blades, thus reducing friction to a minimum.

A saving of 15% to 20% in power is guaranteed over the ordinary fans on the market.

The power saving feature, and increased durability due to slower speed and superior mechanical construction, assures a combination of efficiency and reliability that no one can afford to overlook. (Write for Catalogue No. 400.)

Positive Blowers.

Suitable for agitating liquids, oil and gas burning, cupolas, and where pressures from 1 to 5 lbs. are required. Have no gears or intermeshing parts—less power, less wear. Used for pressure or vacuum and built in various sizes. (Write for Bulletin No. 29.)



POSITIVE BLOWER
(Patented March 12, 1907)

Centrifugal Pressure Blowers.

Superior to all in design and construction. For forges, and pressures up to 16 oz. Built single and double, belt drive, and with direct connected motors. (Write for Bulletin No. 32.)

Disc Ventilating Fans.

The line of disc fans consists of the propeller type, for ventilation of theaters, offices, stores, kitchens, etc., and the single and double disc type for severe factory duty.

All types can be furnished with pulleys for belt drive, or with direct connected motors. The heavy duty type disc fans are particularly suitable for use in foundries, chemical plants, laundries, etc. Standard make motors of ample size used on all direct connected units. (Write for Bulletin No. 31.)



DOUBLE DISC
VENTILATING FAN

ROBERT GORDON, INC.

Heating and Ventilating Equipment

TELEPHONE:
HAYMARKET 3740

630 West Monroe Street
CHICAGO, ILL.

BRANCH OFFICES

NEW YORK, N. Y., Grand Central Palace

DETROIT, MICH., Sun Building

PITTSBURGH, PA., Bessemer Building

AGENCIES

TORONTO and MONTREAL, CAN., E. J. WOODISON Co., LTD.

Products.

Manufacturers of MECHANICAL HOT BLAST HEATERS (patented).

Also manufacturers of M. & L. Unit Heaters for Steam; Air Dryers, Air Conditioning Systems.

Co-designers and constructors of Power Plants complete, Heating and Ventilating Systems, Air Conditioning Systems, Dryers, Sheet Metal Work and Light Structural Work of all descriptions.

Engineering Services.

The Engineering Department is composed of men familiar with every phase of industrial heating and ventilating, and the Contracting Department is well equipped to handle power and piping jobs anywhere.

The Engineering Department will make a comprehensive survey of conditions prevailing in any plant, and submit recommendations for equipment, based on the results of their survey. A particular unit will be recommended only when it will give maximum service at minimum first cost and lowest operating cost. Information relating to installations now in service furnished on request to interested engineers and owners.

Of the hundreds of ROBERT GORDON, INC., installations in use, not one has been a failure. Two examples are the combination power plant and heating system of Saginaw Products Division of the General Motors Co., Saginaw, Mich., and the mechanical hot blast heaters of Peerless Foundry Co., Cincinnati, Ohio. Both of these plants were specified by Frank D. Chase, Inc.

Adaptability of Mechanical Hot Blast Heater.

Designed for heating, ventilating and air conditioning of foundries, machineries, warehouses, mills, factories, manufacturing plants, industrial buildings, sheet metal plants, pattern shops, garages, etc.

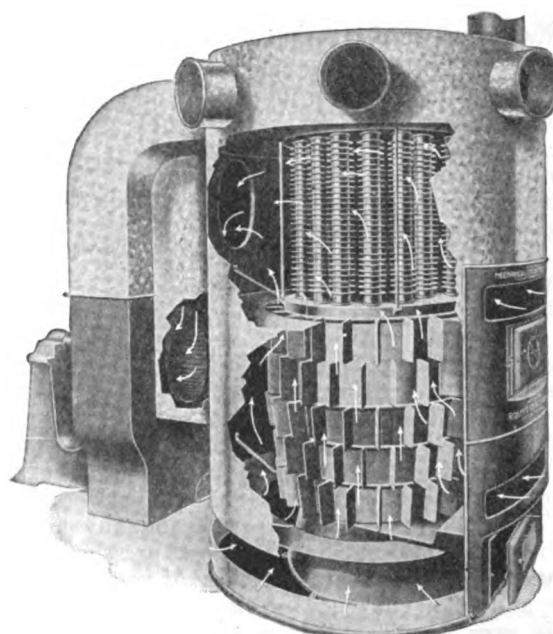
This company will co-operate with engineers in specifying these heaters properly.

Description and Advantages.

The heater consists essentially of a large cast iron stove with a series of heat chambers enclosed in sheet metal casing. The castings are of high grade gray iron and the casings of best grade galvanized iron.

The efficiency of these furnaces is at least twice as great as any form of steam or hot water heating. This is obtained by the direct application of the air to the heated surfaces, whereby losses incident to conversion and transmission through pipes or ducts are eliminated.

The circulation is indicated by the arrows in the illustration. By this system of heating the natural circulation of air is given impetus through the use of a multivane fan. Thus by forced circulation a large volume of warm air is obtained, instead of a small volume of hot, burnt air as where natural circulation exclusively is depended upon.



MECHANICAL HOT BLAST HEATER
(Patented)

The heating or radiating surface is greatly increased by means of radiating fins on the fire pot, combustion chamber and radiator tubes. These fins being staggered, the air is frequently broken up during its passage through the various heating chambers.

The warm air produced by heater absorbs and condenses steam and gas arising from foundry moulds, thus leaving the building clear of these objectionable elements.

Heat capacities range from 100,000 cu. ft. to 500,000 cu. ft. with one unit.

Fuels.

The fuels used are domestic coke, foundry coke, bituminous and anthracite coal, lignite, fuel oil, natural and artificial gas.

Cost.

The initial cost will not exceed one-third that of any other form of heating, and in many cases has run as low as one-eighth the cost of high grade steam or hot water plants.

Operating Cost.

Fuel Expense—The fuel consumption is from one-half to one-fourth that of any other form of heating, due to the scientific construction of the radiating surfaces.

Labor Expense—A licensed engineer or fireman is not needed to operate the heater, nor any skilled help. It can be operated with common labor.

GILLESPIE-DWYER COMPANY

Industrial Heating and Ventilating Equipment

9-11 West Kinzie Street
CHICAGO, ILL.

Products.

Manufacturers of TWINFAN UNIT HEATERS, TWINFAN VENTILATING UNITS.

Also Special Drying and Air Conditioning Equipment.

Twinfan System of Heating.

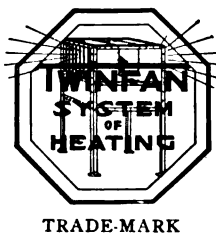
The Twinfan system consists of a number of Twinfan units of varying size and number to meet individual requirement. The units are usually set so that the heated air is discharged towards the exposed walls of the building.

Each unit is a complete heating machine, independent of other units in the building. The unit is built of structural steel with heavy steel casing, and contains steam coils for warming the air and electrically driven fans for distributing the heated air and returning cold air to the unit. Cold air is drawn into base of unit from a point near the floor. It is heated by contact with steam coils and delivered on a horizontal plane from the outlets to the most remote corners of the building.

The Twinfan system operates on any system of steam circulation, medium or low pressure, gravity, vacuum or vapor system. Because of compact arrangement and high efficiency of heating surface, the piping is very simple. It is possible to operate one or any number of Twinfan units irrespective of other units in the building. As a result, any department or section of a building may be satisfactorily heated without heating the entire building.

Twinfan units mechanically distribute the heated air and keep it from rising to the roof level. In this way the heat losses are materially decreased. The heating coils in the Twinfan unit are fully incased. The unit itself is usually placed at some distance from the exposed building surfaces. It follows that the radiant heat from the unit to these surfaces is almost negligible.

Overheating is the common fault of most heating systems and the source of great waste. It is the result of improper or inadequate facilities for the control of



temperature. Valves on radiators and coils provided for this purpose are seldom used—the length of time required for heating surface to heat up and cool off is too great.

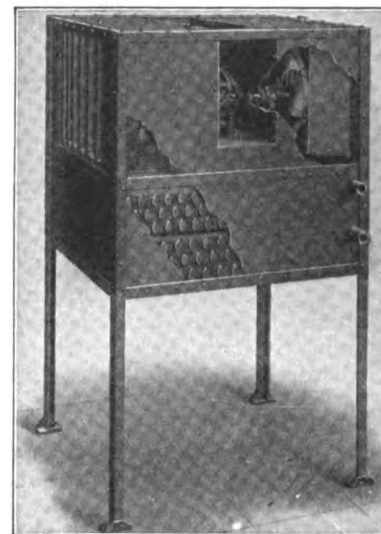
The supply of heat from a Twinfan unit may be stopped instantly by the simple operation of throwing the electric switch and stopping the fans. The coils remain heated so that heat is at all times available, and may be supplied instantly simply by starting the fans.

Modern industrial buildings are usually so constructed that it is possible to add sections when necessary, and the Twinfan system admirably meets this condition. An addition to the Twinfan system necessitates no change in the existing plant—it is accomplished by simply installing additional units to meet the increased demand. The usefulness of the Twinfan system does not stop with the heating season. The Twinfan units may be operated without steam in the coils during the summer months. They will create a good circulation of air which will add materially to the comfort of the occupants.

Twinfan Unit Heater.

A common objection to any system of heating based on the mechanical distribution of heated air, is that it is necessary to run the mechanical equipment all the time. The Twinfan unit is designed to eliminate the necessity of operating the fans when only a portion of the total capacity is required. The heating coils are laid flat, and the air travels vertically through the unit. Two large doors are located on top of the unit which may be opened when the fans are not running.

This provides a means of unrestricted circulation of air by gravity through the unit. Experience has shown that the supply of heat by gravity is more than sufficient to keep the building well above freezing. The value of this feature is



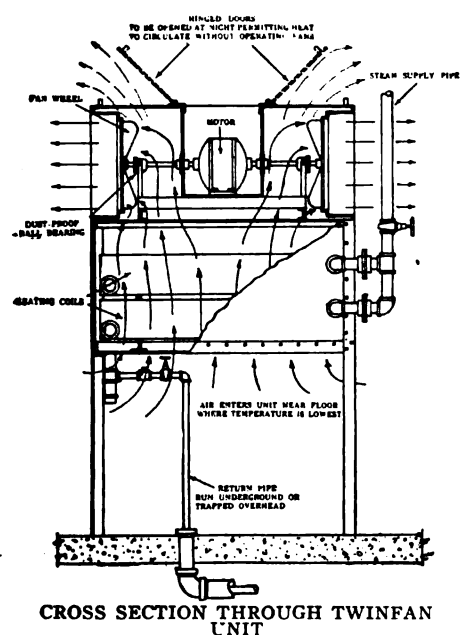
TWINFAN UNIT HEATER



TWINFAN SYSTEM IN CENTRAL MARKET HOUSE, ERIE, PA.
A good example of an installation in an old mill constructed building. Note method of supporting units to building columns



A NO. 42 TWINFAN IN CLOSE QUARTERS
Note accessibility of motor control and use of space under heater for waste storage



The thrust of the fan wheels is neutralized.

The air intake to the unit is near the floor where the air temperature is lowest. This insures a warm floor. The velocity of air entering unit is so low as to be hardly perceptible. This eliminates the possibility of picking up dust particles from floor.

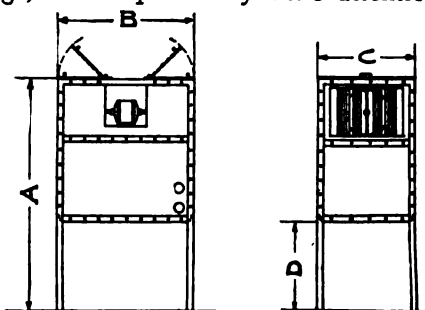
The electric motor in Twinfan unit is of standard, well-known manufacture. It is not located in the path of the heated air, and is always in view, readily accessible for oiling. The fan wheel bearings are dust-

apparent, as it provides a means of heating at night and on moderate days without running the fans.

The Twinfan unit is provided with two fan wheels and two outlets. Aside from the obvious advantage of better distribution without use of piping or elbows which increase friction, this construction makes a perfectly balanced mechanical unit.

proof ball bearings, and require very little attention. They are readily accessible from the doors on top of the unit.

Every Twinfan unit is perfectly proportioned as regards diameter, pitch and speed of the fan wheels, size of motor, quantity, arrangement and area through heating coils, etc. The capacity tables are fully guaranteed.



DIMENSION DIAGRAM TWINFAN UNIT

Unit No.	A	B	C	D	Approximate weight, lbs.
22	8' 2"	4' 8"	3' 0"	3' 6"	1800
42	8' 4"	4' 8"	3' 10"	3' 6"	2600
52	8' 6"	6' 0"	4' 7"	3' 6"	3400
62	9' 2"	6' 7"	5' 6"	3' 6"	5000

Twinfan Ventilating Units.

The Twinfan unit is built in a horizontal type for ventilating duty. A fresh air connection from a window or opening through a building wall to the unit is all that is necessary to complete the installation. Twinfan ventilating units are built in sizes with air capacities from 4,000 to 14,000 cu. ft. of air per minute.

Engineering Service.

Our engineering department will gladly co-operate on the design and application of the Twinfan system. We will design the system, showing the number and location of units necessary, and the piping connections.

CAPACITY TWINFAN UNITS

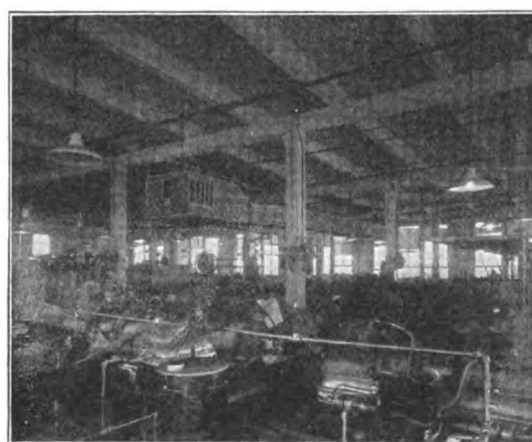
Unit No.	Air delivery, c. f. m.	Heating surface, sq. ft.	Motor horse-power	Steam at 5-lb. gage				Steam at 30-lb. gage			
				Room temperature, degrees Fahr.	Steam, lbs. per hour	B. t. u. delivered per hour	Equivalent* in direct radiation	Room temperature, degrees Fahr.	Steam, lbs. per hour	B. t. u. delivered per hour	Equivalent* in direct radiation
22	4,500	162	1/4	50	238	230,000	920	50	328	302,000	1208
				60	221	213,500	854	60	310	285,000	1140
				70	205	198,000	792	70	296	272,000	1088
42	6,000	216	1/2	50	320	309,000	1236	50	441	406,000	1624
				60	297	287,000	1148	60	417	384,000	1536
				70	275	266,000	1064	70	398	366,000	1464
52	10,000	351	3/4	50	523	505,000	2020	50	720	662,500	2650
				60	444	467,500	1870	60	681	627,000	2508
				70	449	434,000	1736	70	649	597,000	2388
62	14,000	430	1	50	715	691,000	2764	50	984	905,000	3620
				60	662	639,500	2558	60	931	857,000	3428
				70	614	593,000	2372	70	888	817,000	3268

*Emissivity of direct radiation assumed at 250 B. t. u. per sq. ft. per hour.



TWINFAN SYSTEM IN GILL MFG. CO.'S PLANT, CHICAGO, ILL.

A modern system in a modern, monitor type building. Heating surface in the monitor is unnecessary with the Twinfan system



TWINFAN VENTILATING UNIT

Twinfan unit with outdoor air connection in one of the many Twinfan equipped buildings of Hart, Schaffner & Marx, Chicago, Ill.

ILG ELECTRIC VENTILATING CO.

Fans, Blowers, Exhausters and Unit Heaters

TELEPHONE:
KILDARE 1520

2849 North Crawford Avenue
CHICAGO, ILL.

BRANCHES

NEW YORK, N. Y., 13 Park Row
Telephone, Barclay 8787

BOSTON, MASS., TOMPKINS-STODDARD CO., 136 Federal Street
Telephone, Fort Hill 6454

PITTSBURGH, PA., Bessemer Building
Telephone, Smithfield 1213

PHILADELPHIA, PA., 327 Commercial Trust Building
Telephone, Spruce 2099

CLEVELAND, OHIO, 1314 Schofield Building
Telephone, Main 776

DETROIT, MICH., 203 Owen Building
Telephone, Cherry 5231

Products.

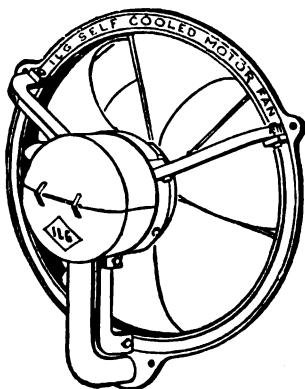
Manufacturers of a complete line of DIRECT CONNECTED ELECTRIC PROPELLER FANS; EXHAUST FANS; HEATING and VENTILATING FANS; AUTOMATIC LOUVERS and SHUTTERS; POWER ROOF VENTILATORS; UNIVERSAL MULTIBLADE BLOWERS and EXHAUSTERS, direct connected and belted; ILGAIR UNIT HEATERS.

Also manufacturers of Motors for driving fans and blowers; Steel Plate Fans; Ready-to-run Ventilating Sets; Mechanical Draft Apparatus; Fans and Blowers for drying; Humidifiers; Residence Kitchen Ventilators; Farm Barn Power Ventilators.

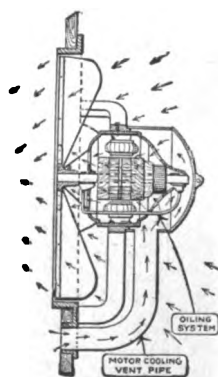
Ilg Self-cooled Propeller Fans.

Self-cooled Motor—The illustrations below show the Ilg patented self-cooled feature. Experience has proved that open motors can not be used on propeller fans, because dirt and grease are drawn into motor. If fully enclosed motor is used, the motor efficiency is decreased, due to overheating. If partially covered motor is used, the suction eventually draws dirt and grease through the enclosing covers.

Furnished with direct connected motor for any current or voltage. Sizes 12 to 72 in. Capacities 1,000 to 45,000 cu. ft. per min.



SELF-COOLED MOTOR
PROPELLER FAN

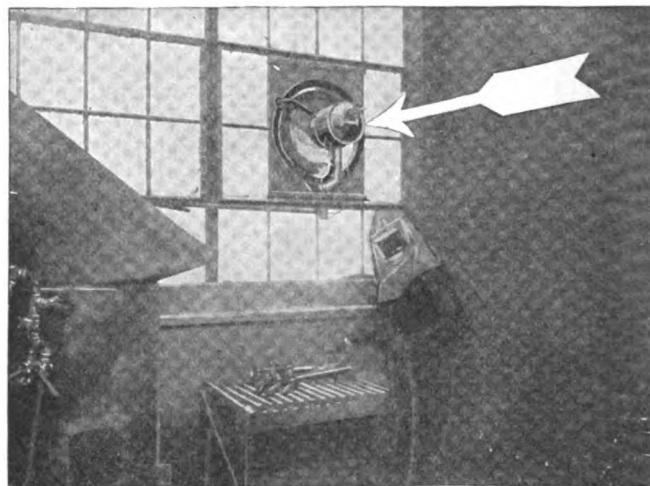


SECTIONAL VIEW

Uses—Used for general exhaust ventilating in industrial plants, restaurants, schools, halls, churches, residences, banks, theaters, stores, public buildings, etc. The self-cooled motor feature makes the fan especially effective in handling gases and extreme heat as high as 400° Fahr.

Catalogue—Write for condensed catalogue showing complete details on propeller fans.

SWEET'S CATALOGUE



ILG SELF-COOLED MOTOR FAN EXHAUSTING DUST FROM
SAND BLASTING OUTFIT

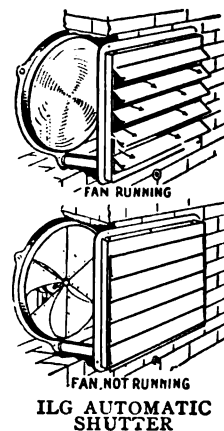
Ilg Automatic Shutters.

Shutters are moistureproof and need no attention after they are installed.

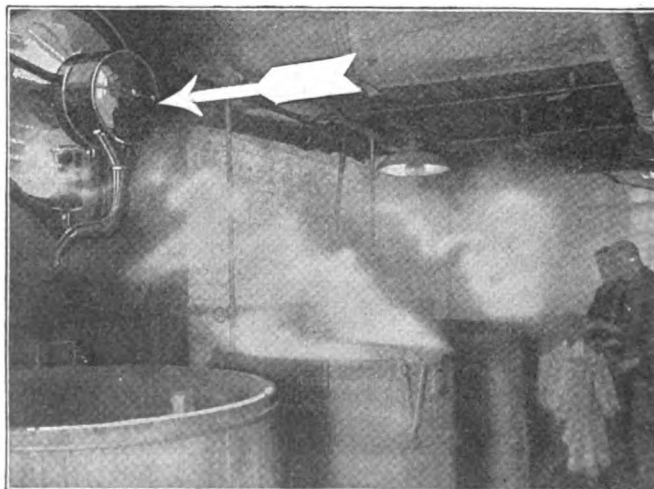
Built of special hard rolled aluminum leaves pressed on Whiting alloy copper coated rods supported in cast iron frame.

When the fan is running, shutter is held open by the force of the air current. When the fan is shut off, shutter closes automatically by gravity.

Made in sizes to correspond with fans.



ILG AUTOMATIC
SHUTTER



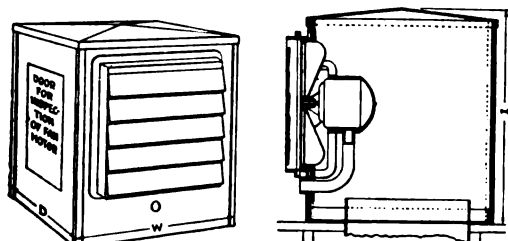
ILG FAN WITH AUTOMATIC SHUTTER EXHAUSTING STEAM
VAPORS FROM DYE VATS

Continued on next page

Ilg Power Roof Ventilators.

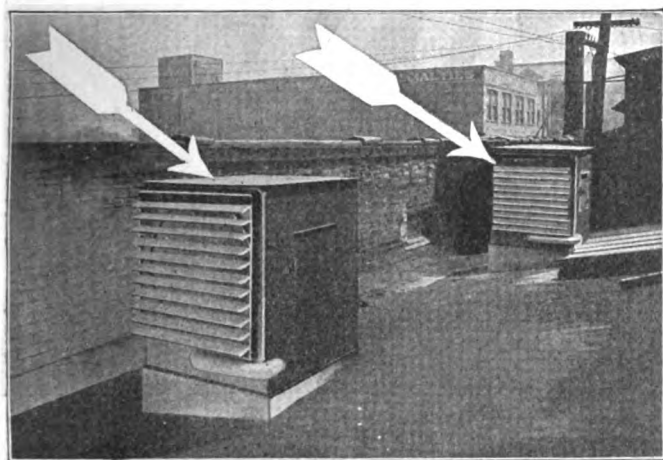
There are many types of buildings where roof ventilation provides the only practical means of exhausting foul air. Heretofore the custom has been to use natural gravity ventilators operated solely by the velocity and direction of the wind, therefore unreliable and spasmodic in effect.

With the Ilg power roof ventilator there is a constant suction, created by the Ilg self-cooled motor fan, which is enclosed in the penthouse. The action of the fan draws off the foul air, thereby making room for fresh air as provided by the natural laws of ventilation.



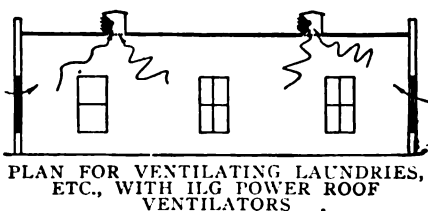
DETAILS ILG POWER ROOF VENTILATOR

Made in sizes of 18, 20, 24, 30, 36, 42 and 48 in. Circular with capacities on request.



TWO 36-INCH ILG POWER ROOF VENTILATORS INSTALLED ON ROOF AND DIRECTLY CONNECTED TO HOODS OVER FURNACES, IN PLANT OF AMALGAMATED METALS CO., CHICAGO, ILL.

One-story factories, laundries, foundries, etc., are economically ventilated by locating Ilg power roof ventilators directly over spots where ventilation is most needed. Fresh air through windows gives complete circulation.

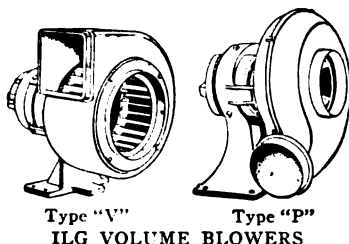


PLAN FOR VENTILATING LAUNDRIES, ETC., WITH ILG POWER ROOF VENTILATORS.

Ilg Volume Blowers.

These blowers have all the features of the larger Universal blowers. They are intended to be used where small volumes of air at low pressures are required. These machines are universal in discharge and drive.

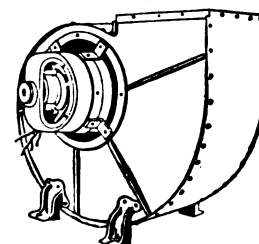
Type "V" for quiet operation and small volume; Type "P" for higher pressure and heavy fumes, dust, etc.



Type "V" Type "P"
ILG VOLUME BLOWERS

Ilg Universal Multiblade Blowers.

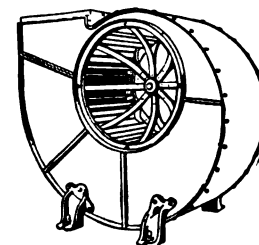
The construction of Ilg blowers and exhausters is a distinct departure from methods heretofore employed. Motor is machined circular and held in cast iron ring bolted to cast iron bowl. Bowl is in turn bolted to cast iron side of blower. On the inlet side, a cast iron inlet flange is bolted to cast iron side.



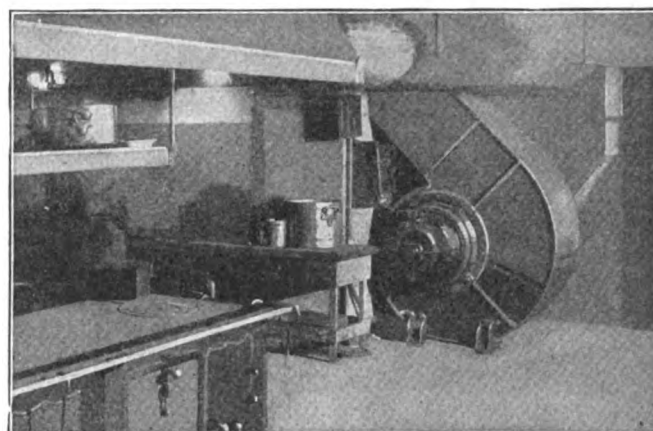
Motor Side

The two cast iron sides of blower are exactly alike, with holes drilled alike; consequently bowl and inlet flange can be interchanged, giving change of drive.

Legs are bolted to cast iron sides, and can be put on in any position, giving any angle of discharge. Wheel is mounted directly on motor shaft and, as motor is pushed up against bowl, the hub of wheel is very close to motor bearing, giving small overhang.



Inlet Side
DIRECT CONNECTED
BLOWER



DIRECT CONNECTED ILG BLOWER IN CRAMPED CORNER

Note accessibility to motor and bearings. Also note the simple method of bolting legs to floor

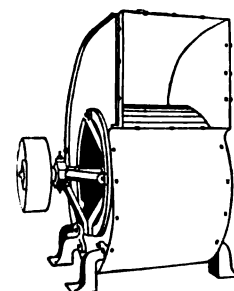
Both Ilg direct connected and belted blowers require the minimum amount of floor space. They require no floor foundation or pedestal for motor.

All bearings are on motor or pulley side. They are not exposed to the suction of air, thereby preventing the oil from being sucked out; also dust and grit can not get into them.

One nameplate—Ilg—covers the unit for customers' protection.

Catalogue—Write for condensed catalogue showing complete details on blowers.

Literature showing specific application of Ilg fans and blowers, for drying, cooling, oxygen supply, heating and ventilating, will also be mailed.



BELTED BLOWER

Continued on next page

Ilgair Unit Heaters.

In the production of the Ilgair unit heater the ILG ELECTRIC VENTILATING CO. has originated a new engineering principle, affording an effective and economical means of heating which complies with all the scientific laws of air circulation.

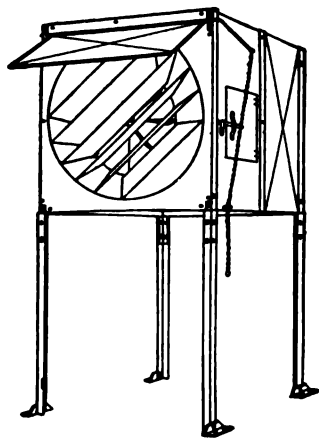
The Ilgair unit heater is a cabinet, open at both ends, in which is housed a 2-stack radiator and an Ilg self-cooled motor propeller fan. This cabinet acts as a heating chamber for the air which is drawn in over the heated coils on the intake side at low velocity (about 1000 ft. per minute) and discharged in volume at high velocity (about 2500 ft. per minute).

Each unit constitutes a separate heater, and both the volume and distribution of the heat is controlled at its source. This unit system speeds up the heating, increases distribution and makes possible the heating of any particular section of the building without operating the entire system.

No ducts or high speed machinery are required. Instead of having to create and distribute the heat from one limited source of supply, the Ilgair unit heater system provides for a multiple of units depending upon the floor area.

No other heating system affords such flexibility of application. It is a simple matter to rearrange the placing of any one or more units, and if the building is remodeled or enlarged it merely means re-placing or installing additional units.

Ilgair unit heaters can be used in summer as cooling outfits and streams of air can be blown in any direction. This is an important feature in plants having processes that give off heat. Unit can also be placed against side walls and connected with outside air to furnish ventilation.

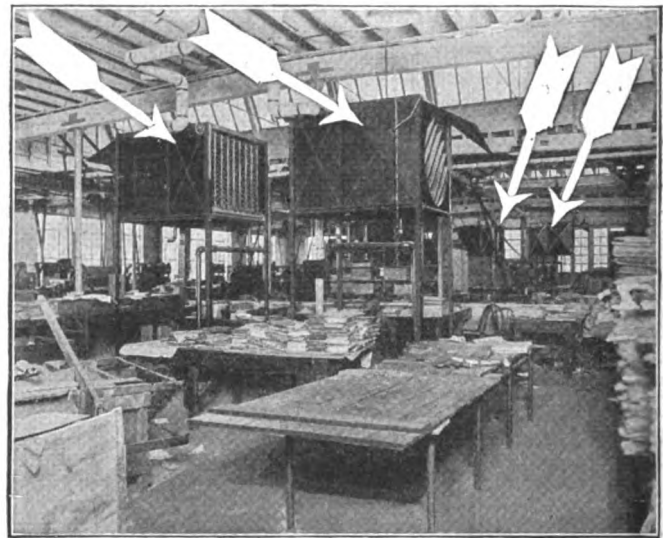


FLOOR TYPE HEATER STANDING 72 INCHES FROM FLOOR
Also made for ceiling suspension

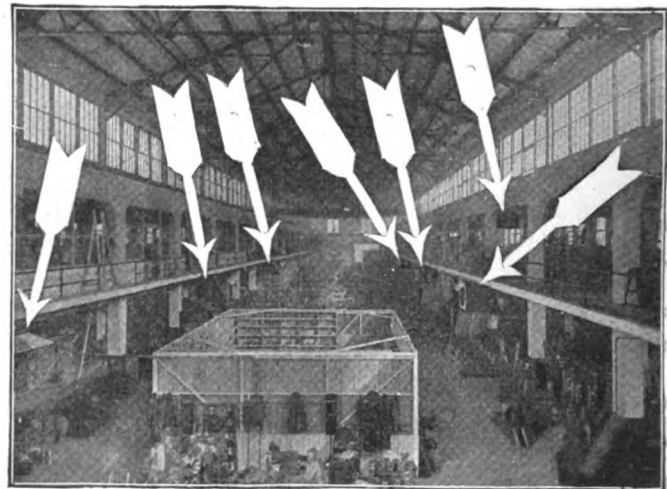
DETAILS AND SPECIFICATIONS OF ILGAIR UNIT HEATERS

Number of unit	Cu. ft. per min.	Radiation, sq. ft.	Approximate dimensions without supports	Power input, watts	Approximate weight complete, lbs.
18	2000	96	37" wide 36" high 49" long	200	1550
20	3000	128	45 1/4" wide 45 1/4" high 56" long	220	1900
24	5000	194	55" wide 48" high 62" long	425	2750
30	7000	270	57 1/4" wide 57 1/4" high 69 1/4" long	550	3550
36	9000	351	76 1/4" wide 59 1/2" high 72" long	850	4700

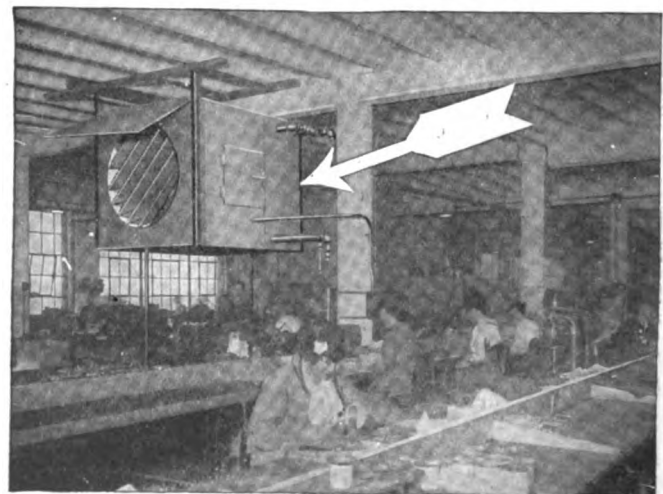
SWEET'S CATALOGUE



FLOOR TYPE ILGAIR UNIT HEATERS IN ONE-STORY SAWTOOTH ROOF CONSTRUCTION BUILDING



CEILING SUSPENSION TYPE ILGAIR UNIT HEATERS IN ONE-STORY MONITOR ROOF BUILDING



CEILING TYPE ILGAIR UNIT HEATER IN MILL CONSTRUCTED BUILDING

Co-operative Service.

Layouts furnished as required. Write for circulars giving descriptions, etc.



MASSACHUSETTS BLOWER COMPANY

Howard Street, Watertown Post Office
BOSTON, MASS.

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CLEVELAND, OHIO
DETROIT, MICH.
SALT LAKE CITY, UTAH
KANSAS CITY, MO.

TORONTO, CAN.

BALTIMORE, MD.
ATLANTA, GA.
ALBANY, N. Y.
ROCHESTER, N. Y.
ST. PAUL, MINN.



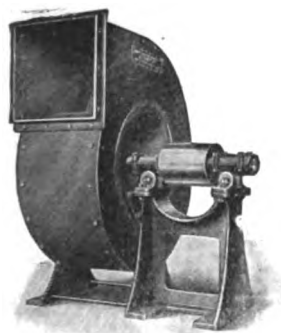
MODIFIED SQUIRREL
CAGE FAN



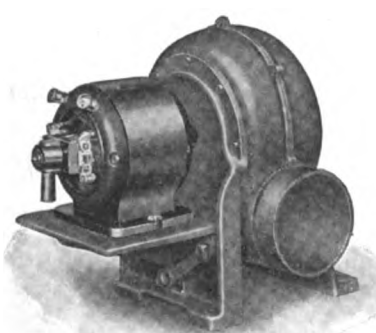
STEEL PLATE FAN



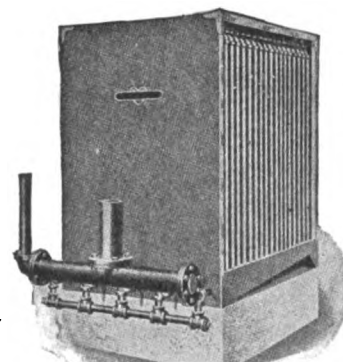
DISC FAN WITH PULLEY



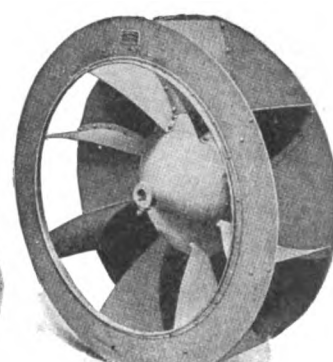
PLANING MILL EXHAUSTER



PORTABLE SERVICE SET
Motor side



COIL HEATER



CONE FAN WHEEL

Products.

FANS, BLOWERS, HEATERS and AIR WASHERS for Heating, Ventilating, Purifying, Cooling, Humidifying, Dehumidifying; FORCED and INDUCED DRAFT, COMMERCIAL DRYING and BLAST EQUIPMENT.

Squirrel Cage Multiblade Fans.

For heating, ventilating, drying and mechanical draft the squirrel cage fan will meet every requirement, except for moving material. Built in all sizes from 6-in. diameter wheels and up.

Steel Plate Blowers and Exhausters.

Adapted for same purposes as the squirrel cage type fan. Can be designed for moving materials.

Massachusetts Propeller and Disc Fans.

For moving large volumes of air under low pressures. Built for pulley drive or direct connection to motors or engine, in all sizes from 12-in. diameter and up, for horizontal or vertical shaft.

Cone Fans.

Designed for installations where the conditions will not permit the usual housing.

Planing Mill Exhausters.

Steel plate shell sufficiently thick to withstand abrasive action of material handled. No exposed bearings. Any discharge.

Portable Service Sets.

Standard sizes. Right- or left-hand discharge. Belt or direct drive.

Pipe Coil Heaters.

For hot water and steam. Adapted for high and low pressure work. Made in return bend and miter types.

Air Washers.

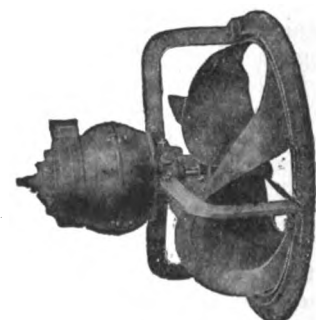
For purifying, cooling, humidifying and dehumidifying air for industrial and commercial purposes. Made in all sizes.

Drying and Cooling Systems.

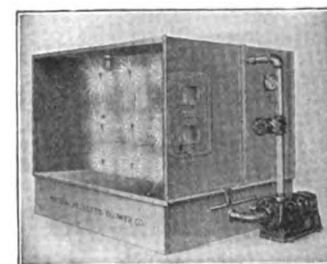
Dry kilns and cooling and ventilating systems designed and equipped to meet any requirements.



MODIFIED SQUIRREL
CAGE FAN WHEEL



MASSACHUSETTS DAVIDSON
PROPELLER FAN, DIRECT
CONNECTED MOTOR



MASSACHUSETTS AIR
WASHER

SKINNER BROS. MFG. CO., INC.

Manufacturers of Patent Air Heaters

ST. LOUIS, MO.

MAIN OFFICE AND FACTORIES

Boyle and Vandeventer Avenues

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BOSTON, SKINNER BROS. MFG. CO., INC., 445 Little Building
CHICAGO, SKINNER BROS. MFG. CO., INC.
CLEVELAND, SKINNER BROS. MFG. CO., INC., Marshall Building
DETROIT, S. J. MARX, 308 Scherer Building
WASHINGTON, D. C., U. D. SELTZER ENGINEERING CO.,
Evans Building
PHILADELPHIA, HAYNES SELLING CO., 1711 Sansom Street
BUFFALO, SKINNER BROS. MFG. CO., INC., Morgan Building

DENVER, O. H. DAVIDSON EQUIPMENT CO., 1633 Tremont
Street
KANSAS CITY, PAXSON WINSBOROUGH, 321 Lathrop Building
MINNEAPOLIS, SKINNER BROS. MFG. CO., INC., Metropolitan
Life Building
SPOKANE, H. B. DeLONG CO., 409 First Avenue
INDIANAPOLIS, SKINNER BROS. MFG. CO., INC., 325-26 Occi-
dental Building
PITTSBURGH, PITTSBURGH HEATING CO., 8 Wood Street

Products.

BAETZ PATENT FAN HEATER UNITS; SKINNER
PATENT DIRECT FIRED FAN BLAST HEATER UNITS.

Also manufacturers of Skinner Patent System Fan
Blast Dryer Outfits.

Baetz Patent Air Heater.

For steam, either exhaust or high or low pressure, 6 sizes and 4 types are made, as shown in Fig. 1, with fan wheels of steel plate or multiblade construction for either motor, line shaft, steam engine, gas or gasoline engine drive. These units are built to occupy the least possible floor space and range from 4 to 36 sq. ft. Fan is made double inlet and is located near the floor directly under a closely nested pipe coil, made in two sections to permit easy removal and give a free air passage through same. Fan exhausts the cooler air on the floor and discharges same up through coil and out into room at low velocity through large diameter directing elbow outlet. If desired, more than one elbow may be installed for special cases. In drying work, one or more sheet metal ducts can be carried from heater outlets for distribution to several drying chambers. Fan wheel is mounted on a polished steel shaft, supported by two large ring oiling, self-aligning bearings, bolted firmly in place on shelves cast rigidly in each inlet plate casting. Standard outfits consist of all parts as illustrated (Fig. 1), except motor, motor belt and elbow outlet. Headers are threaded for screwed fittings, but will be furnished with standard companion flanges on request.

Uses — Heating and ventilating all types of factories, industrial plants, garages, machine and railroad shops.

Drying of all kinds of materials, including fruits, vegetables, candy, etc.

Steam vapor removal from packing plants, paper mill machine and heater rooms to prevent precipitation.



FIG. 1. TYPES OC, NC, OCS AND NCS
BAETZ FAN HEATER

Advantages—No sheet metal ducts are required. No foundation required other than good floor construction carrying 175 lbs. In mild weather sufficient heat will be obtained by natural stack effect heating without running the fan; in normal freezing weather medium, and in coldest weather maximum fan speed, thus requiring smallest possible horsepower and steam consumption, while giving greatest possible flexibility of operation. All units are portable, also self-contained and can be connected with factory labor. The coils are good for pressures from atmospheric to 125 lbs. Any vacuum valves, traps, or steam accessories can be applied.

Water can be circulated through the coils, which will give a greater cooling effect, also lower the relative humidity depending on the circulating water temperature.

If units are not required in the summer, they can be stored, thus giving more floor space during this period; but continued use in summer is recommended, owing to proved value in summer cooling and ventilation.

Guarantee—All workmanship and materials guaranteed one year from date of shipment. This company also guarantees any inside average temperature, if given complete data on building and building construction, amount and kind of steam available.

Literature—For steam systems write for following literature: Descriptive pamphlet No. 50; list and addresses of users, No. 80; Catalogue No. 101.

Direct Fired Type.

For plants having no available steam, this type illustrated in Fig. 2 is furnished. All internal heating construction made of heavy cast iron with deep cup shaped units filled with special oxide cement. Fan construction and other parts same as for steam coil type (Fig. 1).

Standard units consist of complete outfit as shown, with exception of motor, motor belt, directing elbow and smoke pipe, but collar connections for smoke pipe and air directing elbows are also furnished. Descriptive pamphlet No. 60.

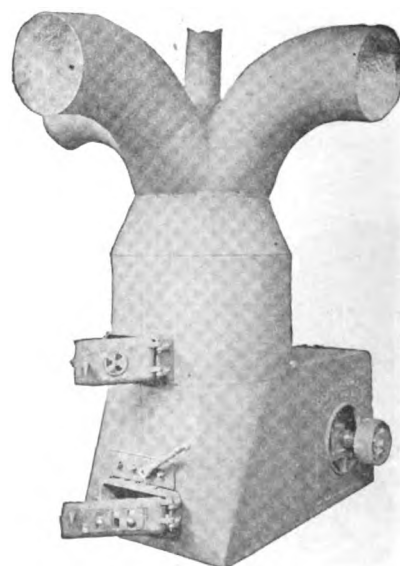


FIG. 2. TYPES DF AND DFS, SKINNER
DIRECT FIRED FAN BLAST HEATER

THE SPENCER TURBINE CO.

Manufacturers of Turbine Blowers and Exhausters

HARTFORD, CONN.

SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

Products.

TURBINE BLOWERS and EXHAUSTERS: Spencer Turbo-compressors, Spencer Vacuum Cleaners, Spencer Organ Blowing Apparatus (the Orgoblo).

Turbo-compressors.

Spencer turbo-compressors are built to meet the needs of modern industrial conditions frequently requiring continuous operation for many days where absolute dependability is most essential. They are built for service and combine simplicity and practicality with sturdy and rugged construction.

Construction—The Spencer plate steel, double wall, reinforced construction gives a maximum of strength with a minimum of weight.

Foundation—As the motor and compressor form one compact and integral unit no special foundation is required.

Bearings—Consist of 2 motor bearings and 1 ball thrust bearing designed with a liberal factor of safety.

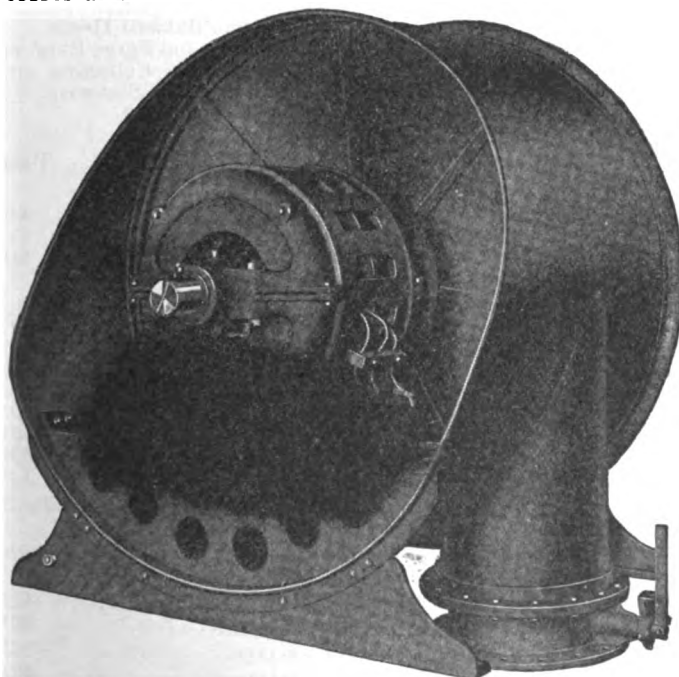
Motors—Of the highest grade, standard type. Spencer turbo-compressors are furnished equipped with 60-cycle alternating current or direct current motors of any standard voltage.

Operation—Spencer turbo-compressors operate at 1750 r. p. m., generally considered by electrical engineers to be the most efficient and practical motor speed, and this one feature has obtained for them rapidly increasing recognition and preference over others.

Special Features—(1) A slow speed, low velocity wide clearance multistage turbine.

(2) Retains its efficiency permanently; no contacts or even close clearances, hence no chance for wear.

(3) Direct connected, self-contained unit, avoids necessity for belts, gears or chains, with their resultant losses and noises.



MOTOR END SPENCER TURBO-COMPRESSOR

SWEET'S CATALOGUE

(4) Constant pressure, with no pulsations or surging, even when operated idle or under partial loads.

(5) Current consumption inherently decreases in proportion to reduction of volume of air used, eliminating all auxiliary governors.

Pressures—The Spencer line of turbo-compressors for 1-lb., 1½-lb. and 2-lb. pressures meets a wide demand for an efficient equipment of the "slow-speed" turbine type to use in supplying air for oil and gas burning furnaces, foundry cupolas, etc.

CAPACITIES, SPENCER TURBO-COMPRESSORS

1-LB. PRESSURE		1½-LB. PRESSURE		2-LB. PRESSURE	
Catalogue number	Volume, cu. ft. per min.	Catalogue number	Volume, cu. ft. per min.	Catalogue number	Volume, cu. ft. per min.
1005	600	1507	675	2010	600
1007	1000	1510	900	2015	1000
1010	1300	1515	1350	2020	1300
1015	2000	1520	1800	2025	1650
1020	2700	1525	2250	2030	2000
1025	3350	1530	2700	2035	2350
1030	4000	1535	3150	2040	2700
1035	4700	1540	3600	2050	3350
1040	5400	1550	4500	2060	4000
1050	6750	1560	5400	2075	5000
1060	8100	1575	6750	20100	6700
1075	10000	15100	9000	20125	8100
				20150	10000

For other pressures, write for bulletin.

Spencer Vacuum Cleaners.

Turbine, or multistage fan type exhausters, of the wide clearance, constant potential, low velocity type. Motors direct connected; no belts or gears. No water or sewer connections required.

Current consumption varies in direct proportion to work being done, through inherent self-governing characteristics of turbine.

Simplicity of design, and high grade construction insures low maintenance cost.

Turbine, with extremely wide clearances, and absolutely no close fitting parts, is ideal type of exhauster for handling dirt-laden air. No cloth bags or screens.

Entire system designed to produce correct air stream conditions, to do universal vacuum cleaning with uniform efficiency, speed and thoroughness.

Superiority of cleaning implements and accessories universally acknowledged. All floor tools provided with completely controllable swivel, enabling the operator to reach the dirt with ease and rapidity.

Sizes and Types—Spencer cleaners are manufactured in sizes suitable for all buildings, from smallest residences, to largest skyscrapers, hotels, factories, and business buildings.

Particularly adapted for school buildings. Central plants installed for cleaning entire group of college or similar buildings.

Service—The engineering department is glad to co-operate with engineers or architects in laying out piping systems, drawing specifications or submitting recommendations regarding any vacuum cleaning problems.

References—The finest examples of all kinds of buildings throughout the country are equipped with Spencer systems.

Write for list and complete information.

B. F. STURTEVANT COMPANY

Fans, Fan Systems, Blowers, Heating and Ventilating Apparatus and Power Plant Equipment

HYDE PARK, BOSTON, MASS.

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OFFICES	MANAGERS	ADDRESSES	TELEPHONE NUMBERS
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BOSTON, MASS.	R. E. SHAW	555 Massachusetts Trust Building	Fort Hill 2310
BUFFALO, N. Y.	C. F. HODGES	100 Bedford Avenue, Nye Park	Tupper 7130
CHICAGO, ILL.	L. O. R. CLARK	530 South Clinton Street	Bidwell 7427-J
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SEATTLE, WASH.	RALPH CHATHAM	1105-06 White Building	Main 6462

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MONTREAL, QUE.	W. C. ELLIOTT	404 New Birks Building	Uptown 7583
TORONTO, ONT.	C. B. MCBRIDE	210 Lumsden Building	

Products.

HEATING AND VENTILATING EQUIPMENT:

Multivane Volume Blowers and Exhausters.
Propeller and Disc Type Volume Exhaust Fans.

Heaters.
Air Washers.
Engines and Motors.

POWER HOUSE EQUIPMENT:

Steam Engines.
Steam Turbines.
Fuel Economizers.
Mechanical Draft Apparatus.

Galvanized Duct Work.
Portable Ventilating Sets.

Turbine, Steam Engine and Gasoline Electric Generating Sets.
Generator Coolers.
Transmission Gears.

Sturtevant

(REG. U. S. PAT. OFF.)
TRADE-MARK

AIR CONDITIONING EQUIPMENT:

Paper, Glue, Wood and Leather Drying and Vapor Absorption Systems.
Air Washing, Humidifying and Dust Removing Systems.

Dehumidifying Systems.

INDUSTRIAL EQUIPMENT:

High, Medium and Low Pressure Blowers.
Volume Blowers.
Planing Mill Exhausters.
Cupola Blowers.
Gas Blowers and Boosters.

Gas Exhausters.
Acidproof Fans.
Steam Exhaust Heads.
Forges and Forge Blowers.
Pneumatic Collecting and Conveying Systems.

For Autoforce Ventilators, see page 363

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- 243. Paper Drying

HEATING AND VENTILATING:

- 271. Multivane Fans
- 238. Multivane Fans; Performance Charts
- 230. Heaters
- 227. Heating and Ventilating Layouts; Blue Print Book
- 201. Electric Dust Blowing Sets
- 237. Ready-To-Run Ventilating Sets
- 1011. Heating and Ventilating Factories
- 1012. Heating and Ventilating School's
- 1013. Heating and Ventilating Public Buildings
- 1014. Heating and Ventilating; Book Complete

MECHANICAL DRAFT:

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- 276. Turbo Undergrate Blowers, Design 5
- 256. Steam Turbines
- 217. D. C. Type "D" Motors
- 259. Vertical Engines

PLANING MILL FANS AND DUST CONVEYING SYSTEMS:

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- 233. Slow Speed, Low Power Reversible and Convertible Planing Mill Exhauster, Design 6
- 261. Pneumatic Dust Collecting and Conveying Systems
- 234. Steel Plate Blowers and Exhausters
- 252. Steel Plate Fan; Performance Charts

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- 256. Steam Turbines
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- 223. Fuel Economizers in Textile Mills

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- 257. Positive Pressure Blowers
- 258. Design 4 and 5 Pressure Blowers
- 265. Steel Pressure Blowers
- 242. Monogram Blowers and Exhausters

VACUUM CLEANERS:

- 244. Stationary Vacuum Cleaners
- 248. Architects' Hand Book

MISCELLANEOUS:

- 195. General Catalogue
- 250. Architects' and Engineers' Data Book. Carefully prepared, giving full technical information usually required. Contains 960 pages of invaluable information covering heating and ventilating. Price \$10.00.

Publications.

The Sturtevant line is so varied, that a comprehensive presentation in one publication is undesirable. This company, has, therefore, issued a special bulletin on each particular line covering the mechanical details.

Engineering Service.

As each installation is unique, it is usually necessary that an engineer analyse the conditions before making recommendations.

The engineering staff of the B. F. STURTEVANT COMPANY has been trained to analyse all conditions and to properly apply the company's apparatus accordingly.

Consult this department, which is at the disposal of engineers and others without obligation.

Sweet's Catalogue.

The following pages, devoted to a partial list of the Sturtevant line, are intended to assist engineers and architects in making specifications on the main points of Sturtevant equipment.

If more information is desired, consult the nearest sales office.

Types of Sturtevant Fans and Their Uses.

CENTRIFUGAL FANS—Sturtevant Multivane Fans (Design 3)—For supplying fresh air under pressure and for removing foul air. They are usually installed in connection with piping or duct work. Piping may be applied to inlet or outlet, or both.

PROPELLER FANS—Sturtevant Propeller Fan—For exhausting foul air from rooms or similar enclosed spaces. They can not be used efficiently against static pressures greater than $\frac{1}{8}$ or $\frac{3}{16}$ in. and therefore will not operate to advantage with long piping or ducts. They are usually installed in a wall, window or ceiling.

DISC FANS—Sturtevant Disc Fans—For the same classes of service as propeller fans, except that they work efficiently against static pressures as high as $\frac{1}{4}$ or $\frac{3}{8}$ in. and are used with slightly reduced efficiency for pressures up to $\frac{1}{2}$ in.

Choice of Size of Fan.

AIR CHANGES—The tables herein give the volume of air per minute delivered by each fan.

Where a fan must run noiselessly, as in sleeping rooms, low speed fans are recommended. If a fan is so placed that a slight noise is not objectionable, it can run at a higher speed and a larger volume of air can be handled by the same fan.

In making a choice of fan, the air changes for various types of rooms must be first considered. These changes are shown in the following table:

AIR CHANGES FOR VARIOUS TYPES OF ROOMS	
Kind of Room	Number of minutes in which air should be changed completely
Office.....	8 to 12
Toilet.....	5 " 7
Kitchens.....	3 " 5
Lodge room.....	5 " 7
Theater.....	8 " 15
Paper mill machine room.....	8 " 12
Foundry.....	12 " 18
Cotton mill and machinshops.....	15 " 20
Assembly hall.....	10 " 15
Smoking room.....	2 " 4

NOTE—Owing to the wide variation in the ratio of the number of occupants to the size of the room, calculations for offices, schoolrooms, theaters, and assembly halls made according to the above figures should be checked on a basis of air supply per occupant, as crowded rooms may require more air than would be afforded by the above air changes. Good practice recommends 30 cu. ft. per minute for each occupant of an office, or schoolroom, and 20 cu. ft. for theaters and assembly halls. To be on the safe side, the larger fan determined by these methods should be used.

CALCULATION OF STATIC PRESSURES—The resistance of heating systems in inches of water, or static pres-

RESISTANCE OF HEATING SYSTEMS IN INCHES OF WATER OR STATIC PRESSURE AGAINST WHICH FAN MUST WORK

Details of Systems	Static resistance in inches of water—air at 60°
Ordinary resistance for public building ventilation without heaters. Systems well proportioned	$\frac{1}{4}$ in.
Maximum resistance for public building ventilation with complex systems and without heaters. Minimum resistance for public building heating without air washers	$\frac{1}{2}$ in.
Ordinary resistance for public building heating systems, theaters, without air washers. Minimum resistance for public building heating systems with air washers	$\frac{3}{4}$ in.
Ordinary resistance for public building heating systems with air washers	$\frac{5}{8}$ in.
Maximum resistance for public building heating systems with air washers. Minimum resistance for factory heating systems	1 in.
Ordinary resistance for factory and roundhouse heating systems	$1\frac{1}{4}$ in.
Maximum resistance for factory and roundhouse heating systems	$1\frac{1}{2}$ in.

In the above, the term "public buildings" includes schools, theaters, office buildings, hotels, etc. The resistance above is the maintained resistance of the system, that is, the sum of the static pressures on both the inlet and outlet sides of the fan.

SWEET'S CATALOGUE

sure against which the fan must work, is next considered. The resistance shown in table is the maintained resistance of the system, that is, the sum of the static pressures on both the inlet and outlet sides of the fans.

As propeller fans operate wide open or against no resistance, static pressures are disregarded. In the selection of disc and multivane fans, static pressure is taken into consideration.

Sturtevant Multivane Fans (Design 3).

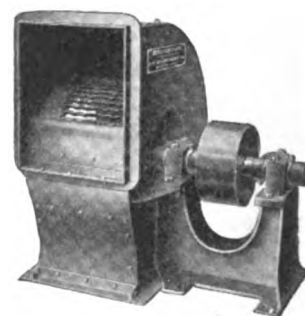
The most efficient commercial fans on the market. Service tests under the most trying conditions have proved conclusively that they will deliver a given amount of air at a given pressure at an expenditure of considerably less power than other types.

They occupy small space and their light weight permits them to be suspended from ceilings or supported by structural iron work.

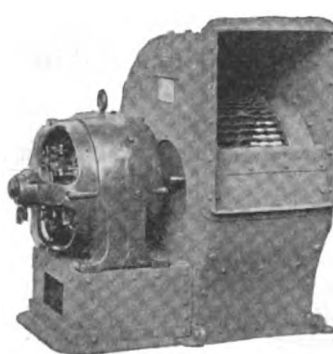
The great rigidity of their construction makes them very durable and they may be depended upon for long service, with minimum repairs.

The compactness of these fans is of great value, as they may be placed in positions impossible for other types.

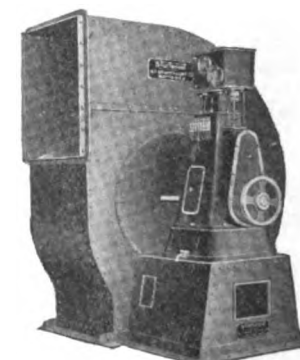
Made in overhung wheel, overhung pulley, full housed and seven-eighths housed types, for direct connection to motors, and high speed engines.



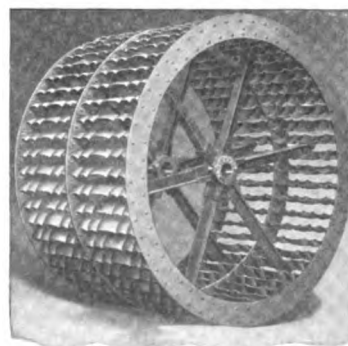
STURTEVANT OVERHUNG WHEEL MULTIVANE FAN (DESIGN 3)



STURTEVANT ELECTRIC MULTIVANE FAN, FULL HOUSED, OVERHUNG WHEEL



STURTEVANT SINGLE WIDTH MULTIVANE FAN, FULL HOUSED, DIRECT CONNECTED TO STURTEVANT VS-7 ENGINE



WHEEL FOR LARGE SIZE MULTIVANE FANS Showing double spider and third annular ring



WHEEL FOR MEDIUM SIZE MULTIVANE FANS

Continued on next page

How to Specify Multivane Fans.

GENERAL—Furnish a Multivane fan that shall be made (single or double) inlet, (single or double) width, (right or left) and, discharge and have (full or seven-eighths) housing.

Wheels shall be not less than in. diameter.

Outlet shall be in. by in.; diameter of the inlet shall be in., total height of the fan housing shall be in.; width in direction of shaft in., and length transverse to shaft in.

Fan shall have a capacity of cu. ft. per minute against a resistance of in. water gage either at the inlet or at the outlet (or at both, taking the sum) and shall operate at approximately r.p.m., requiring approximately b.h.p.

HOUSING—Housing shall be of spiral form constructed of steel plate strongly braced, bolted and riveted to a rigid frame of angle iron.

Side plates and round-about sheet shall be made of No. 11-gage for fans above 45 in. high. The smaller sizes shall have these parts made of No. 14-gage plate.

Outlet shall be rectangular in shape and consist of angle irons bolted to the housing and arranged for connection to a discharge duct.

Inlet shall be of cone shape and so constructed as to allow the wheel to be taken out through the opening caused by the removal of the cone. In the single inlet fan the side opposite the inlet shall be closed by a dished plate bolted to the side of the housing.

Cut-off piece shall be made of a sheet bent 180° upon itself and having the two ends bolted to the spiral sheet, thus leaving no edges of metal which can in any way be acted upon by the air issuing from the outlet so as to produce vibration, and therefore, noise at this point.

WHEEL—Blades of the wheel shall be made of refined steel plate and spooned with spherical depressions to efficiently handle the air. Blades shall be pressed and formed while hot by means of punch and die to insure uniformity and strength in the blades throughout the wheel.

Hub shall be made of cast iron having cast integral with it and emanating from it, steel arms of "T" section. Hub shall be accurately bored and fitted with keyway and set screws.

Blades shall be riveted at either end to annular steel plate rings or side plates. Holes through which the blades are riveted to the side plates shall be punched to template, as well as the blades themselves, to insure the proper position of each blade in the wheel.

For diameters above 46 in., a third annular ring shall be placed in the center of the wheel, and two hubs used instead of one.

Outer ends of the "T" arms emanating from the hub shall be riveted to the center portion of the driving blades, which shall be of thicker metal than the intermediate blades.

Wheel shall be absolutely symmetrical either side of its center, and, having no back plate, can be used for either a right- or left-hand fan and have either single or double inlet. Wheel shall be very carefully balanced.

BEARINGS—Bearings shall be of the spherical self-aligning ring oiled type and bolted to their support. They shall be of large diameter and built extra long to give ample bearing surface. Each bearing shall be fitted with two oil rings which feed oil on to the shaft from a large oil well located in the bottom part of the box.

Bearings shall be lined with the best quality babbitt, containing upwards of 85% tin, bored and scraped to exact size.

SHAFT—The shaft shall be made of steel forging and after the keyways are cut, shall be accurately turned and ground.

VOLUMES AND PRESSURES OF DESIGN 3 SINGLE INLET MULTIVANE FANS

(Table is greatly condensed, but gives a general idea of size fan necessary.)

Volumes and horsepower shown are correct for fans discharging air at 65° Fahr., and density .075 lb. per cu. ft. against continuously maintained resistance

Fan size	¼-in. S. P.			⅜-in. S. P.			½-in. S. P.			¾-in. S. P.			1-in. S. P.			1¼-in. S. P.			1½-in. S. P.		
	Vol.	r.p.m.	h.p.	Vol.	r.p.m.	h.p.	Vol.	r.p.m.	h.p.	Vol.	r.p.m.	h.p.	Vol.	r.p.m.	h.p.	Vol.	r.p.m.	h.p.	Vol.	r.p.m.	h.p.
4	1750	314	0.130	2290	392	0.27	2920	470	0.405	3170	470	0.37	3740	588	0.99	2170	549	0.55	1950	588	0.53
	2340	353	0.225	3340	470	0.57	3450	510	0.69	3600	510	0.90	4260	627	1.30	3310	588	0.87	3510	627	1.05
	2820	392	0.35	3760	510	0.76	3920	549	0.92	3590	549	0.83	4750	666	1.65	3930	627	1.20	4150	666	1.40
	3230	431	0.465	4160	549	0.97	4340	588	1.15	4070	588	1.10	5150	705	2.00	4470	666	1.55	5630	785	2.70
5	2390	269	0.180	3120	336	0.365	3040	370	0.43	2960	404	0.50	5100	504	1.35	2960	470	0.75	2660	504	0.72
	3190	302	0.305	3900	370	0.56	3980	404	0.67	4100	437	0.81	5810	538	1.75	4510	594	1.29	4780	538	1.45
	3840	336	0.46	4550	404	0.78	4700	437	0.94	4900	470	1.15	6480	571	2.20	5360	538	1.65	5650	571	1.90
	4410	370	0.63	5130	437	1.06	5450	470	1.25	5560	504	1.50	7030	601	2.70	6100	571	2.10	6320	605	2.45
6	4160	265	0.40	4070	204	0.475	5200	353	0.88	3870	353	0.68	3830	382	0.78	3860	412	0.93	3460	441	0.94
	5000	294	0.60	5940	353	1.00	6140	382	1.25	5350	382	1.05	5450	412	1.25	5930	441	1.55	6250	470	1.85
	5750	324	0.83	6700	382	1.35	6970	412	1.65	6390	412	1.50	6640	441	1.75	7090	470	2.15	7370	500	2.50
	6430	353	1.10	7400	412	1.75	7720	441	2.05	7250	441	1.95	7590	470	2.30	7950	500	2.70	8310	529	3.20
6½	3940	209	0.295	6420	288	0.92	5010	288	0.71	4890	314	0.83	6850	366	1.60	4480	366	1.25	4380	392	1.20
	5260	235	0.50	7500	314	1.30	6570	314	1.10	6760	340	1.35	8420	392	2.25	7450	392	1.96	7890	418	2.35
	6330	262	0.76	8460	340	1.70	7760	340	1.55	8070	366	1.85	9600	418	2.90	8840	418	2.70	9320	444	3.15
	7280	288	1.05	9360	366	2.20	8820	366	2.05	9170	392	2.45	10700	444	3.65	10100	444	3.45	10500	470	4.0
7	4860	188	0.365	6360	235	0.74	8110	282	1.40	6040	282	1.05	5970	306	1.20	6020	329	1.50	5400	353	1.45
	6500	212	0.62	7930	259	1.15	9580	306	1.90	8340	306	1.65	8500	329	1.95	9290	353	2.45	9750	376	2.90
	7820	235	0.93	9270	282	1.60	10900	329	2.55	9660	329	2.30	10400	353	2.75	10900	376	3.35	11500	400	3.90
	8970	259	1.30	10500	306	2.10	12100	353	3.20	11300	353	3.05	11800	376	3.6	12400	400	4.25	13000	424	4.95
8	7000	157	0.52	9160	196	1.05	8920	216	1.25	12000	255	2.35	8610	255	1.75	8650	275	2.2	7800	294	2.1
	9350	177	0.90	11400	216	1.65	11700	235	2.00	14400	275	3.30	12300	275	2.80	13300	294	3.5	14000	314	4.2
	11800	196	1.35	13400	235	2.30	13900	255	2.75	16300	294	4.35	15000	294	3.95	15700	314	4.8	16600	333	5.6
	12900	216	1.85	15100	255	3.05	15700	275	3.65	18100	314	5.5	17100	314	5.2	17900	333	6.1	18700	353	7.2
9	9530	134	0.71	12500	168	1.45	12200	185	1.70	16100	202	2.00	11700	219	2.4	11800	235	3.00	10600	252	2.85
	12700	151	1.20	15600	185	2.20	15900	202	2.70	19400	219	3.25	16700	235	3.8	18000	252	4.75	19100	269	5.7
	13300	168	1.85	18200	202	3.10	18800	219	3.75	20500	235	4.5	20400	252	5.4	21400	269	6.6	22600	286	7.7
	17600	185	2.55	20500	219	4.15	21400	235	5.00	22200	252	5.9	23200	275	7.0	24300	286	8.3	25400	303	9.7
10	12500	118	0.93	16300	147	1.90	15900	162	2.55	19500	176	3.25	21400	191	3.1	15400	206	3.9	13900	221	3.75
	16600	132	1.60	20300	162	2.90	20800	176	3.5	21400	191	4.2	21800	206	5.0	23600	221	6.2	25000	235	7.5
	20000	147	2.4	23900	176	4.05	24600	191	4.9	25500	206	5.9	26600	221	7.1	28000	235	8.6	29500	250	10.0
	23000	162	3.3	26900	191	5.4	27900	206	6.5	29000	221	7.8	30400	235	9.2	31800	250	11.0	33300	265	12.5
11	15300	105	1.2	20600	131	2.4	20100	144	2.85	27000	170	5.3	19400	170	3.95	19500	183	4.95	17500	196	4.75
	21000	118	2.0	25700	144	3.7	26300	157	4.45	32300	183	7.5	27600	183	6.3	29800	196	7.9	31600	209	9.5
	25300	131	3.0	30100	157	5.2	31000	170	6.2	36700	196	9.8	33700	196	8.9	35400	209	11.0	37300	222	12.5
	29100	144	4.2	33900	170	6.8	35300	183	8.2	40700	209	12.5	38400	209	11.5	40200	222	13.5	42000	235	16.
12	19400	94	1.45	25400	118	2.95	24800	129	3.5	34100	141	4.1	23900	153	4.85	24100	165	6.1	21600	177	5.9
	28000	106	2.50	31700	129	4.55	32500	141	5.5	33400	153	6.6	34400	165	7.8	36800	177	9.7	39000	188	11.5
	31200	118	3.75	37100	141	6.4	38300	153	7.7	39500	165	9.2	41500	177	11.0	43600	188	13.5	46800	200	15.5
	35900	129	5.2	41900	153	8.4	43500	165	10.0	45300	177	12.0	47400	188	14.5	49600	200	17.	51900	212	20.0
13	23600	86	1.75	30800	107	3.6	30800	118	4.3	29300	128	5.0	29000	139	5.9	29200	150	7.4	26200	160	7.1
	31000	96	3.00	38500	118	5.5	39100	128	6.7	40500	139	8.0	41200	150	9.5	44600	160	12.0	47300	171	14.
	37900	107	4.5	45000	129	7.7	46500	139	9.3	48400	150	11.0	50300	160	13.5	53900	171	16.0	55900	182	19.
	43500	118	6.3	50700	139	10.0	52900	150	12.5	55000	160	14.5	57500	171	17.5	60300	182	20.5	63000	193	24.
14	28000	78	2.1	36700	98	4.3	35700	108	5.1	34800	118	5.9	34500	128	7.0	34800	137	8.8	31200	147	8.4
	37400	88	3.6	45900	108	6.5	46800	118	7.9	48100	128	9.5	49000	137	11.5	53000	147	14.0	56100	157	17.0
	45000	98	5.4	53500	118	9.2	55200	128	11.0	57500	137	13.5	59900	147	16.0	63000	157	19.5	66400	167	22.5
	51800	108	7.5	60300	128	12.0	62800	137	14.5	65300	147	17.5	68300	157	20.5	71600	167	24.5	74900	177	29.
15	32800	72	2.45	43000	91	5.0	41800	99	5.9	40900	109	6.9	40400	118	8.2	40700	127	10.5	36500	136	9.9
	44000	81	4.2	53600	99	7.7	54900	109	9.3	56400	118	11.0	57500	128	13.	62000	136	16.5	65800	145	20.
	52800	91	6.3	62600	109	10.5	64700	118	13.	67400	127	15.5	70200	136	18.5	73700	145	22.5	77700	154	26.
	60600	99	8.7	70600	118	14.	73500	127	17.	76500	136	20.5	80000	145	24.5	83900	154	29.	87600	163	34.

Sturtevant Steel Pressure Blowers.

Designed for all purposes where pressures up to 16 oz. per sq. in. are to be maintained and *for forcing air for long distances.*

These blowers may be driven by belts from a line shaft or from engine, motor or turbine, or may be driven direct connected to an electric motor, steam engine or steam turbine.

See description of Sturtevant engines, turbines, and motors on page 526.

Sturtevant steel pressure blowers are used for supplying *air blast* to cupolas, forges, and to oil, gas and pulverized fuel burners.

They are also used for blowing scale from hammers, furnishing *air blast* for ventilating and cooling, and draft for coke and coal fires.

Under usual operating conditions, 500 cu. ft. of air per minute are required per ton capacity of cupola. The pressure ranges with the size of the cupola from 12 to 28 in. (7 in. to 16 oz.).

For forge blowing, it is usual to allow from 40 to 60 cu. ft. of air per minute for each sq. in. of tuyere area. The pressure required at the forge averages about 7 in. of water. In small forges, it sometimes drops as low as 4 in. and in large forges it may go as high as 10 or 12 in.

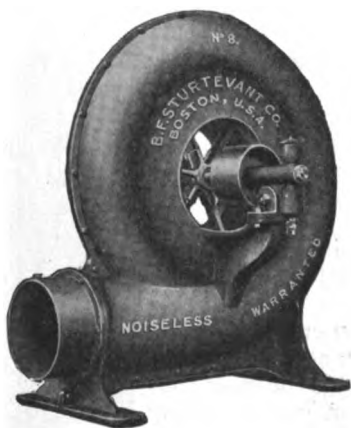
Standard arrangement is bottom horizontal discharge with pulley on the right hand side, as one faces blower outlet. Other hands and discharges can be supplied if required. Steel pressure blowers are also furnished direct connected to electric motors and steam turbines.

The following capacity table is much condensed, but gives a general idea of the size fan required for various conditions.

Wheels are accurately balanced and run smoothly when driven at highest speeds.

Journal bearings are of unusual length, which makes possible sustained operation for long periods.

Each bearing is cast in a single piece and lined with Sturtevant white metal, which is carefully bored and of great length with efficient oiling features. These bearings are practically non-heating and of great durability.



STURTEVANT STEEL PRESSURE BLOWER

DATA, STEEL PRESSURE BLOWERS

Size	Capacities						Diam. wheel	Outside diam. outlet, in.	Extreme dimensions, in.		
	R. p. m.	C. f. m.	H. p.	R. p. m.	C. f. m.	H. p.			Length	Width	Height
0000	6770	376	.9	9450	538	2.5	7 1/4	2 1/2	10 1/4	9 1/4	12
00	5240	618	1.4	7320	874	4.1	9 1/4	3 1/4	13 1/4	12 1/4	15 1/4
0	4450	780	1.8	6210	1103	5.1	10 3/4	4	15 1/4	14 1/4	18 1/4
1	3900	900	2.1	5450	1251	5.9	12 1/4	4 1/2	18	16 1/4	20 1/4
2	3280	1075	2.5	4600	1480	7.0	14 1/4	5 1/4	21	18	24
3	2810	1500	3.4	3930	2085	9.8	17	6 1/4	24 1/4	20 1/4	28 1/4
4	2450	1615	3.9	3420	2260	10.6	19 1/4	7 1/4	28 1/4	25 1/4	33 1/4
5	2100	1990	4.6	2935	2800	13.2	22 1/4	8 1/4	34	29 1/4	39 1/4
6	1920	2555	5.7	2670	3600	16.8	25	10 1/4	39 1/4	34 1/4	45 1/4
7	1540	4225	10.0	2155	5900	27.9	31	12	45 1/4	41	51 1/4
8	1345	6215	14.7	1880	8700	41.0	35 1/4	13 1/4	52	46	59
9	1160	7240	17.0	1620	10000	47.5	41 1/4	16	60 1/4	51 1/4	69 1/4
10	1015	14770	34.0	1420	20600	96.8	47	18 1/4	70	60 1/4	80 1/4

Sturtevant Monogram Fans, Blowers and Exhausters.

The range of service of these units is midway between Sturtevant multivane fans and Sturtevant steel pressure blowers previously described.

The Monogram is distinctly a volume fan, handling air in greatly increased volume over the higher pressure types, while operating at lower pressures.

They will efficiently deliver large volumes of air at pressures of from 3 to 10 in. of water, but can be used for pressures as low as 1 or 2 in. and as high as 14 in.

Especially adapted for ventilating, for exhausting chemical fumes, for use with hot blast heater units, for drying systems and for supplying blast to forges and furnaces. In addition to these uses, the smaller sizes find a broad field of service in industrial work, being very largely adopted for dust collecting.

These units may be driven by belts from line shaft or from engine, motor or turbine, or may be driven direct connected to electric motor, steam engine or steam turbine.

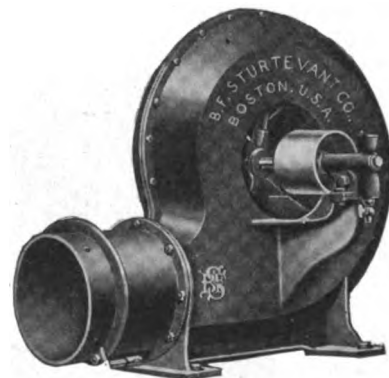
See description of Sturtevant engines, turbines, and motors on page 526.

Casing is of cast iron, cast in 2 sections and bolted together. Blast wheel is of the side plate type for all ordinary applications, but special wheels can be fitted to meet varying conditions. Bearings are ample in size, thoroughly lubricated and lined with Sturtevant white metal.

Monogram fans are built either as blowers or exhausters, and are regularly built with bottom horizontal discharge in all sizes and with up-blast discharge in sizes 3 to 10 inclusive. They can be built with down-blast or horizontal discharge as desired.

Monogram blowers are regularly built right hand, but can be built left hand if desired. Monogram exhausters are regularly built both hands.

Blowers may be equipped with adjustable bed with telescopic outlet. Sizes 4 to 10 are the only sizes regularly fitted with adjustable beds, but other sizes can be so fitted, if desired. Exhausters are not used with adjustable beds.



STURTEVANT MONOGRAM EXHAUSTER

DATA, MONOGRAM EXHAUSTERS

Size	Capacities						Diam. wheel, in.	Outside diam. inlet, in.	Outside diam. outlet, in.	Extreme dimensions, in.		
	R. p. m.	C. f. m.	H. p.	R. p. m.	C. f. m.	H. p.				Length	Width	Height
0000	4640	90	.08	6530	130	.23	6	3 1/4	2 1/4	9 1/4	8 1/4	10
00	3370	198	.16	4750	267	.49	8 1/4	4 1/4	3 1/4	14 1/4	12 1/4	14 1/4
0	2855	373	.33	4020	525	.91	9 1/4	5 1/4	4 1/4	17 1/4	14 1/4	16 1/4
1	2560	532	.46	3600	746	1.3	10 1/4	6 1/4	5 1/4	19 1/4	16 1/4	19 1/4
2	2270	775	.67	3200	1090	1.9	12 1/4	7 1/4	7 1/4	24 1/4	18 1/4	22 1/4
3	1885	1090	.97	2655	1537	2.7	14 1/4	9	9	28 1/4	21 1/4	26 1/4
4	1590	1502	1.3	2240	2113	3.8	17 1/4	10 1/4	10 1/4	32 1/4	24 1/4	31
5	1390	2090	1.8	1960	2950	5.2	20	12 1/4	12 1/4	37 1/4	28 1/4	36 1/4
6	1185	3356	2.9	1665	4735	8.4	23 1/4	15 1/4	14 1/4	43 1/4	32 1/4	41 1/4
7	1030	4757	4.3	1450	6700	11.8	27	16 1/4	16 1/4	50	38 1/4	50
8	900	6498	5.7	1265	9153	16.2	31	18 1/4	18 1/4	56 1/4	45 1/4	56 1/4
9	695	10113	8.9	980	14238	25.1	40	21 1/4	21 1/4	64 1/4	50 1/4	65 1/4
10	605	14690	12.9	850	20679	36.6	46	24 1/4	24 1/4	75	60 1/4	77 1/4

Sturtevant High Pressure Blowers.

Designed for delivering air or gas at pressure of from 1 to 5 lbs. per sq. in.

They are of the rotary or positive type and are especially adapted for furnishing blasts for cupolas, gas and oil burner furnaces, cement kilns, annealing and smelting furnaces, steel converters, puddling furnaces, forges using either coal, oil or gas, for agitating and aerating liquids, for cooling processes and for all work requiring blasts up to 5 lbs. per sq. in. Used as exhausters, they create the necessary vacuum for pneumatic conveying service, for the manufacture of coal gas and for many other applications.

One of the principal advantages of this design of blower is that the pulsations so common in many types of positive blowers are almost unnoticeable in the Sturtevant high pressure blower. This is especially valuable when the blower is to be used in the manufacture of gas or in producing blasts for use in gas or oil furnaces.

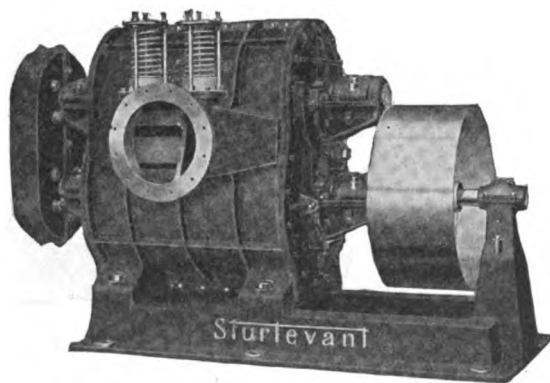
On either side of casing is an opening flanged and fitted for standard gas pipe fittings.

As the casing is symmetrical, rotors may be operated in either direction, and the openings in the casing are thereby used either as a discharge or inlet, depending upon the direction of rotation of the rotors.

The rotors never come in contact, and so ample is the clearance between the 2 rotors and between the rotors and casing that it is practically impossible to cause them to come in contact.

No internal lubrication is necessary, entirely eliminating the tendency present in some positive blowers to force the oil used in their internal lubrication through the pipes, causing trouble in many classes of work.

High grade construction and materials, accurate workmanship and simplicity of design make this blower capable of continuous operation for long periods with little attention.



STURTEVANT HIGH PRESSURE BLOWER
With pulley and outboard bearing

Size	Capacities						Extreme dimensions, in.		
	R. p. m.	C. f. m.	H. p.	R. p. m.	C. f. m.	H. p.	Inside diam. inlet, in.	Inside diam. outlet, in.	Length
00	375	5	.2	800	25	1.5	11 1/2	1 1/2	17
0	300	30	.5	700	85	1.5	21 1/2	2 1/2	26
1	250	70	1.3	600	200	3.0	30	3 1/2	31 1/4
2	300	170	2.6	500	300	4.4	44	4 1/2	38 1/4
3	250	230	3.4	475	480	7.4	44	4 1/2	48 1/2
4	300	425	5.5	450	650	8.6	66	6 1/2	58 1/2
5	260	575	7.2	450	1050	13.5	88	8 1/2	59
6	300	1020	12.3	425	1540	18.0	1010	10	67 1/4
7	265	1500	17.0	410	2400	28.0	1010	10	75
8	260	2300	26.0	370	3400	39.0	1212	12	84
9	250	3300	37.0	350	4700	54.0	1616	16	94
10	250	4600	51.0	320	6000	69.0	1616	16	103 1/4
11	215	5800	65.0	300	8200	95.0	2020	20	120 1/4
12	190	8000	90.0	255	11000	125.0	2424	24	136 1/2
13	160	11000	125.0	220	15000	170.0	3030	30	159 1/8

Sturtevant Reversible Slow Speed Planing Mill Exhausters (Design 2).

These exhausters are the latest type of convertible, slow speed, low power exhausters for planing mill work, being especially adapted for collecting and conveying shavings, sawdust, dust and all material that may be conveyed in a current of air.

Sturtevant reversible planing mill exhausters will convey more material at a smaller expenditure of power than those of any other manufacture.

They are designed according to correct principles and embody the results of over 50 years' experience in the manufacture of fans.

They are exceptionally sturdy in appearance, rugged in construction and meet the demand for fans which can *readily be changed to either hand or to any direction of discharge.*

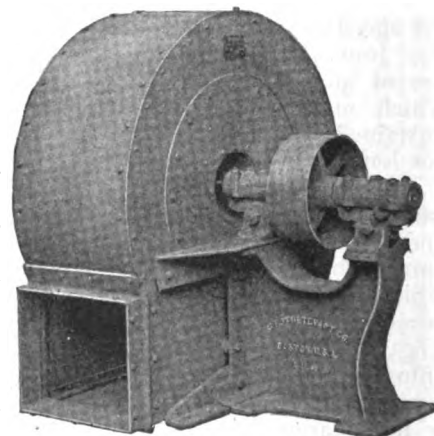
The cone on the pulley side of the housing and the inlet ring are of cast iron, secured to the side sheets by tap bolts threaded into annular steel rings on the inside of the housing side sheet and riveted to it. This construction clamps the side sheet securely to the supporting castings besides facilitating the interchangeability of discharge.

The roundabout corner angles are on the inside of the housing and bolted to roundabout sheet so that the bolts are readily accessible.

The blast wheel has eighteen arms made of steel tees cast in a solid iron hub. A steel back plate is used to stiffen the blades. This construction together with careful balancing of the parts insures a strong wheel free from objectionable vibrations.

The bearings are self-adjustable and self-lubricating, having a large oil reservoir with brush feed, and are lined with Sturtevant white metal, hammered in. In fact, these bearings are the same pattern which this company has found satisfactory for so many years in their standard steel plate planing mill exhausters.

The long experience of the Sturtevant engineers makes them particularly competent to design and install the most efficient conveying and dust collecting systems to meet all requirements.



DESIGN NO. 2, REVERSIBLE SLOW SPEED, LOW POWER PLANING MILL EXHAUSTER

DIMENSIONS AND WEIGHTS, STURTEVANT REVERSIBLE PLANING MILL EXHAUSTERS

Size	Outside dimensions			Weight, lbs.	Size	Outside dimensions			Weight, lbs.
	Outside diam. inlet, in.	Outlet, in.	Pulley diam. face, in.			Outside diam. inlet, in.	Outlet, in.	Pulley diam. face, in.	
SINGLE									
30	16 $\frac{3}{4}$	10 $\frac{7}{8}$ x 10	9 x 5 $\frac{1}{4}$	50	24 $\frac{7}{8}$	18 $\frac{1}{8}$ x 16 $\frac{1}{4}$	13 x 8 $\frac{1}{4}$	1127	
35	18 $\frac{1}{4}$	12 $\frac{3}{4}$ x 12	10 x 5 $\frac{1}{2}$	460	55	27	19 $\frac{3}{8}$ x 17 $\frac{3}{4}$	15 x 8 $\frac{1}{4}$	1343
40	20 $\frac{3}{4}$	14 $\frac{3}{4}$ x 12 $\frac{3}{4}$	11 x 5 $\frac{1}{2}$	678	60	29	21 $\frac{1}{8}$ x 19 $\frac{1}{4}$	15 x 10 $\frac{1}{2}$	1567
45	22 $\frac{7}{8}$	16 $\frac{3}{4}$ x 14 $\frac{3}{4}$	13 x 5 $\frac{3}{8}$	882	70	34 $\frac{1}{8}$	25 $\frac{3}{8}$ x 21 $\frac{3}{4}$	16 x 11 $\frac{1}{4}$	2202
DOUBLE									
30	16 $\frac{3}{4}$	10 $\frac{7}{8}$ x 10	10 x 9	50	24 $\frac{7}{8}$	18 $\frac{1}{8}$ x 16 $\frac{1}{4}$	14 x 13	1868	
35	18 $\frac{1}{4}$	12 $\frac{3}{4}$ x 12	11 x 10	838	55	27	18 $\frac{5}{8}$ x 17 $\frac{3}{4}$	15 x 15	2277
40	20 $\frac{3}{4}$	14 $\frac{3}{4}$ x 12 $\frac{3}{4}$	12 x 11	1185	60	29	21 $\frac{1}{8}$ x 19 $\frac{1}{4}$	20 x 15	2645
45	22 $\frac{7}{8}$	16 $\frac{3}{4}$ x 14 $\frac{3}{4}$	13 x 13	1436	70	34 $\frac{1}{8}$	25 $\frac{3}{8}$ x 21 $\frac{3}{4}$	24 x 16	3616

Sturtevant Heating System.

In the Sturtevant system of heating, air is forced by a fan across steam coils and is then conveyed through ducts to all parts of the building to be heated. This arrangement is usually known as the fan or hot blast system.

AIR WASHING—Where air washing is required, the Sturtevant air washer can be installed in the Sturtevant heating system as shown on page 524.

ADVANTAGES OF THE FAN SYSTEM OF HEATING—The chief advantage of the fan system of heating over steam pipe or radiator systems is its lower cost.

Other advantages are: greater flexibility; more readily controlled and regulated; less trouble to maintain; ventilates as well as heats; much less radiating surface required; humidity can be controlled; no undesirable steam piping to disfigure building.

ADAPTABILITY TO AVAILABLE SPACE—A distinctive advantage of Sturtevant heaters is that they can be installed in floor space of any dimensions and with ceiling of any height. The total lineal feet of 1-in. pipe necessary to heat any building can readily be arranged in a heater of dimensions that will be suitable for the room in question.

Types of Sturtevant Heaters and Their Uses.

LONDON HEATER—Used where it is desired to have perfect control over the temperature of hot air supplied, regardless of outside weather conditions. Adapted to public building work, schools, etc. Individually controlled valves are provided for every section.

RETURN BEND HEATER—This type provides for individual control of sections. It may be used for the same service as the other types, the chief difference being that it has a larger free area, and sections with greater surface are built in this type than in the other types.

MITRE TYPE HEATER—Provides for individual control of sections, and either steam or hot water may be used.

Very satisfactory for all conditions of service and, on account of its superior construction, is the most expensive Sturtevant heater made.

Arrangements on Hot Blast Apparatus.

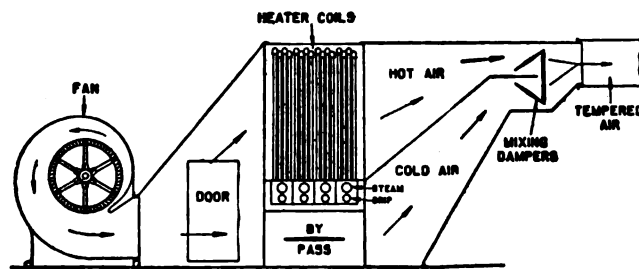
Sturtevant heaters may be installed in either "draw-through" or "blow-through" arrangement, depending upon the conditions of service.

In the former, air is drawn over the heater coils, passes through the fan and is forced through the distributing ducts. This is the usual arrangement where air of one temperature is required and is generally adopted in shop and factory heating.

Where air is required at more than one temperature, a "blow-through" rig is necessary. In this arrangement, air enters the fan first and is then blown over the heater coils. Dampers and a by-pass in the heater casing are so arranged that some or all of the air from the fan may be diverted around the heater and through a cold air duct (see illustration following).

A "draw-through" rig usually requires less space than a "blow-through" of the same capacity. The "draw-through" arrangement is shown in the air washer section on page 524.

Where one section is not large enough, double width, 2-way and 3-way heaters are installed.



BLOW-THROUGH HEATER WITH BY-PASS AND MIXING DAMPERS

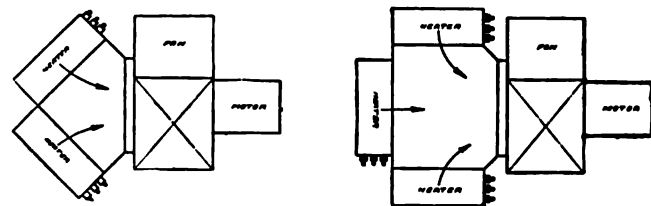
In some outfits, by-pass is above the coils

Piping and Bases of Sturtevant Heater Sections.

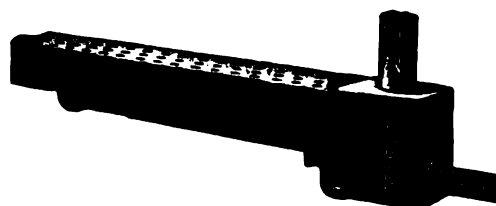
PIPING—All Sturtevant heater sections are made of an extra heavy 1-in. piping, spaced on $2\frac{1}{8}$ - or $2\frac{3}{4}$ -in. centers.

BASES—The bases of the London and Mitre type sections are of cast iron, amply strong to withstand severe service. Being corrugated on the sides, the bases fit easily into one another and save floor space. The Sturtevant is the only heater made with a corrugated base.

The ends of the corrugated bases are so made that where a double width section is needed, 2 sections can be placed end to end and no extra space is left between the pipes of the 2 sections.



Two-way Heater Three-way Heater
SHOWING ARRANGEMENTS WHICH GIVE GREATER FREE AREA THAN CAN BE SECURED BY USING SINGLE WIDTH OR DOUBLE WIDTH HEATERS



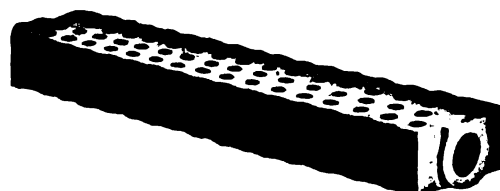
BASE OF LONDON HEATER

Hole in head accommodates through-bolt for binding sections together



BASE OF RETURN BEND HEATER

A, air vent; B, bleeder



DRIP BASE OF MITRE TYPE HEATER

Supply base is identical except that large tapping is in the back

The base of the return bend heater is of cast iron but is not corrugated. Each section is an individual unit and has supply and drip connections valved independently of the other sections.

SIZES—With the exception of the return bend heater, all bases for 1-in. pipe are made in 2 widths: 2 rows and 4 rows of pipes.

The 2-row sections are generally used in connection with a number of 4-row sections, making an intermediate depth possible.

Length of bases will be found on page 521.

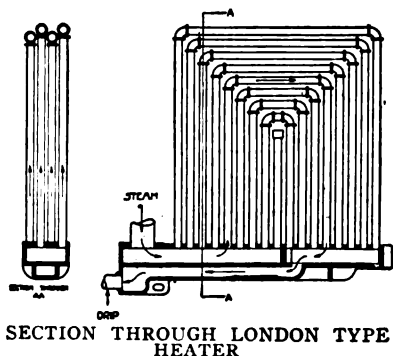
London Type Heaters.

These heaters are made with a steam supply in the top portion of the base that extends beyond the steel plate jacket that encloses the heater. The drip is tapped into the end of the extended portion of the base. With this arrangement each 2-row or 4-row section can be individually controlled.

The extended portion of the base permits tapping a supply connection large enough to permit the use of low pressure or exhaust steam without restricting the flow or causing the drop in pressure.

The drip is taken from a drainage pocket in the bottom of the section, thus complete drainage is assured.

The pipes are placed $2\frac{1}{8}$ in. apart, making a section with the free area about 5.5% of the heating surface.



How to Specify London Type Heaters.

There shall be furnished a pipe coil heater of the type, having lineal ft. of in. pipe and sq. ft. of free area. Heater shall be composed of 4-row sections and 2-row sections. All sections shall have a nominal length of ft., and nominal height of pipes shall be ft. in.

A sheet steel casing of No. gage shall be furnished, and this shall be suitably braced and stiffened.

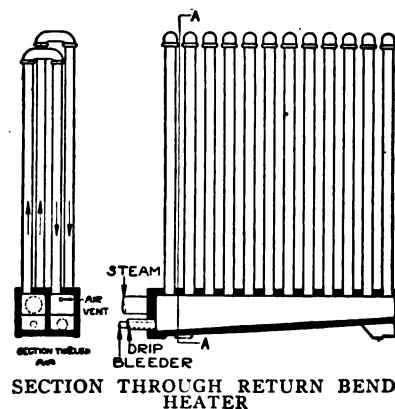
Return Bend Heaters.

The pipes in the return bend heaters are spaced $2\frac{3}{4}$ in. apart as compared to $2\frac{1}{8}$ in. spacing in the other Sturtevant heaters. This wider spacing results in a greater proportion of free area to total area, so that with the same air velocity and steam temperature a greater number of rows of pipes is required to result in the same temperature rise as in the other Sturtevant heaters. But with the same amount of heating surface, with air under given conditions and steam of given temperature, the same temperature rise in air will result in all Sturtevant heaters. The number of rows of pipes must not be confused with the amount of heating surface, as for equivalent-size sections of the same number of rows there is less heating surface in the return bend type as compared to the other types.

The base of this heater is divided by a vertical partition, which separates the supply side from the drip side. As condensation takes place in the supply side as well as in the drip side, a separate drip connection called a bleeder is provided. And for best results, the bleeder connections should be led to a trap separated from the main return trap.

Each pair of vertical pipes is joined at the top with a malleable return-bend fitting. This construction is of superior design, inasmuch as it results in two less joints at the top of the pipe as compared to the method of joining the pipe by two separate elbows and a short nipple.

For sizes, dimensions, temperature rise curves, heating surfaces, free area, and designing notes, see pages 519-23.



How to Specify Return Bend Heaters.

There shall be furnished a pipe coil heater of the type, having lineal ft. of in. (1 or $1\frac{1}{4}$ in.) pipe and sq. ft. of free area. Heater shall be composed of 4-row sections. All sections shall have a nominal length of ft., and nominal height of pipes shall be ft. in.

A sheet steel casing of No. gage shall be furnished, and this shall be suitably braced and stiffened.

Mitre Type Heaters.

In this type, there are 2 bases to each section. Vertical and horizontal pipes form a mitre. The steam (or hot water) is admitted to the vertical base and the water of condensation is drained from the horizontal base.

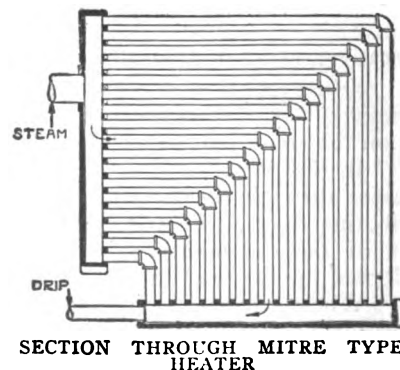
Mitre sections may be used with hot water as a heating medium because the flow of water is downward, due to the drop in temperature of the water.

When it is not advisable to depend on gravity circulation, a pump may be used to force the water through the coils.

The relative lengths of vertical and horizontal pipes vary greatly, and depend on the floor space and headroom available. If horizontal pipes are longer than 10 ft., a sheet steel diaphragm is used in the center of the pipes to keep them properly spaced and to prevent sagging.

Each Mitre section is controlled by individual supply and drip valves.

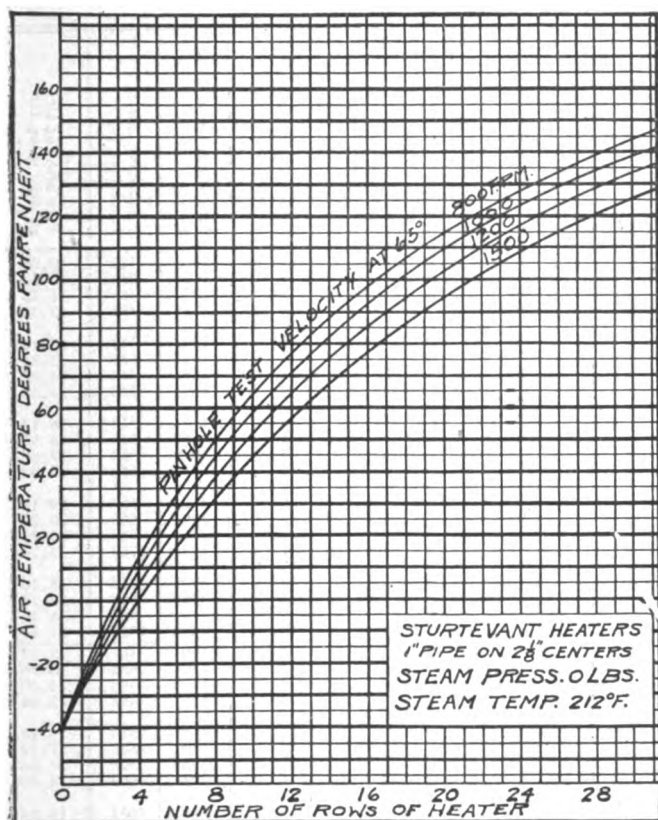
For sizes, dimensions, temperature rise curves, heating surfaces, free areas and designing notes, see pages 519-23.



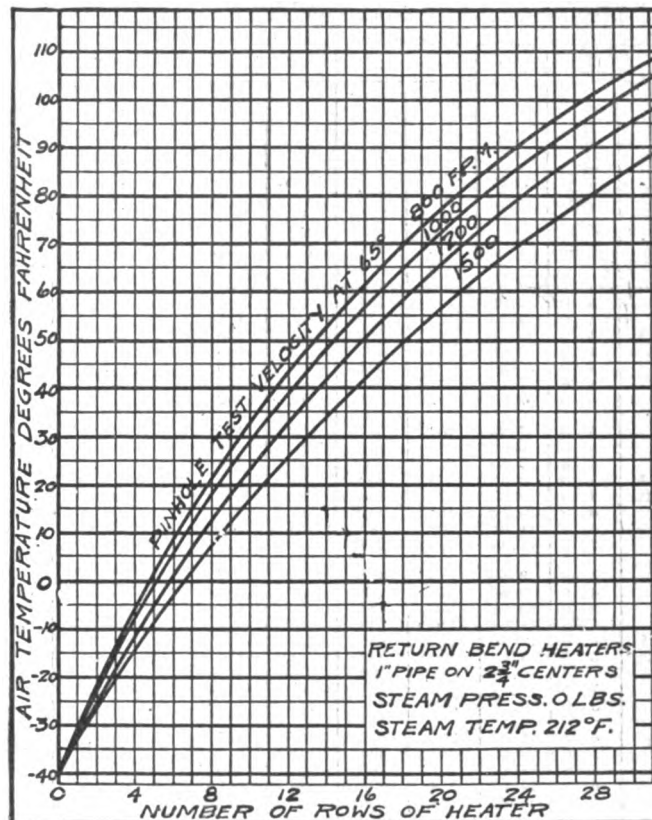
How to Specify Mitre Type Heaters.

There shall be furnished a pipe coil heater of the type, having lineal ft. of in. (1 or $1\frac{1}{4}$ in.) pipe and sq. ft. of free area. Heater shall be composed of 4-row sections and 2-row sections. All sections shall have a nominal length of ft., and nominal height of pipes shall be ft. in.

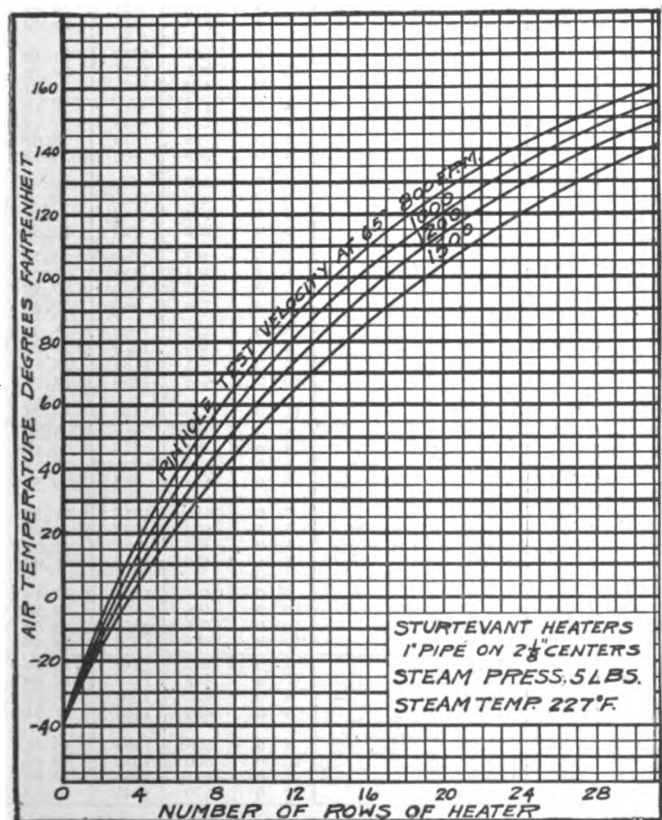
A sheet steel casing of No. gage shall be furnished, and this shall be suitably braced and stiffened.



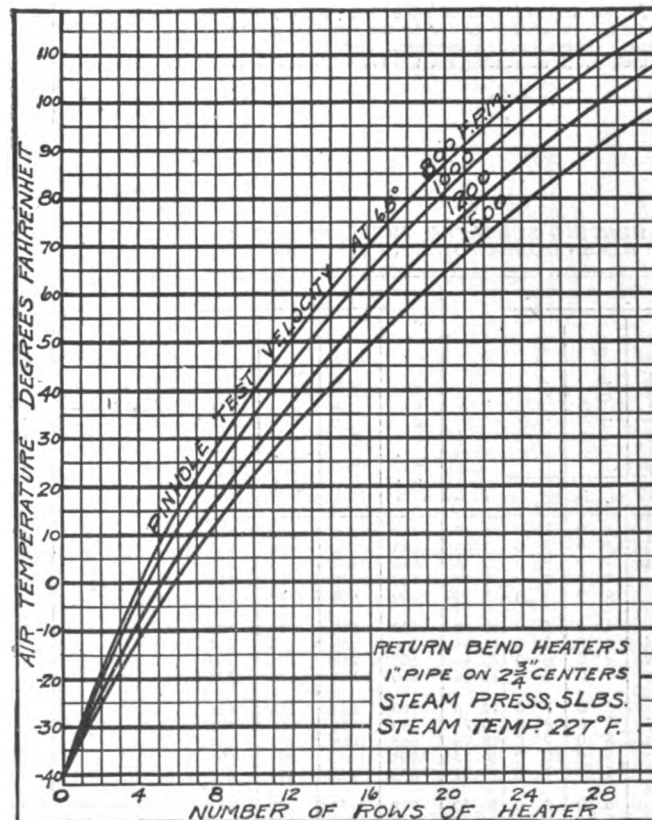
For London and Mitre Type Heaters
Latent heat, 966 B.t.u.



For Return Bend Heaters
Latent heat, 966 B.t.u.



For London and Mitre Type Heaters
Latent heat, 955 B.t.u.



For Return Bend Heaters
Latent heat, 955 B.t.u.

TEMPERATURE RISE CURVES

With given initial and final air temperatures, air velocity and steam pressure, first find the number of rows to give final temperature directly from chart. Next find the number of rows to heat air from minus 40 to actual initial temperature; the difference between these numbers will give the number of rows required. Given the number of rows, to find final temperature, first find number of rows to heat from minus 40 to initial temperature, and add to this the number of rows given, then find actual initial temperature with this number of rows

HEATING SURFACES, FREE AREAS AND DIMENSIONS OF LONDON HEATERS

Size of section		Free area for air passage in sq. ft.	4-row section		2-row section	
Nominal length of base	Nominal height of pipes		Heating surface, sq. ft.	Equivalent lineal ft. of 1-in. pipe	Heating surface, sq. ft.	Equivalent lineal ft. of 1-in. pipe
ft.	in.					
3 ft.	3 0	3.85	67	194	33	97
	3 6	4.52	79	230	40	115
	4 0	5.21	92	266	46	133
	4 6	5.76	102	296	51	148
	5 0	6.46	114	332	57	166
	5 6	7.12	127	368	63	184
4 ft.	6 0	7.67	137	398	69	199
	3 6	5.94	108	312	54	156
	4 0	6.85	124	360	62	180
	4 6	7.60	138	400	69	200
	5 0	8.46	155	450	78	225
	5 6	9.37	172	498	86	249
5 ft.	6 0	10.10	186	540	93	270
	6 6	11.01	202	588	101	294
	7 0	11.88	220	638	110	319
	4 0	8.50	156	454	78	227
	4 6	9.45	174	506	87	253
	5 0	10.51	196	568	98	284
6 ft.	5 6	11.68	216	628	108	314
	6 0	12.56	234	680	117	340
	6 6	13.65	256	742	128	371
	7 0	14.75	277	804	138	402
	7 6	15.75	294	854	147	427
	8 0	16.81	316	916	158	458
7 ft.	4 6	11.29	210	610	105	305
	5 0	12.60	236	684	118	342
	5 6	13.89	262	760	131	380
	6 0	14.96	283	822	142	411
	6 6	16.32	309	896	155	448
	7 0	17.64	334	970	167	485
8 ft.	7 6	18.75	356	1032	178	516
	8 0	20.07	382	1106	191	553
	8 6	21.18	403	1168	201	584
	9 0	22.50	428	1242	214	621

NOTE—Actual height of top of heater above floor is obtained by adding 12 in. to the nominal height of pipes. This allows for the base. Free area is approximately 5.5% of heating surface for 4-row sections.

HEATING SURFACES, FREE AREAS AND DIMENSIONS OF MITRE TYPE HEATERS

Size of section				Free area for air passage in sq. ft.	4-row section		2-row section		
Nominal length of base	Nominal length of pipes		Nominal height of pipes		Heating surface, sq. ft.	Equivalent lineal ft. of 1-in. pipe	Heating surface, sq. ft.	Equivalent lineal ft. of 1-in. pipe	
	ft.	in.							ft.	in.
3 ft.	3	0	5	0	6.35	123	356	62	178
	3	6	5	6	7.01	135	392	68	196
	4	0	6	0	7.56	146	422	73	211
	4	6	5	0	7.67	148	428	74	214
4 ft.	4	0	5	6	8.33	160	464	80	232
	4	6	6	0	10.10	196	570	98	285
	4	6	7	0	11.84	230	668	115	334
	4	6	8	0	13.44	262	758	131	379
5 ft.	5	0	6	0	11.84	230	668	115	334
	5	0	7	0	14.76	290	842	145	421
	5	0	8	0	16.74	330	956	165	478
	5	0	9	0	18.75	368	1068	184	534
6 ft.	6	0	10	0	20.73	408	1182	204	591
	6	0	7	0	16.91	333	966	166	483
	6	0	8	0	20.00	398	1154	199	577
	6	0	9	0	22.43	445	1290	223	645
6 ft.	6	0	10	0	24.82	492	1426	246	713
	6	0	11	0	27.40	543	1576	272	788
	6	0	12	0	29.80	590	1712	295	856

NOTE—On account of base, actual height is approximately 8½ in. greater than nominal height of pipes. Free area is approximately 5.2% of heating surface for 4-row sections.

HEATING SURFACES, FREE AREAS AND DIMENSIONS OF RETURN BEND HEATERS

Size of section		Heating surface, sq. ft.	Equivalent lineal ft. of 1-in. pipe	Free area for air passage in sq. ft.
Nominal size and length of base	Nominal height of pipes			
ft.	in.			
No. 12 2 ft. 11½ in.	2 9	48	139	4.80
	3 0	52	151	5.19
	3 3	56	163	5.58
	3 6	61	175	5.97
	3 9	65	187	6.36
	4 0	69	199	6.75
	4 3	73	211	7.14
	4 6	77	223	7.53
	4 9	81	235	7.92
	5 0	85	247	8.31
	5 3	90	259	8.70
	5 6	94	271	9.09
No. 15 3 ft. 7¾ in.	5 9	98	283	9.48
	6 0	102	296	9.87
	6 6	110	320	10.65
	7 0	119	345	11.43
	2 9	60	174	5.80
	3 0	65	189	6.27
	3 3	70	204	6.74
	3 6	76	219	7.21
	3 9	81	234	7.68
	4 0	86	249	8.15
	4 3	91	264	8.62
	4 6	96	279	9.09
No. 18 4 ft. 3¾ in.	4 0	101	294	9.56
	5 0	107	309	10.03
	5 3	112	324	10.50
	5 6	117	339	10.97
	5 9	122	354	11.44
	6 0	127	369	11.91
	6 6	138	399	12.85
	7 0	148	429	13.79
	7 6	158	459	14.73
	8 0	169	490	15.67
	2 9	72	207	6.93
	3 0	78	227	7.49
No. 22 5 ft. 2½ in.	3 3	85	245	8.05
	3 6	91	263	8.61
	3 9	97	281	9.17
	4 0	103	299	9.73
	4 3	109	317	10.29
	4 6	116	335	10.85
	4 9	122	353	11.41
	5 0	128	371	11.97
	5 3	134	389	12.53
	5 6	140	407	13.09
	5 9	147	425	13.65
	6 0	153	443	14.21
No. 25 5 ft. 10¾ in.	6 6	165	479	15.33
	7 0	178	515	16.45
	7 6	190	551	17.57
	8 0	202	587	18.69
	8 6	215	623	19.81
	9 0	227	659	20.93
	3 0	95	275	8.94
	3 3	103	297	9.61
	3 6	110	319	10.28
	3 9	118	341	10.95
	4 0	125	363	11.62
	4 3	133	385	12.29
No. 28 6 ft. 7¾ in.	4 6	141	407	13.96
	4 9	148	429	14.63
	5 0	156	451	15.30
	5 3	163	473	15.97
	5 6	171	495	16.64
	5 9	179	517	17.31
	6 0	186	539	17.98
	6 6	201	582	19.32
	7 0	216	626	20.66
	7 6	232	670	22.00
	8 0	247	714	23.34
	8 6	262	758	24.68
No. 31 7 ft. 3¾ in.	9 0	277	802	26.02
	10 0	307	890	28.70
	5 0	125	363	11.62
	5 3	133	385	12.29
	5 6	141	407	13.96
	5 9	148	429	14.63
	6 0	156	451	15.30
	6 3	163	473	15.97
	6 6	171	495	16.64
	6 9	179	517	17.31
	7 0	186	539	17.98
	7 6	201	582	19.32
No. 36 8 ft. 5½ in.	8 0	216	626	20.66
	8 6	232	670	22.00
	9 0	247	714	23.34
	9 6	262	758	24.68
	10 0	277	802	26.02
	10 6	307	890	28.70
	5 0	125	363	11.62
	5 3	133	385	12.29
	5 6	141	407	13.96
	5 9	148	429	14.63
	6 0	156	451	15.30
	6 3	163	473	15.97
No. 40 9 ft. 4½ in.	6 6	171	495	16.64
	6 9	179	517	17.31
	7 0	186	539	17.98
	7 6	201	582	19.32
	8 0	216	626	20.66
	8 6	232	670	22.00
	9 0	247	714	23.34
	9 6	262	758	24.68
	10 0	277	802	26.02
	10 6	307	890	28.70
	5 0	125	363	11.62
	5 3	133	385	12.29

All sections contain 4 rows.
The over all height of a heater above the bottom of the base is determined by adding to the nominal height of pipes, one of the following constants:

For sizes Nos. 12, 15 and 18, add 8½ in.

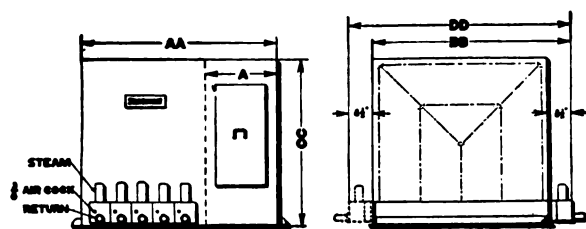
For sizes Nos. 31 and 36, add 9¾ in.

For sizes Nos. 22, 25 and 28, add 9¾ in.

For size No. 40, add 10¼ in.

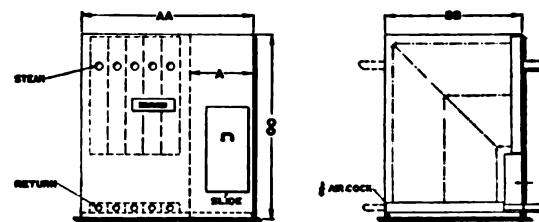
This additional height is due to space occupied by base and by elbow at the top.

NOTE—Free area is approximately 9% of heating surface. The percentage varies slightly for every heater.



DIMENSIONS OF LONDON HEATERS

Size of section		A*		AA	BB	CC	DD
Nominal length of base	Nominal height of pipes	Single	Double				
3 ft.	3 0	21	24	4.25N ₂ + 7.75N ₄ N ₂ = number of 2-row sections N ₄ = number of 4-row sections	46 1/4	48	91 3/4
	3 6	21	24			54	
	4 0	21	24			60	
	4 6	21	24			66	
	5 0	21	24			72	
	5 6	21	24			78	
4 ft.	3 6	21	24		58 1/4	54	116 3/4
	4 0	21	24			60	
	4 6	21	24			66	
	5 0	21	24			72	
	5 6	21	24			78	
	6 0	21	24			84	
5 ft.	4 0	21	27		71 3/4	60	142 1/4
	4 6	24	27			66	
	5 0	24	27			72	
	5 6	24	27			78	
	6 0	24	30			84	
	6 6	27	30			90	
6 ft.	4 6	24	27		84 3/4	66	167 3/4
	5 0	24	27			72	
	5 6	27	30			78	
	6 0	27	30			84	
	6 6	30	33			90	
	7 0	30	33			96	



DIMENSIONS OF MITRE TYPE HEATERS

Size of section		A*		AA	BB	CC
Nominal length of base	Nominal height of pipes	Single	Double			
3 ft.	3 0	21	24	4.25N ₂ + 7.75N ₄ N ₂ = number of 2-row sections N ₄ = number of 4-row sections	45 3/4	67 1/2
	3 6	21	27			73 3/4
	4 0	24	27			79 1/4
	4 6	24	27			85 1/4
	5 0	24	27			91 1/4
	5 6	24	27			97 1/4
4 ft.	4 0	24	27		58 1/4	79 1/4
	4 6	27	30			85 1/4
	5 0	27	30			91 1/4
	5 6	27	30			97 1/4
	6 0	30	33			103 1/4
	6 6	30	33			109 1/4
5 ft.	5 0	27	33		70 3/4	92
	5 6	30	33			98 1/4
	6 0	30	33			104 1/4
	6 6	30	33			110 1/4
	7 0	33	36			116 1/4
	7 6	33	36			122 1/4
6 ft.	6 0	33	36		83 1/2	103 1/2
	6 6	33	36			109 1/2
	7 0	36	39			115 1/2
	7 6	36	39			121 1/2
	8 0	39	42			127 1/2
	8 6	39	42			133 1/2

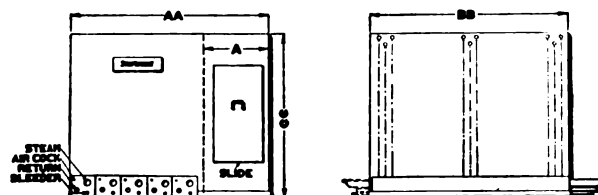


DIAGRAM OF RETURN BEND HEATERS

DIMENSIONS OF RETURN BEND HEATERS

Size of section				A *				BB				Size of section				A *				BB				Size of section				A *				BB																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
Nominal size and length of base		Nominal height of pipes		Single **		Double §		AA		Single **		Double §		CC		Nominal size and length of base		Nominal height of pipes		Single **		Double §		AA		Single **		Double §		CC		Nominal size and length of base		Nominal height of pipes		Single **		Double §		AA		Single **		Double §		CC																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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Data for Design and Calculation of Sturtevant Heating Systems.

HEAT LOSSES—The reduction of temperature within buildings is due to (1) transmission of heat through roof, windows, walls, doors, floors, etc.; (2) direct leakage of hot air through cracks, open spaces, etc.

The material, thickness and method of construction of the walls, also exposure and relative amount of glass, determine the rapidity of heat loss.

Transmission Losses—To calculate the heat loss by transmission, it is customary to use the coefficients given in the table at the foot of this column. For example, when outside temperature is 20° and inside temperature is 70°, an 8-in. brick wall of 700 sq. ft. will have a heat loss by transmission of $.458 \times (70^\circ - 20^\circ) \times 700 = 16,030$ B.t.u. per hour.

Leakage Losses—In the average building, the leakage loss amounts to one air change per hour; that is, in a building of 200,000 cu. ft. content, the leakage is 200,000 cu. ft. per hour. This varies with different types of buildings and with the grade of construction; thus this figure must be used with judgment and the designer must know from experience whether or not the building is better or worse than the average, and make allowance accordingly.

It should also be noted that in large buildings the air change is less frequent than in smaller buildings of the same construction, as the ratio of the wall space to the total cubic contents is considerably less. The leakage loss must be taken into consideration in buildings where ventilation is not provided, that is, where the fan draws its supply of air from the

rooms. If, however, the fan uses fresh air from the outside, no such allowance is necessary, as this is included in the heat required to warm the air used for ventilation.

Calculation of Heat Losses by Transmission—Assume an industrial building under the following conditions, and calculate heat loss by transmission in this building as shown in table below:

TABULATION OF HEAT LOSSES BY TRANSMISSION

Wall	Material and area	Loss in B.t.u. per hour, no allowance for exposure	Total loss, including allowance for exposure
East wall 10,000 sq. ft. Exposure factor 15%	20 in. brick = 5,900 sq. ft. Single window = 4,000 sq. ft. Doors (35% glass) = 100 sq. ft.	$5,900 \times 50^\circ \times .23 = 67,800$ $4,000 \times 50^\circ \times 1.215 = 243,000$ $100 \times 50^\circ \times .57 = 2,850$ Total..... 313,650	$313,650 \times 1.15 = 360,000$
West wall 10,000 sq. ft. Exposure factor 25%	Same as east wall	Same as east wall	$313,650 \times 1.25 = 392,000$
North wall 5,000 sq. ft. Exposure factor 35%	20-in. brick = 3,050 sq. ft. Single window = 1,750 sq. ft. Doors (35% glass) = 200 sq. ft.	$3,050 \times 50^\circ \times .23 = 35,100$ $1,750 \times 50^\circ \times 1.215 = 106,000$ $200 \times 50^\circ \times .57 = 5,700$ Total..... 146,800	$146,800 \times 1.35 = 198,200$
South wall 5,000 sq. ft. Exposure factor 5%	Same as north wall	Same as north wall	$146,800 \times 1.05 = 153,500$
Roof 20,000 sq. ft. No exposure factor due to flat roof	5-ply tar and gravel roof on 2-in. plank = 17,000 sq. ft. Single skylight 20 x 150 = 3,000 sq. ft.	$17,000 \times 50^\circ \times .3 = 255,000$ $3,000 \times 50^\circ \times 1.215 = 182,000$ Total..... 437,000	= 437,000
Floor 20,000 sq. ft. Assume basement temperature 30°	Double floor = 20,000 sq. ft.	$20,000 \times 40^\circ \times .31 = 248,000$	= 248,000
Total loss by transmission.....			= 1,788,700

B.T.U. TRANSMITTED THROUGH MATERIALS PER SQUARE FOOT OF EXPOSED SURFACE PER DEGREE DIFFERENCE OF TEMPERATURE BETWEEN INSIDE AND OUTSIDE AIR

Material	Coefficient	Material	Coefficient
Brick wall		Double floor with lath and plaster ceiling beneath	.18
4 in. thick	.66	Double floor without lath and plaster ceiling beneath	.31
8 in. thick	.46	Dirt floor—no covering	.23
12 in. thick	.32	Wood floor on dirt	.14
16 in. thick	.26	Galvanized iron siding	1.21
20 in. thick	.23	"Book Tile" roof	.80
24 in. thick	.19	Slate roof	.80
Concrete or stone		2-in. plank	.40
12 in. thick	.49	8-in. brick wall lined with 4-in. hollow terra cotta blocks—plastered inside	.22
16 in. thick	.43	12-in. brick wall lined with 4-in. hollow terra cotta blocks—plastered inside	.18
20 in. thick	.38	16-in. brick wall lined with 4-in. hollow terra cotta blocks—plastered inside	.16
24 in. thick	.35	4-in. terra cotta roof—plastered	.42
Single window or skylight†	1.215	8-in. terra cotta roof—plastered	.26
Double window or skylight† (independent sashes)	.57	12-in. terra cotta roof—plastered	.20
Door (close fitting and not often open)†	.57	5-ply tar and gravel roof on 4-in. reinforced concrete slab	.64
Door, average (same as glass)	1.215		
Hy-Rib construction	1.0		
5-ply tar and gravel roofing on 2-in. plank	.30		
Frame walls, clapboard, paper, studding and plaster	.31		
Single wooden floor 1-in. thick with lath and plaster ceiling beneath	.27		

†In all cases measure the full opening for glass area or door area. To the values calculated from the constants as given above, add for north exposure 35%, south exposure 5%, east exposure 15%, west exposure 25%.

If the point of the compass is not known, 20% is added for each side instead of the above factors. If the roof is flat, or sloped only slightly, nothing is added for roof exposure.

If, however, it is quite steep, there is necessarily an increased heat loss due to exposure, and the factors above should be used for the roof as well. For a sawtooth roof, figure the two surfaces independently, using exposure factors in the same way as for walls.

†The 50° is the difference between inside temperature and lowest encountered outside temperature.

*In most cases doors are figured the same as glass.

Calculation of Heat Losses by Leakage—To the heat losses by transmission must be added the heat losses by leakage.

Assume the leakage in the building described above to be greater than average and equal to $1\frac{1}{2}$ air changes per hour.

This building has a total content of 1,000,000 cu. ft., the air leakage is $1\frac{1}{2}$ by 1,000,000 or 1,500,000 cu. ft. per hour, and this amount of air must be taken in at 20° and heated to 70° to replace the warm air lost by leakage.

The heat required to raise this air from 20° to 70° is found from the formula:

$$\text{B.t.u.} = \frac{\text{Cubic contents} \times \text{air changes} \times \text{temperature rise}}{55.2^*}$$

$$= \frac{1,000,000 \times 1\frac{1}{2} \times 50}{55.2} = 1,360,000 \text{ B.t.u. per hour}$$

These figures represent the heat loss due to leakage.

*1 B.t.u. will raise 55.2 cu. ft. of air 1° in temperature under standard conditions or will raise 1 cu. ft. 55.2° Fahr. In commercial work, either 55 or 56 is used in the above formula.

Total Heat Losses—The total heat losses for the building described above are 3,148,700 B.t.u. This amount of heat must be transmitted to the air supplied to the building.

RECOMMENDED VELOCITIES THROUGH HEATERS—In an industrial installation, the apparatus is designed to supply the necessary heat with as slight cost as possible; whereas in public building work, noise must be considered.

This latter is often the controlling factor and greatly affects the velocities used.

See following table for recommended velocities.

RECOMMENDED VELOCITIES THROUGH HEATERS

Number of 4-row sections deep	Public buildings, schools, office buildings, etc., velocity in ft. per min.	Factories, shops and industrial buildings, velocity in ft. per min.
1 to 3	1200	1500*
4 to 6	1000	1200
7 or more	800†	1200

*In factory work, velocities through the heater sometimes run as high as 1800, but this is done only under unusual conditions or where space limitations preclude the possibility of a heater of adequate size. It should be noted that high velocities greatly increase the power required to drive the fan and militate against an efficient system.

†Under special conditions, the velocities in public building work may run as low as 600 ft. per min. In drying work, where very high temperatures are sometimes necessary, extremely low velocities—even 300 ft. per min.—and deep heaters are installed.

DESIGN OF DISTRIBUTING SYSTEM—Piping—A well designed piping system should be laid out on a basis of equal friction loss per foot, and the following table is calculated on this basis. With this table it is possible to figure the sizes of pipe necessary when two or more pipes meet, or when a main splits into two or more branches.

*EQUALIZATION OF PIPES

Diam. in.	1 in.	2 in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.	14 in.	16 in.	18 in.	20 in.	24 in.
2	5.7	1														
3	15.6	2.8	1													
4	32.0	5.7	2.1	1												
5	55.9	9.9	3.6	1.7	1											
6	88.2	15.6	5.7	2.8	1.6	1										
7	130	22.9	8.3	4.1	2.3	1.5	1									
8	181	32.0	11.7	5.7	3.2	2.1	1.4	1								
9	243	43.0	15.6	7.6	4.3	2.8	1.9	1.3	1							
10	316	55.9	20.3	9.9	5.7	3.6	2.4	1.7	1.3	1						
11	401	70.9	25.7	12.5	7.2	4.6	3.1	2.2	1.7	1.3						
12	499	88.2	32.0	15.6	8.9	5.7	3.8	2.8	2.1	1.6	1					
13	609	108	39.1	19.0	10.9	7.1	4.7	3.4	2.5	1.9	1.2					
14	733	130	47.0	22.9	13.1	8.3	5.7	4.1	3.0	2.3	1.5	1				
15	871	154	55.9	27.2	15.6	9.9	6.7	4.8	3.6	2.8	2.1	1.6	1			
16		181	65.7	32.0	18.3	11.7	7.9	5.7	4.2	3.2	2.4	1.8	1.2			
17		211	76.4	37.2	21.3	13.5	9.2	6.6	4.9	3.8	2.8	2.1	1.6	1		
18		243	88.2	43.0	24.6	15.6	10.6	7.6	5.7	4.3	3.2	2.4	1.8	1.3	1	
19		278	101	49.1	28.1	17.8	12.1	8.7	6.5	5.0	3.8	2.8	2.1	1.5	1.1	
20		316	115	55.9	32.0	20.3	13.8	9.9	7.4	5.7	4.6	3.4	2.5	1.7	1.3	1
22		401	146	70.9	40.6	25.7	17.5	12.5	9.3	7.2	5.7	4.3	3.2	2.4	1.8	1.3
24		499	181	88.2	50.5	32.0	21.8	15.6	11.6	8.9	6.7	5.0	3.8	2.8	2.1	1.6
26		609	221	108	61.7	39.1	26.6	19.0	14.2	10.9	8.3	6.3	4.8	3.6	2.8	2.1
28		733	266	130	74.2	47.0	32.0	22.9	17.1	13.1	9.9	7.4	5.7	4.3	3.2	2.4
30		871	316	154	88.2	55.9	38.0	27.2	20.3	15.6	11.6	8.9	6.7	5.0	3.8	2.8
36			499	243	130	88.2	60.0	43.0	32.0	24.6	15.6	10.6	7.6	5.7	4.3	3.2
42			733	357	305	130	88.2	63.2	47.0	36.2	26.6	19.0	14.2	10.9	8.3	6.3
48			499	286	181	123	88.2	62.7	50.5	33.2	24.6	15.6	10.6	7.6	5.7	4.3
54			670	383	243	165	118	88.2	67.0	55.9	38.0	27.2	20.3	15.6	10.6	7.6
60			871	499	316	215	154	115	98.2	70.9	55.9	43.0	32.0	24.6	15.6	10.6

*This table gives the number of pipes of smaller size equal to one larger pipe. Thus one 10-in. pipe has the same air carrying capacity as 20.3 3-in. pipes for equal friction loss per lineal foot of pipe.

Size of Main Ducts and Velocities—In factory work, the air velocity in the main duct varies from 1500 to 2500 ft. per minute and averages about 2000 ft. This velocity decreases gradually until the air reaches the risers. In public building work, the velocities in main duct range from 1000 to 1500 ft. and average about 1200 ft. The velocities in any connection leading to a riser must be intermediate between that leaving the fan and that existing in the riser.

Knowing the volume of air handled and assuming the velocity, the cross-sectional area of the main ducts is secured from the formula:

$$\text{Area} = \frac{\text{Cubic feet of air passing through ducts per minute}}{\text{Velocity in feet per minute}}$$

Velocities in Vertical Flues—In public buildings, the usual velocities in risers leading to registers are from 400 to 800 ft. per minute. The larger the riser, the greater is the allowable velocity. The figures in the accompanying table will serve as a rough guide.

Velocities Through Registers—In public buildings, the factors of noise and drafts render it advisable to restrict velocities through net clear area of registers to not more than 500 ft. per minute; 325 and 500 ft. are usually considered the limiting values. The desirable velocity depends on the type of room and the location of the register, also the larger the register the higher is the velocity that it is safe to use. In most cases, an approximate velocity is assumed, and from this the size of the register is figured. This size may not conform to standard size registers, and the nearest should therefore be chosen. The range of velocities allows a considerable leeway, so that a register can be chosen to suit the structural requirements of the building. Floor registers are not recommended; but if used, velocities of from 175 to 275 ft. per minute should be adopted.

VELOCITIES THROUGH REGISTERS

Cu. ft. per min. of air supplied to room	Under 500	525 to 950	1,000 to 1,800	1,850 to 2,500
Velocity through net area of registers, ft. per min.	325 to 375	375 to 410	410 to 450	450 to 500

TO FIND SIZE OF MAIN STEAM CONNECTION AND RETURN PIPE—Determine the total amount of heat units necessary per hour to raise the air volume under consideration from its initial temperature entering the heater to its final temperature leaving the heater from the number of heat units required; find the number of pounds of steam necessary to supply the required amount of heat by dividing the heat units by latent heat of evaporation per pound of steam at the steam pressure used. The resulting figure will be the pounds of steam required and condensed per hour.

By consulting the table below, the proper size steam and drip main can be chosen with the pounds of steam known with gage pressures of 0, 5 and 80 lbs.

For other steam pressures, interpolation with sufficient accuracy can be made to determine the size mains required.

SIZES OF STEAM PIPES FOR STURTEVANT HEATERS IN INCHES

Lbs. steam condensed per hour	Steam pressure						Lbs. steam condensed per hour	Steam pressure					
	0 lbs.		5 lbs.		80 lbs.			0 lbs.		5 lbs.		80 lbs.	
	Supply	Return	Supply	Return	Supply	Return		Supply	Return	Supply	Return	Supply	Return
50	1.25	1.00	1.0	0.75	1.0	0.75	3000	6.0	3.0	4.5	2.5	3.0	2.0
100	1.5	1.00	1.25	1.00	1.0	0.75	3250	6.0	3.0	4.5	2.5	3.0	2.0
150	2.0	1.25	1.5	1.0	1.0	0.75							
200	2.5	1.5	2.0	1.25	1.25	1.0	3500	6.0	3.0	4.5	2.5	3.0	2.0
250	2.5	1.5	2.0	1.25	1.25	1.0	3750	7.0	3.5	4.5	2.5	3.0	2.0
300	2.5	1.5	2.0	1.25	1.25	1.0	4000	7.0	3.5	5.0	2.5	3.5	2.0
350	3.0	2.0	2.0	1.25	1.25	1.0	4250	7.0	3.5	5.0	2.5	3.5	2.0
400	3.0	2.0	2.5	1.5	1.25	1.0	4500	7.0	3.5	5.0	2.5	3.5	2.0
450	3.0	2.0	2.5	1.5	1.25	1.0	4750	7.0	3.5	5.0	2.5	3.5	2.0
500	3.0	2.0	2.5	1.5	1.5	1.0	5000	7.0	3.5	6.0	3.0	3.5	2.0
600	3.5	2.0	2.5	1.5	2.0	1.25	5250	7.0	3.5	6.0	3.0	3.5	2.0
700	3.5	2.0	2.5	1.5	2.0	1.25	5500	8.0	4.0	6.0	3.0	3.5	2.0
800	3.5	2.0	3.0	2.0	2.0	1.25	5750	8.0	4.0	6.0	3.0	3.5	2.0
900	4.0	2.0	3.0	2.0	2.0	1.25	6000	8.0	4.0	6.0	3.0	4.0	2.0
1000	4.0	2.0	3.0	2.0	2.0	1.25	7000	8.0	4.0	6.0	3.0	4.0	2.0
1250	4.5	2.5	3.0	2.0	2.0	1.25	8000	9.0	4.5	6.0	3.0	4.0	2.0
1500	4.5	2.5	3.5	2.0	2.5	1.5	9000	9.0	4.5	7.0	3.5	4.5	2.5
1750	5.0	2.5	3.5	2.0	2.5	1.5	10000	9.0	4.5	7.0	3.5	4.5	2.5
2000	5.0	2.5	4.0	2.0	2.5	1.5	11000	10.0	5.0	7.0	3.5	4.5	2.5
2250	5.0	2.5	4.0	2.0	2.5	1.5	12000	10.0	5.0	7.0	3.5	4.5	2.5
2500	6.0	3.0	4.0	2.0	3.0	2.0	13000	10.0	5.0	8.0	4.0	5.0	2.5
2750	6.0	3.0	4.5	2.5	3.0	2.0	14000	12.0	6.0	8.0	4.0	5.0	2.5
							15000	12.0	6.0	8.0	4.0	5.0	2.5

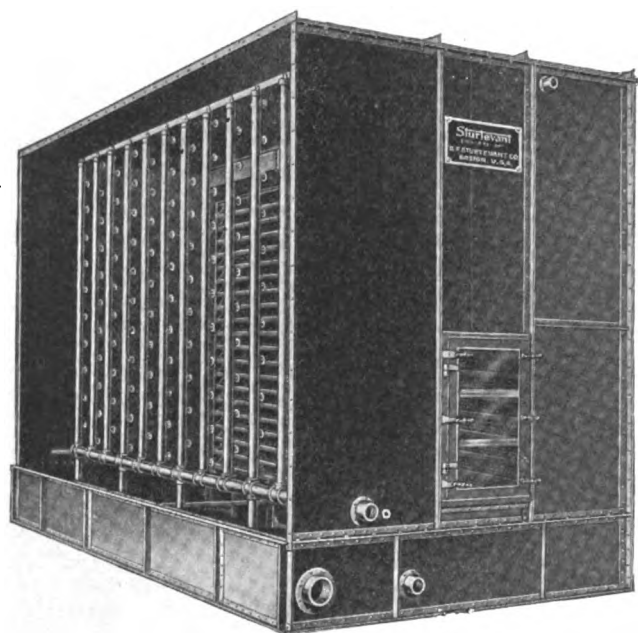
Sturtevant Air Washers.

TYPES—There are three standardized types of Sturtevant air washers:

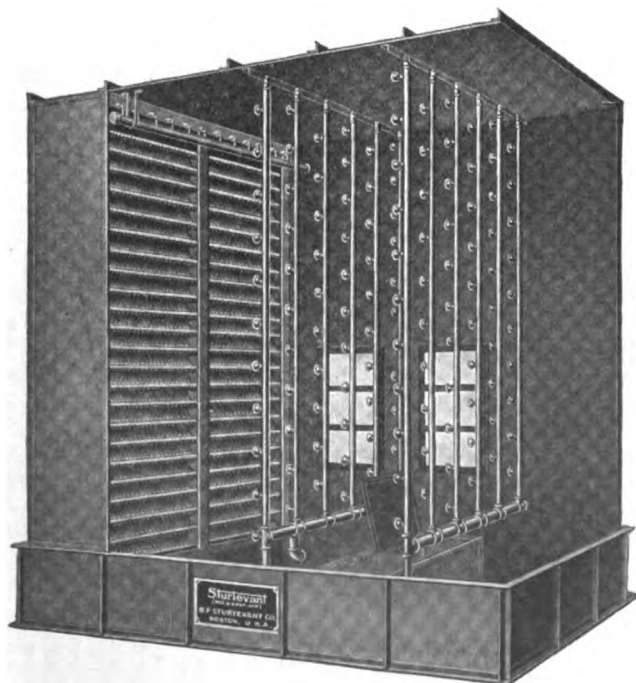
Type H—An efficient apparatus designed for all general work in washing, purifying and humidifying. This is the type recommended.

Type C—For more severe service than Type H, and will give the maximum cooling that is possible with re-circulated water; that is, it cools to practically the wet bulb temperature. This type is of similar design to Type H, but has an additional group of nozzles and a spray chamber 2 ft. longer.

Type S—Suited for all average air washing requirements in simple ventilating systems. Recommended where low cost is the primary consideration.



STURTEVANT TYPE H AIR WASHER



STURTEVANT TYPE C AIR WASHER WITH SIDE AND BAFFLES REMOVED

Note auxiliary spray pipe and method of attaching risers at top

Sturtevant Type H Air Washer.

Adapted for a very wide range of work. In comparison with competitive apparatus, it has the following advantages:

Tank constructed of No. 14-gage iron, thus it is heavier than that of most other makes. Has more than twice the strainer area of any other washer made and has ten times the area of some. Strainer area is hundreds of times greater than area of pump suction. No washer has its strainer designed for such easy removal for cleaning.

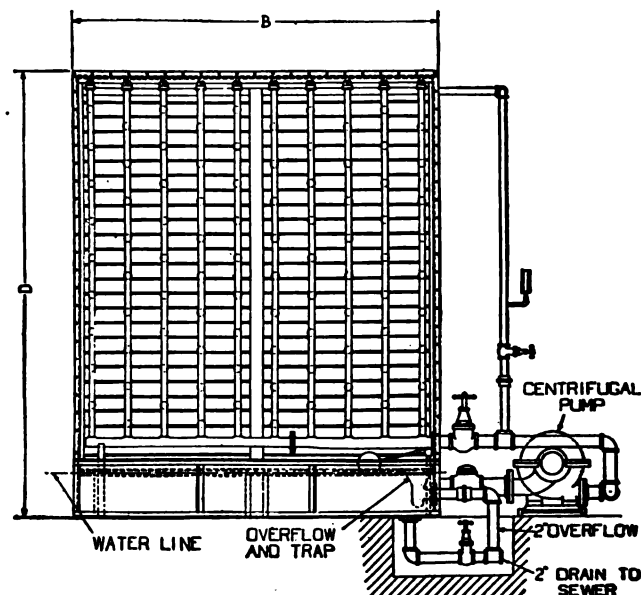
No other washer has as many spray nozzles for a given capacity. In the Sturtevant, there is one nozzle for every 325 cu. ft. of air, exclusive of the auxiliary nozzles washing the eliminators.

No other washer is furnished with trap in overflow. No other washer supplies as much as 5 gals. of water per minute for each foot of width of the eliminator plates for auxiliary washing.

No other washer is furnished with louvers where air enters. These louvers, or diffuser plates, eliminate eddy currents and prevent mist getting outside the spray chamber.

CLEANING EFFICIENCY—Sturtevant air washers have a guaranteed cleaning efficiency of 98%.

Type H will increase the relative humidity of the air and will cool 85% of the wet bulb temperature. Type C will cool to 100% of the wet bulb depression.



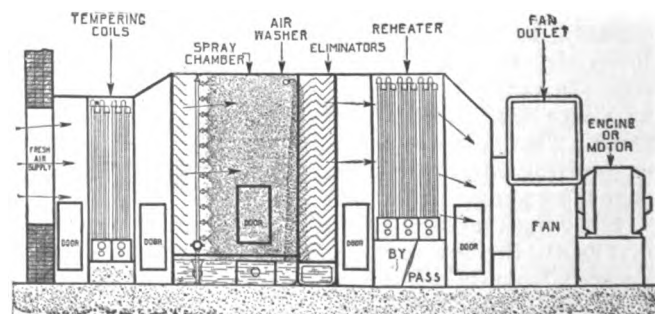
SIDE ELEVATION OF STURTEVANT TYPE H AIR WASHER

Dimensions B and D are given in third and fourth columns of table on following page. If pump is placed as indicated above, the additional width required for the pump and piping is as follows:

Pump discharge, in. 1½ 2 2½ 3 4 5

Minimum additional width, ft. and in. 2-6 3-0 3-6 4-0 4-6 5-0

The size of pump necessary for any size of air washer is given in column 5 of table on following page.



TYPICAL STURTEVANT HEATING, VENTILATING AND AIR CONDITIONING SYSTEM

How to Specify Air Washers.

GENERAL—There shall be furnished a by size air washer. Width of the washer shall be ft. in. by a height ft. in. The length of the washer in direction of flow of air shall be 7 ft.

The air washer shall have a capacity of cu. ft. of air per minute at a velocity of ft. per minute.

TANK—The tank shall be constructed of galvanized steel firmly braced and riveted to a rigid frame of galvanized angle irons. The plates of the tank shall be of No. 14-gage, the angle irons shall be 1½ by ½ in., and shall be spaced not more than 3 ft. apart. The top framing angles are to be punched 5 in. on centers for ¾-in. bolts, to secure the casing of the spray chamber to the tank. All rivet heads and seams shall be soldered over to make the tank watertight. The tank shall be fitted with a conical shaped overflow and trap which shall carry away the surplus water. The trap shall be provided to prevent the admission of sewer gas from the drain to the spray chamber.

CASING—The casing of the washer shall be made of No. 18 gage galvanized steel thoroughly braced with 1½ by 1½ by ½-in. galvanized angle irons, spaced not more than 3 ft. on centers. The seams and rivet heads are to be soldered so as to make the casing watertight. The casing shall be fitted with an 18 by 30-in. hinged door for access to spray chamber. This door shall consist of a rigid cast iron frame fitted with 3 glass panels. The door shall be hung on heavy hinges and shall clamp against a heavy rubber gasket inserted in the frame that carries the door. To make the door watertight, it shall be provided with 6 latches operating with a cam motion. The frame shall be arranged to collect any water that may drip from the door, and return same to tank, should the door be left unclamped.

ELIMINATORS—There shall be provided eliminator plates to remove the entrained moisture from the air after it has passed through the spray chamber. These eliminators shall be of the horizontal cut-lip type, arranged in tiers of not more than 5-ft. widths. The plates shall be not lighter than No. 22-gage steel and shall be galvanized after they have been cut and formed to shape. The plates are to be so arranged that a large part of the surface will become a washing surface for the removal of dust that impinges upon them. The eliminators shall consist of one group in the direction of the flow of air and be so arranged that the passageway between two plates shall be continuous.

SPRAY DEVICE—The spray device shall consist of a horizontal header placed across the bottom of the spray chamber and fitted with vertical risers so placed as to bring the spray nozzles, secured to the risers, in a plane parallel to and at a distance of 48 in. in front of the eliminators. The upper ends of the risers shall be capped with a special cap that will permit fastening to a galvanized angle iron across the top of the spray chamber, thus holding the risers securely in line. There shall be not less than one atomizing nozzle for each 325 cu. ft. of air washed per

minute. The nozzles shall be constructed entirely of bronze and shall have large waterways to prevent clogging of the nozzles by sediment carried in the water. The nozzle openings shall be not less than ⅛ in. in diameter, and shall discharge not more than 1¼ gal. per minute with 19-lb. pressure per sq. in. All piping and fittings shall be heavily galvanized. For washers of 8-ft. height and under, 1-in. risers shall be used; for washers over 8 ft. in height, 1¼-in. risers shall be used.

In addition to the atomizing nozzles, there shall be furnished a spray pipe across the top of the spray chamber adjacent to the eliminator plates. These nozzles shall be of the rain-spray type, shall be placed 6 in. on centers and shall have capacity to wash each foot of width of the eliminators with not less than 5 gal. of water per minute.

STRAINER—The straining device shall consist of a compartment extending the full width of the tank and shall be fitted with fine mesh copper wire screens arranged for easy removal for cleaning. There shall be 2 sq. ft. of strainer area for each foot in width of the tank. The top of the compartment shall be closed with hinged doors to prevent dirt washed from the air falling into it.

DIFFUSER PLATES—Across the front of the spray chamber shall be placed a series of louverlike diffuser plates to eliminate eddy currents and to prevent back splash of the spray washer. The washer shall be so designed that when the fan is not in operation, the spray water will be entirely retained within the spray chamber when the pump is running.

PUMP AND MOTOR—For re-circulating the spray water, there shall be furnished centrifugal pump of the double suction, split casing type. The pump to be furnished with a bronze impeller, bronze covered steel shaft and bronze bushings. The bearings shall be of the ring oiling type. Heavy cast iron base shall be furnished, upon which to mount the pump and motor. An oil groove shall extend completely around the cast iron base. The pump will be driven by the motor through an insulated flexible coupling.

The motor shall be of ... horsepower, capacity at ... r.p.m., and designed to operate on current of the following characteristics:

ACCESSORIES—Where necessary, a suitable starter will be furnished with the motor. A 5-in. diameter pressure gage, with white dial and black figures reading to 30 lbs., shall be furnished with the washer. A bronze float for maintaining constant water level in the tank will be furnished with the washer. The casing shall be fitted with a waterproof marine type fixture ready to receive the electric bulb to be furnished by others.

NOTE—Pipe connections will be fitted to the washers for connecting the pump suction and discharge to the strainer compartment and to the spray headers, respectively. The contractor is to furnish between the washer and pump, galvanized piping in accordance with the washer manufacturer's drawings.

DATA, STURTEVANT AIR WASHERS, TYPE H (ATOMIZING TYPE 7 FT. LONG)

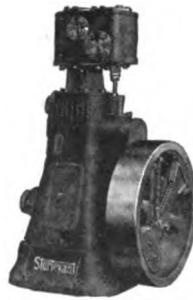
Capacity, cu. ft. per min.	Size, ft.		Total width, ft.	Total height, ft.	Pump discharge, in.	Gals. per min.	H.p. motor	R.p.m. pump		Capacity, cu. ft. per min.	Size, ft.		Total width, ft.	Total height, ft.	Pump discharge, in.	Gals. per min.	H.p. motor	R.p.m. pump	
	Width	Height									Width	Height							
3600—4500	3 x 3	3	3 3/4	4 1 1/2	1 1/2	38	2	1750		28800—36000	9 x 8	9	9 3/4	9	1 1/2	3	212	7 1/2	1150
4800—6000	3 x 4	3	3 3/4	5 1 1/2	1 1/2	46	3	1750		32400—40500	9 x 9	9	9 3/4	10	1 1/2	3	233	7 1/2	1150
6000—7500	3 x 5	3	3 3/4	6 1 1/2	1 1/2	53	3	1750		36000—45000	9 x 10	9	9 3/4	11	1 1/2	3	253	7 1/2	1150
7200—9000	3 x 6	3	3 3/4	7 1 1/2	1 1/2	61	3	1750											
6400—8000	4 x 4	4	4 3/4	5 1 1/2	1 1/2	58	3	1750		32000—40000	10 x 8	10	10 3/4	9	1 1/2	3	233	7 1/2	1150
8000—10000	4 x 5	4	4 3/4	6 1 1/2	1 1/2	68	3	1750		36000—45000	10 x 9	10	10 3/4	10	1 1/2	3	255	7 1/2	1150
9600—12000	4 x 6	4	4 3/4	7 1 1/2	2	77	3	1750		40000—50000	10 x 10	10	10 3/4	11	1 1/2	3	278	7 1/2	1150
11200—14000	4 x 7	4	4 3/4	8 1 1/2	2	87	3	1750											
8000—10000	5 x 4	5	5 3/4	5 1 1/2	1 1/2	71	3	1750		35200—44000	11 x 8	11	11 3/4	9	1 1/2	3	253	7 1/2	1150
10000—12500	5 x 5	5	5 3/4	6 1 1/2	2	83	3	1750		39600—49500	11 x 9	11	11 3/4	10	1 1/2	4	278	7 1/2	1150
12000—15000	5 x 6	5	5 3/4	7 1 1/2	2	94	5	1750		44000—55000	11 x 10	11	11 3/4	11	1 1/2	4	302	10	1150
14000—17500	5 x 7	5	5 3/4	8 1 1/2	2	105	5	1750											
16000—20000	5 x 8	5	5 3/4	9 1 1/2	2	116	5	1750		38400—48000	12 x 8	12	12 3/4	9	1 1/2	3	265	7 1/2	1150
18000—22500	5 x 9	5	5 3/4	10 1 1/2	2 1/2	128	5	1750		43200—54000	12 x 9	12	12 3/4	10	1 1/2	4	290	10	1150
										48000—60000	12 x 10	12	12 3/4	11	1 1/2	4	315	10	1150
12000—15000	6 x 5	6	6 3/4	6 1 1/2	2	97	5	1750		41600—52000	13 x 8	13	13 3/4	9	1 1/2	4	298	10	1150
14400—18000	6 x 6	6	6 3/4	7 1 1/2	2	110	5	1750		46800—58500	13 x 9	13	13 3/4	10	1 1/2	4	328	10	1150
16800—21000	6 x 7	6	6 3/4	8 1 1/2	2 1/2	124	5	1750		52000—65000	13 x 10	13	13 3/4	11	1 1/2	4	358	10	1150
19200—24000	6 x 8	6	6 3/4	9 1 1/2	2 1/2	136	5	1750		44800—56000	14 x 8	14	14 3/4	9	1 1/2	4	318	10	1150
21600—27000	6 x 9	6	6 3/4	10 1 1/2	2 1/2	150	5	1750		50400—63000	14 x 9	14	14 3/4	10	1 1/2	4	350	10	1150
24000—30000	6 x 10	6	6 3/4	11 1 1/2	2 1/2	162	5	1750		56000—70000	14 x 10	14	14 3/4	11	1 1/2	4	382	10	1150
16800—21000	7 x 6	7	7 3/4	7 1 1/2	2 1/2	127	5	1750		48000—60000	15 x 8	15	15 3/4	9	1 1/2	4	338	10	1150
19600—24500	7 x 7	7	7 3/4	8 1 1/2	2 1/2	142	5	1750		54000—67500	15 x 9	15	15 3/4	10	1 1/2	4	372	10	1150
22400—28000	7 x 8	7	7 3/4	9 1 1/2	2 1/2	157	5	1750		60000—75000	15 x 10	15	15 3/4	11	1 1/2	4	406	15	1150
25200—31500	7 x 9	7	7 3/4	10 1 1/2	2 1/2	172	7 1/2	1750		51200—64000	16 x 8	16	16 3/4	9	1 1/2	4	358	10	1150
28000—35000	7 x 10	7	7 3/4	11 1 1/2	3	187	7 1/2	1150		57600—72000	16 x 9	16	16 3/4	10	1 1/2	4	394	10	1150
										64000—80000	16 x 10	16	16 3/4	11	1 1/2	4	428	15	1150
19200—24000	8 x 6	8	8 3/4	7 1 1/2	2 1/2	154	5	1750		54400—68000	17 x 8	17	17 3/4	9	1 1/2	4	377	10	1150
22400—28000	8 x 7	8	8 3/4	8 1 1/2	2 1/2	173	7 1/2	1750		61200—76500	17 x 9	17	17 3/4	10	1 1/2	4	414	15	1150
25600—32000	8 x 8	8	8 3/4	9 1 1/2	3	192	7 1/2	1150		68000—85000	17 x 10	17	17 3/4	11	1 1/2	4	452	15	1150
28800—36000	8 x 9	8	8 3/4	10 1 1/2	3	211	7 1/2	1150											
32000—40000	8 x 10	8	8 3/4	11 1 1/2	3	229	7 1/2	1150											

Sturtevant Steam Engines.

Vertical engines, VS-7 and VS-8 types, are furnished for use as independent engines and for driving fans, blowers, exhausters and generators direct connected.

They are of the simple, single valve type and may be operated as automatic or throttling engines.

These two types differ only in their oiling arrangements. The VS-7 type has a gravity system and the VS-8 has forced lubrication.



STURTEVANT VERTICAL ENGINE

DATA, VS-7 AND VS-8 ENGINES
HIGH AND MEDIUM PRESSURE

Size	Max. r. p. m.	Horsepowers at varying steam pressures									
		60	70	80	90	100	110	120	130	140	150
4x5	500	4.0	5.0	5.5	6.5	7.5	8.5	9.5	10.0	11.0	12.0
5x5		6.0	7.5	9.0	10.5	12.0	13.0	14.5	16.0	17.5	18.5
6x5		9.5	11.5	13.5	15.0	17.0	19.0	21.0	23.0		
7x5		13.0	15.5	18.0	21.0	23.5					
5x6	475	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0	19.5	21.0
6x6		11.0	13.0	15.5	17.5	20.0	22.5	24.5	26.5	29.0	31.0
7x6		14.5	17.5	20.5	24.0	27.0	30.0	33.0	36.0		
8x6		19.5	23.5	27.0	31.0	35.0					
6x7	425	11.5	13.5	16.0	18.0	20.5	23.0	25.0	27.0	29.5	32.0
7x7		15.5	18.5	21.5	25.0	28.0	31.0	34.0	37.5	40.5	44.0
8x7		20.5	24.5	28.5	33.0	37.0	41.5	45.5	50.0		
9x7		26.0	31.0	36.0	41.5	46.6					
7x8	400	16.5	19.5	23.0	26.5	30.0	33.0	36.0	39.5	42.5	46.0
8x8		22.0	26.5	31.0	35.0	39.5	44.0	48.5	53.0	57.5	62.0
9x8		27.5	33.5	39.0	44.5	50.0	55.5	61.0	66.5		
10x8		34.5	41.0	48.0	55.0	62.0					
8x9	375	23.0	27.5	32.0	36.5	41.0	46.0	50.5	55.0	59.5	65.0
9x9		29.0	35.0	41.0	47.0	53.0	59.0	64.5	70.0	76.0	82.0
10x9		36.0	43.5	51.0	59.0	67.0	75.5	80.0	88.0		
11x9		43.5	52.0	61.0	70.0	79.0					
9x10	350	30.0	36.0	42.5	48.5	54.0	60.5	66.0	72.5	78.5	84.5
10x10		37.5	45.0	52.5	60.0	68.0	75.5	83.0	91.0	99.0	106.0
11x10		45.0	54.0	63.5	73.0	82.0	91.0	100.0	109.0		
12x10		54.0	65.0	76.0	87.0	98.0					
10x12	300	38.0	46.0	54.0	62.0	70.5	78.5	85.0	93.0	100.0	108.0
11x12		46.5	56.0	64.5	73.5	82.0	91.5	101.0	110.0	120.0	129.0
12x12		56.0	70.0	78.0	90.0	101.0	112.0	123.0	135.0	145.0	156.0
13x12		65.0	78.0	92.0	105.0	118.0	131.0	143.0	153.0		
14x12		75.0	90.0	106.0	120.0	136.0	151.0				
16x12	300	30	40	50	60	70	80				
		28.0	49.5	73.0	94.0	118.0	138.0				

LOW PRESSURE

Size	Max. r. p. m.	Horsepowers at varying steam pressures							
		15	20	25	30	35	40	50	60
8x5	400	2.0	3.0	5.0	7.0	8.5	10.5	14.5	18.0
12x6	375	4.5	8.5	12.5	17.0	21.5	26.0		
14x7	350	8.5	14.0	21.0	26.0	33.0	40.0		
18x8	300	14.0	21.5	30.0	39.0				

Sturtevant Steam Turbines.

Simple and durable construction makes the Sturtevant steam turbine a reliable source of power for driving fans, blowers, centrifugal pumps and electric generators.

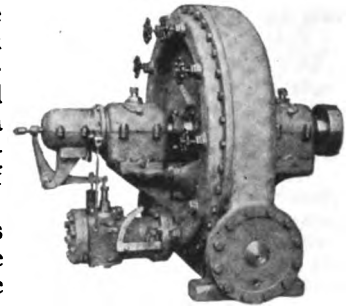
Type 6 is of the single stage, multi-velocity type, and its operation is such as to give high efficiency

DATA, TYPE 6 STEAM TURBINES

Size	R. p. m.	H. p.	Over all dimensions, in.			Maximum pipe sizes, in.		Diam. rotor, in.
			Length	Width	Height	Steam	Exhaust	
A-6	1000	1	37½	23½	22	1½	4	12
	4000	50						
B-6	1200	5	42½	30¾	28¾	2	6	18
	3600	100						
C-6	1200	10	52½	38¾	36¾	3	8	24
	3200	150						
D-6	1200	25	56½	45½	43½	3½	8	30
	2800	250						
E-6	1000	50	60½	51½	49½	4	10	36
	1400	360						

and permit of moderate rotative speeds. Hand valves are used for shutting off the nozzles, and the speed is regulated by a centrifugal throttling governor placed on the end of the shaft.

Internal lubrication is unnecessary, therefore the exhaust steam is free from oil.



STURTEVANT STEAM TURBINE, TYPE 6

Sturtevant Electric Motors.

TYPE D—Type D motors are designed primarily for use as a general purpose motor. The field frame is of cast iron. All sizes are provided with commutating poles. Sizes 100 to 103, inclusive, have 2 poles; sizes 1 to 9, inclusive, have 4 poles. They can be arranged for either floor, wall or ceiling mounting.

TYPE C—Type C motors are designed to meet the demand for a slow speed motor for direct connection to fan apparatus and the like.

The smaller sizes are of the end shield type, and the larger are all of the pedestal type.

They are built in standard voltages and in capacities from 1 to 800 h.p.

OTHER TYPES—Type TF turbo motor for direct connection to high speed centrifugal fan and centrifugal pumps. Built in sizes 5 to 100 h.p.; speeds up to 4,000 r.p.m.

Type MP-4 built in larger sizes up to 125 h.p. at medium speeds.



STURTEVANT TYPE D MOTOR WITH COMMUTATING POLES



STURTEVANT TYPE C MOTOR WITH COMMUTATING POLES

DATA, TYPE D MOTORS, STANDARD STOCK RATINGS

Frame Size	Full load ratings						Max. allow. speed with weak shunt field	Shipping weight, lbs.
	115-volt		230-volt		550-volt			
	H. p.	R. p. m.	H. p.	R. p. m.	H. p.	R. p. m.		
100	1	1750	1	1750	1	1750	2000	135
101	2	1750	2	1750	2	1750	2000	250
102	3	1750	3	1750	3	1750	2000	300
103	5	1750	5	1750	5	1750	2000	400
1	7½	1750	7½	1750	7½	1750	2000	475
2	10	1750	10	1750	10	1750	2000	600
100	¾	1150	¾	1150	¾	1150	1700	135
101	1	1150	1	1150	1	1150	1700	250
102	2	1150	2	1150	2	1150	1700	300
103	3	1150	3	1150	3	1150	1700	400
1	5	1150	5	1150	5	1150	1700	475
2	7½	1150	7½	1150	....	....	1700	600
3	10	1150	10	1150	7½	1150	1700	800
4	15	1150	15	1150	10	1150	1700	980
5	20	1150	20	1150	15	1150	....	1250
6	..	....	25	1150	20	1150	....	1850
7	..	....	30	1150	..	....	....	2250
8	..	....	40	1150	..	....	....	2650
9	..	....	50	1150	..	....	....	3400
5	15	850	15	850	..	....	1100	1250
6	20	800	20	800	15	850	1100	1850
7	25	850	25	850	20	800	1100	2250
8	30	850	30	850	30	850	1100	2650
9	..	....	40	800	40	800	1100	3400

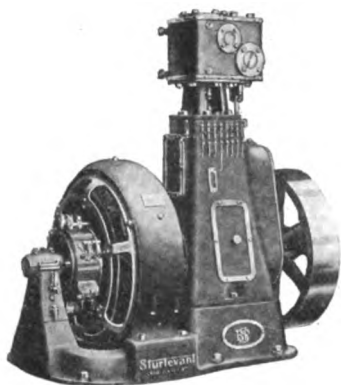
Sturtevant Generating Sets.

VS-7 AND VS-8 STEAM ENGINE SETS—Compact and self-contained units especially adapted for isolated power plants and for auxiliaries in large plants.

Generators are of the 8-pole type, capable of carrying a 50% overload momentarily without shifting brushes and without destructive sparking and a 25% overload for 2 hours without sparking or undue heating.

Both types are identical, except that the VS-7 has gravity lubrication and the VS-8 has forced lubrication.

Speed regulation is within 1½%, making the sets particularly desirable for lighting purposes.



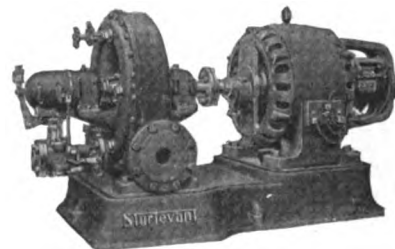
STURTEVANT VERTICAL STEAM ENGINE GENERATING SET
DATA, STEAM ENGINE GENERATING SETS

Kw.	Generator type	Engine size	Pipes, in.		Steam pressure, lbs.	R. p. m.	Net weight, lbs.		
			Steam	Exhaust			Set	Engine and ext. base	Generator
7½	7½ M P 6	4 x 5	1½	1½	175	450	2700	1350	1350
		5 x 5	1½	1½	120		2700	1350	
		6 x 5	1½	2	90		2725	1375	
		7 x 5	1½	2	60		2750	1400	
10	10 M P 6	5 x 6	1½	2	120	450	3675	1900	1775
		6 x 6	1½	2	90		3675	1900	
		7 x 6	2	2½	70		3700	1925	
		8 x 6	2	2½	50		3725	1950	
12½	12½ M P 6	5 x 6	1½	2	150	450	3775	1900	1875
		6 x 6	1½	2	110		3775	1900	
		7 x 6	2	2½	90		3800	1925	
		8 x 6	2	2½	60		3825	1950	
15	15 M P 6	6 x 7	2	2½	120	400	5175	2650	2525
		7 x 7	2	2½	90		5175	2650	
		8 x 7	2½	3	75		5250	2725	
		9 x 7	2½	3	60		5325	2800	
17½	17½ M P 6	6 x 7	2	2½	150	375	5275	2650	2625
		7 x 7	2	2½	110		5275	2650	
		8 x 7	2½	3	90		5350	2725	
		9 x 7	2½	3	70		5425	2800	
20	7 C	7 x 8	2½	3	120	350	6175	3475	2700
		8 x 8	2½	3	90		6175	3475	
		9 x 8	3	3½	75		6275	3575	
		10 x 8	3	3½	60		6375	3675	
22½	8 C	7 x 8	2½	3	130	350	6200	3475	2725
		8 x 8	2½	3	110		6200	3475	
		9 x 8	3	3½	90		6300	3575	
		10 x 8	3	3½	70		6400	3675	
25	9 C	7 x 8	2½	3	150	350	6225	3475	2750
		8 x 8	2½	3	110		6225	3475	
		9 x 8	3	3½	90		6325	3575	
		10 x 8	3	3½	70		6425	3675	
30	10 C	8 x 9	3	3½	130	325	6900	4100	2800
		9 x 9	3	3½	100		6900	4100	
		10 x 9	3	3½	80		7025	4225	
		11 x 9	3	3½	60		7150	4350	
35	12½ C	8 x 9	3	3½	150	325	7100	4100	3000
		9 x 9	3	3½	120		7100	4100	
		10 x 9	3	3½	90		7225	4225	
		11 x 9	3	3½	70		7350	4350	
40	15 C	9 x 10	3	3½	130	300	9125	5125	4000
		10 x 10	3	3½	110		9125	5125	
		11 x 10	3	3½	90		9275	5275	
		12 x 10	3½	4	75		9425	5425	
50	24 C	9 x 10	3	3½	150	275	11375	5125	6250
		10 x 10	3	3½	125		11375	5125	
		11 x 10	3	3½	105		11525	5275	
		12 x 10	3½	4	90		11675	5425	
60	24 C	10 x 12	3	3½	140	275	15100	8650	6450
		11 x 12	3½	4	120		15100	8650	
		12 x 12	4	4½	100		15100	8650	
		13 x 12	4	4½	90		15300	8850	
75	34 C	14 x 12	5	6	80	275	15300	8850	7500
		16 x 12	5	6	60		15500	9050	
		10 x 12	3	3½	170		16550	9050	
		11 x 12	3½	4	150		16550	9050	
100	50 C	12 x 12	4	4½	130	300	16550	9050	8500
		13 x 12	4	4½	110		16750	9250	
		14 x 12	5	6	100		16750	9250	
		16 x 12	5	6	80		16950	9450	

TURBO GENERATING SETS—These sets make desirable power and lighting units. When mounted on cast iron subbase, their compactness recommends them where space is an important item to be considered. Absence of vibration due to perfect balance makes a foundation other than a subbase unnecessary.

Absence of oil in the exhaust steam makes it possible to utilize the exhaust in the heating system. An efficient regulating device makes it possible to maintain a constant voltage and impossible for the turbine to overspeed. Individual nozzle shut-off valves are a source of great steam economy when operating under fractional loads.

Sturtevant steam turbines (described on preceding page) can be furnished separately and can be directly connected to standard makes of electric generators.



STURTEVANT TURBO GENERATING SET

*DATA, D. C. 2-WIRE TURBO GENERATING SETS

Kw.	Type turbine	Steam pressure, lbs.	Diameter pipes, in.		R. p. m.	Overall dimen., in.			Net weight, lbs.
			Steam	Exhaust		Length	Width	Height	
5	A6	75 to 250	1½	2	4000	66½	30	30	1300
7½	A6	75 to 250	1½	2½	3600	71	30	30	1575
10	A6	75 to 250	2	3	3600	71	30	30	1775
	B6	75 to 250	2	3	3600	74½	31½	34½	2225
15	A6	75 to 250	2	4	3600	73½	30	34	2225
	B6	75 to 250	2	4	3600	76½	36	36½	2700
25	B6	75 to 250	2½	4	3600	82½	36	36½	2900
	C6	75 to 250	2½	4	3600	89½	43½	44½	3425
35	B6	75 to 250	3	5	2800	94½	36	37½	3525
	C6	75 to 250	3	5	2800	101½	41½	45½	4075
50	C6	100 to 250	3	5	2800	101½	41½	45½	4130
	D6	75 to 250	4	6	2800	110½	48½	52	5130
75	D6	100 to 250	4	8	2200	124	48½	52½	6450
	E6	75 to 250	5	8	2200	134½	60	61½	7250
100	D6	150 to 250	5	8	2200	130	48½	52½	6925
	E6	100 to 250	5	8	2200	140	60	61½	7725

*D.C. 3-wire, 125 and 250 volts can be furnished in sizes from 35 to 100 k.w. to comply with operating conditions, also A.C. 2 and 3 phase, all cycles, in sizes from 50 to 150 k.v.a.

Sturtevant Gear Transmissions.

Built primarily for turbo blower outfits. Their chief duty is to enable both turbine and blower to run at their most efficient speed, resulting in the remarkable saving in power and lower steam consumption.

Gears have double helical (herringbone) stub teeth, giving maximum strength and perfect rolling contact without end thrust. They are accurately cut and do not require filing, fitting or running in. Tooth pres-



STURTEVANT GEAR TRANSMISSION

DATA, GEAR TRANSMISSIONS

Pitch	Ratio (Max.)	Centers, in.	Weights		
			4-in. face	6-in. face	8-in. face
8	8.08	8½	1200	1300	1400
to	12.33	12½	1600	1700	1800
10	16.58	16½	2000	2100	2200
6	5.78	8½	.....	.....	1500
to	9.00	12½	.....	.....	1900
8	12.20	16½	.....	.....	2300
5	4.66	8½	.....	.....	1600
to	7.34	12½	.....	.....	2000
7	10.00	16½	.....	.....	2400

sure is very light, consequently the life of the gears is unusually long.

Quiet operation is secured by means of fine pitch and wide face. Bearings are long and shafts large, giving minimum bearing pressure.

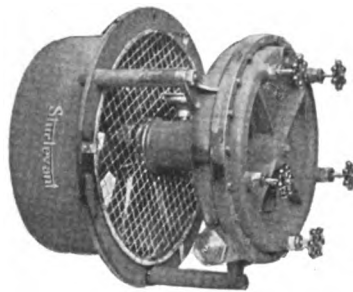
Complete transmission, including gears, oil pump and bearings is contained in lower casing. Upper casing serves as a cover to keep oil in and dust out. Small door in upper casing permits inspection while in operation.

Sturtevant Turbo Undergrate Blowers.

Compact, self-contained units designed to secure the advantages of mechanical forced draft without the expense of the larger systems.

They consist of a specially designed built-up propeller fan, with rolled aluminum blades securely riveted into a bronze hub and mounted upon the shaft of a Sturtevant steam turbine. The rotor is a solid forging of the best open hearth steel, with buckets milled into the rim. Nozzles and reversing buckets consist of one solid bronze casting, reversing buckets being milled in the solid metal.

Bearings are bronze sleeves lubricated by ring oilers, which are continually supplied with oil from a reservoir with capacity large enough to make frequent filling unnecessary. Bearing casing and supporting arm are cast integrally with the turbine casings, making an exceptionally rigid unit.



TURBO UNDERGRATE BLOWER

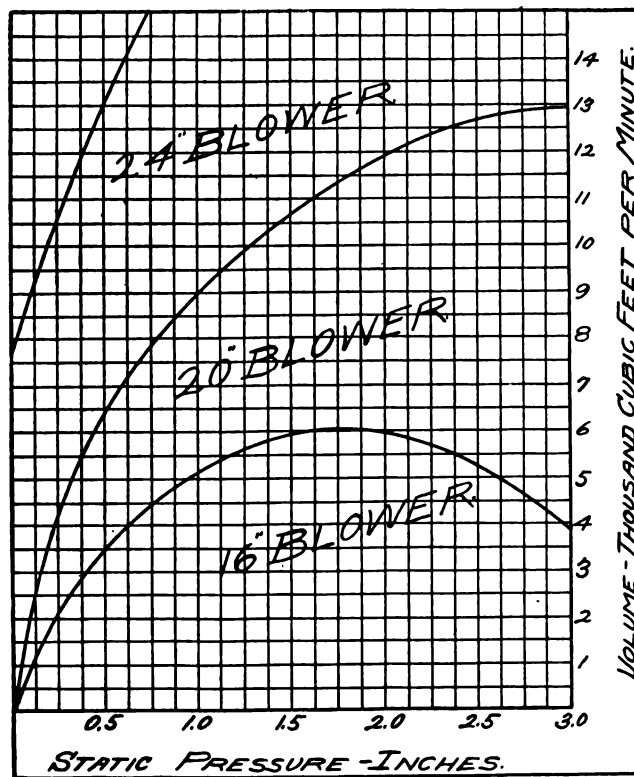


CHART SHOWING RANGE OF DESIGN 5 TURBO UNDERGRATE BLOWERS

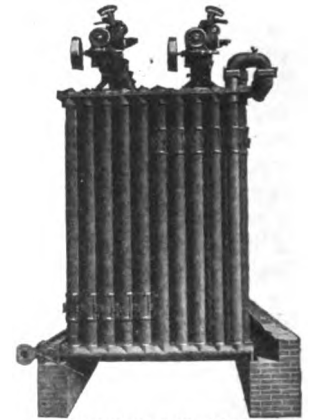
Curves shown on above chart are not "point" curves for the performance of each fan, but the operating field of each blower is shown by the area bounded by these curves. For instance: the operating field of the 16-in. blower is that part of the cross area which lies below the lowest curve; of the 20-in. blower, the area between the lowest and middle curves; of the 24-in. blower, the area between the middle and top curves

Sturtevant Fuel Economizers.

Sturtevant fuel economizers effect large fuel savings, increase the capacity of boilers, prolong their life, purify the feed water and reduce the smoke nuisance. When used in connection with the Sturtevant system of mechanical draft, increased savings may be secured through the burning of the cheapest grades of fuel.

The construction of the Sturtevant economizer is extremely simple.

Consult the Sturtevant engineers for a satisfactory solution of economizer problems.



STURTEVANT FUEL ECONOMIZER

SIZES, STANDARD ECONOMIZERS

Height over gearing, 12 ft. 6 in. Height over section, 10 ft. 2 1/4 in.

Machine No.	No. pipes	No. sections	No. pipes in section	External heating surface, sq. ft.	Capacity, lbs. of water	General dimensions			
						Length, ft., in.	Width with standard back side dampers, ft., in.	Area between tubes, sq. in.	
11	100	20	5	1248	6300	12-1	4-9	19.40	26.65
12	120	24	5	1499	7560	14-6	"	"	"
13	140	28	5	1747	8820	16-11	"	"	"
14	160	32	5	1997	10080	19-4	"	"	"
19	120	20	6	1496	7560	12-1	5-5	22.00	29.30
20	144	24	6	1795	9072	14-6	"	"	"
21	168	28	6	2094	10584	16-11	"	"	"
22	192	32	6	2393	12096	19-4	"	"	"
23	216	36	6	2692	13608	21-9	"	"	"
28	140	20	7	1743	8820	12-1	6-1	24.70	31.95
29	168	24	7	2092	10584	14-6	"	"	"
30	196	28	7	2440	12348	16-11	"	"	"
31	224	32	7	2789	14112	19-4	"	"	"
32	252	36	7	3137	15876	21-9	"	"	"
40	192	24	8	2388	12096	14-6	6-9	27.35	34.60
41	224	28	8	2786	14112	16-11	"	"	"
42	256	32	8	3185	16128	19-4	"	"	"
43	288	36	8	3583	18144	21-9	"	"	"
44	320	40	8	3981	20160	24-2	"	"	"
53	288	32	9	3580	18144	19-4	7-5	30.00	37.25
54	324	36	9	4027	20412	21-9	"	"	"
55	360	40	9	4475	22680	24-2	"	"	"
56	396	44	9	4922	24948	26-7	"	"	"
57	432	48	9	5370	27216	29-0	"	"	"
64	280	28	10	3478	17640	16-11	8-1	32.65	39.90
65	320	32	10	3974	20160	19-4	"	"	"
66	360	36	10	4471	22680	21-9	"	"	"
67	400	40	10	4968	25200	24-2	"	"	"
68	440	44	10	5465	27720	26-7	"	"	"
69	480	48	10	5962	30240	29-0	"	"	"
70	520	52	10	6458	32760	31-5	"	"	"
78	528	48	11	6554	33268	29-0	8-9	35.30	42.55
79	572	52	11	7101	36045	31-5	"	"	"
80	616	56	11	7646	38811	33-10	"	"	"
81	660	60	11	8193	41588	36-3	"	"	"
82	704	64	11	8739	44359	38-8	"	"	"
91	720	60	12	8933	45371	36-3	9-5	37.95	45.20
92	768	64	12	9529	48398	38-8	"	"	"
93	816	68	12	10125	51425	41-1	"	"	"
94	864	72	12	10721	54452	43-6	"	"	"
95	912	76	12	11317	57479	45-11	"	"	"
96	960	80	12	11913	60506	48-4	"	"	"
97	1008	84	12	12489	63432	50-9	"	"	"
98	1056	88	12	13065	66357	53-2	"	"	"

Sturtevant Drying Systems.

The drying department of this company is in a position to provide drying equipment for various kinds of industrial work. The experts comprising this department have an intimate knowledge of the materials most generally requiring drying, and their services are at the disposal of those desiring to install systems for drying paper, brick and clay products, leather, varnish, paint, fish, fruits, chemical powders, milk, malt, glue, lumber, etc.

All drying requirements and conditions are known by the Sturtevant engineers and can be obtained precisely by Sturtevant dryers. Submit dryer problems to this company for a satisfactory solution.

L. J. WING MFG. CO.

Air Handling and Power Plant Equipment

354-360 West 13th Street

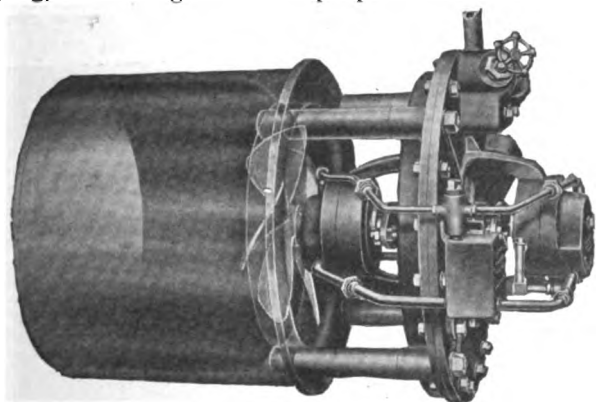
NEW YORK, N. Y.

Products.

WING TURBINE and ELECTRIC BLOWERS; CENTRIFUGAL BLOWERS; DAMPER REGULATORS; "HYPRESS" PRESSURE BLOWERS; SMALL STEAM TURBINES; "SCRUPLEX" FANS, EXHAUSTERS and UNIT HEATERS.

Wing Turbine Blower.

Applications—Used both with hand fired boilers, and stokers, including underfeed and chain grate. The Wing eliminates the duct work required by a central fan system and is much lower in cost. Its wide application is aptly expressed by the phrase, "For Every Fuel, For Every Furnace." Wing blowers are also employed for drying, ventilating and other purposes.



WING TURBINE BLOWER

CAPACITIES, DIMENSIONS, ETC., WING PROPELLER TURBINE BLOWERS

Blower	From		To		Casing diam., in.	Tur-bine projec-tion, in.	Connections		Ship-ping weight, lbs.
	C.f.m.	Static pressure, in.	C.f.m.	Static pressure, in.			Steam, in.	Exhaust, in.	
1 K	4,000	0.25	2,200	2.5	15½	15¼	¾	1½	292
3 K	7,000	0.25	2,500	4.5	18	15¼	¾	1½	400
5 K	10,000	0.25	2,500	5.0	20	15½	1	2	490
7 K	13,750	0.25	5,500	5.5	22	15½	1	2	515
9 K	13,700	0.25	6,000	6.0	25	17½	1½	3	525
12 K	13,500	0.25	6,700	6.0	28¾	17¼	1½	3	685
15 K	17,700	0.25	12,250	6.0	31½	17¼	1½	3	765

Above air deliveries are for maximum speed, which varies from 5,000 r.p.m. for the 1 K down to 4000 r.p.m. for the 15 K.

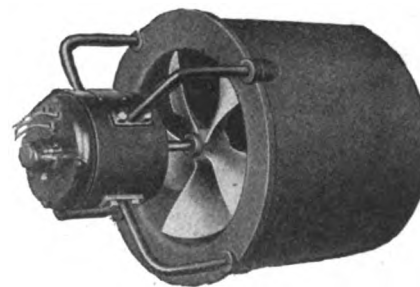
Construction—The L. J. WING MFG. Co., originator of the undergrate turbine blower, over 15 years ago, has also been the most progressive in bringing it through the several stages of its development. Four years ago the company introduced a system of filtered oil lubrication for the Wing, superseding grease (the lubricant in the earlier model). This lubricating system provides perfect filtration of the oil; a handful of grit could be thrown into the filling side of the oil tank, yet not a particle reach the bearings; for no solid matter can siphon through the filtering wicks with the oil. The Wing oiling system is not only gritproof, but foolproof. Plenty of reservoir capacity is provided; the bearings themselves run in oil.

The heavy, high speed turbine rotor is mounted between bearings, avoiding the vibration which results with overhung rotors. The patented expanding fan casing overcomes the centrifugal action of the fan.

Eddy currents with their consequent noise and power loss are almost entirely eliminated. The machine as a whole, is compact, heavy and extremely rugged.

Wing Electric Blower.

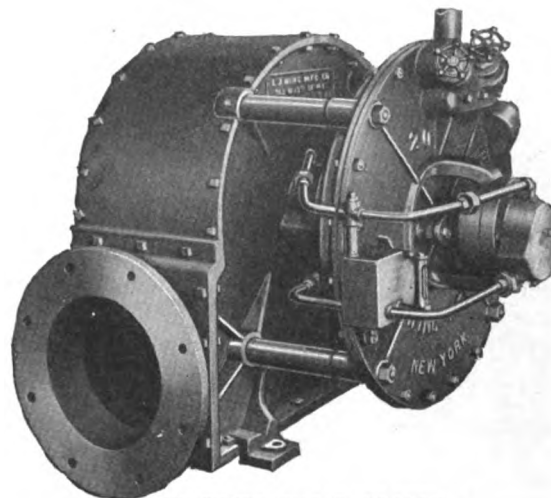
For electric drive, the Wing Type E-M motor driven blower can be supplied. The motors are fully enclosed, and the units most economical. Complete information on these units on request.



WING ELECTRIC BLOWER

Wing Centrifugal Blower.

For application requiring pressures beyond the range of the propeller fans, the Wing centrifugal turbine blower is used. Fan wheel is usually mounted on the turbine shaft, making a compact simple unit.



WING CENTRIFUGAL BLOWER

Wing "Hypress" Blowers.

Used for gas appliances, printing presses, sealing machines, anaesthesia apparatus or any equipment requiring small volumes at high pressure or vacuum. Exceptionally small, light and economical, positive in operation, and compression takes place in the machine itself, with consequent high efficiency.

Wing Damper Regulators.

Recommended for operating stack dampers and turbine blower valves. They are simple, easily installed and operate within limits of 3 lbs.

Wing Steam Turbines.

Capacities up to about 30 h.p. Information on request.

Wing "Scruplex" Fans, Exhausters and Unit Heaters.

For information, see our advertisement in SWEET'S ARCHITECTURAL CATALOGUE, Fifteenth Edition.

ATMOSPHERIC CONDITIONING CORPORATION

Specialists in Air Conditioning Equipment

443 Chestnut Street
PHILADELPHIA, PA.

Products.

EQUIPMENT for Maintaining Artificial Atmospheric Conditions in Industrial Plants; HUMIDIFYING, DEHUMIDIFYING, DRYING, COOLING APPARATUS and AIR CONDITIONING APPARATUS for Generator and Transformer Ventilation.

Webster Air Conditioning Apparatus for Generator and Transformer Ventilation.

The construction of the Webster air conditioning apparatus for cleansing and cooling the air for turbo-generator and transformer ventilation is arranged to permit the air to pass through a spray chamber in which water is finely atomized, producing an extremely intimate contact between the air and the water.

Under certain conditions and in some localities, the prime object in installing such an apparatus is for the removal of dust, dirt, oily particles and foreign matter generally from the air, the thought of cooling being secondary.

For use in such cases the Webster Type "G-W" apparatus will fully meet the requirements; the length of apparatus, quantity of water circulated and cost of installation will be somewhat less than that for the Webster Type "G-C" equipment, which is designed to secure the greatest cooling effect possible with recirculated water, reducing the temperature of the air passing to the entering wet bulb temperature.

The Webster apparatus includes as its initial feature a spray chamber containing a series of Webster spiral mist nozzles for atomizing the spray water.

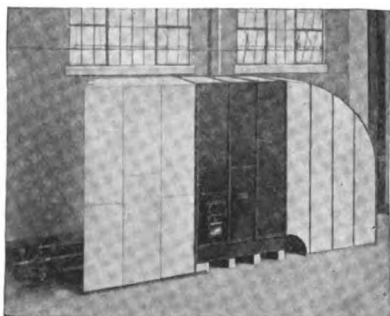
These nozzles are arranged uniformly over the entire spray chamber, there being but one group in the "G-W"



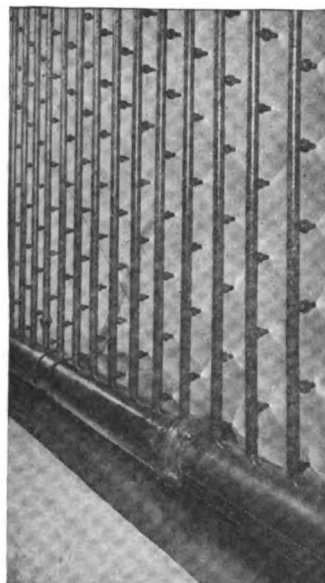
type of apparatus, the quantity of water handled being sufficient to remove 98% of all foreign matter contained in the entering air, and capable of cooling this air 70% of the wet bulb depression.

In the Webster Type "G-C" apparatus the spray chamber piping consists of two banks of sprays, one discharging the water in the direction of the air flow, the other discharging against the air flow. This construction insures a very intimate contact between the air and water, resulting in the air being reduced to the saturation point, at the same time giving a 98% cleansing effect.

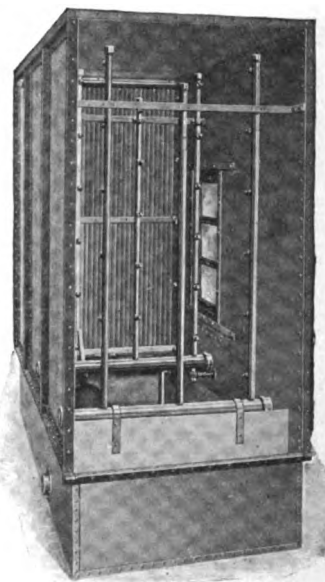
The Type "G-W" (400 series) is 7 ft. long, while the Type "G-C" (500 series) is 9 ft. long and each is made in various dimensions and capacities to meet any local space condition.



50,000 C.F.M. WEBSTER APPARATUS
INSTALLED IN POWER
PLANT BELOW

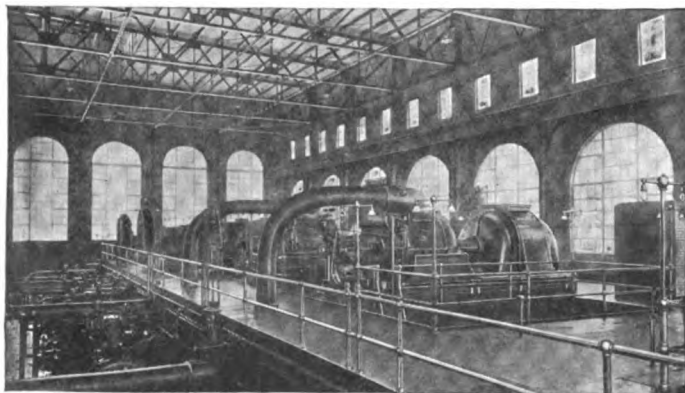


SPRAY CHAMBER VIEW OF
WEBSTER APPARATUS



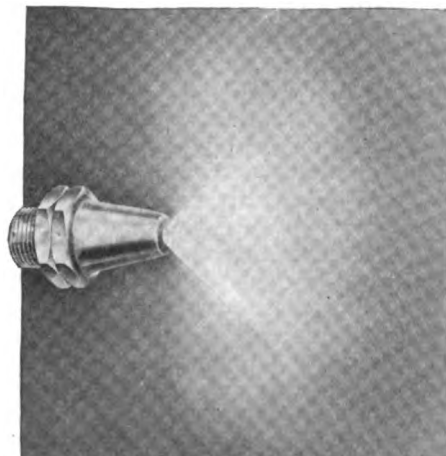
WEBSTER TYPE "G-C"
APPARATUS

WEBSTER SPIRAL MIST NOZZLE—Nozzle shown in illustration is designed to produce the proper atomi-



INTERIOR VIEW OF GENERATOR ROOM, MUNICIPAL POWER
PLANT, JACKSONVILLE, FLA.

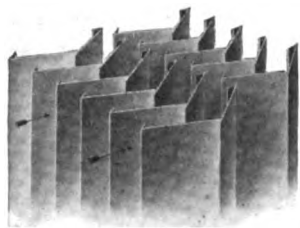
SCOFFIELD ENGINEERING Co., Construction Engineers, Philadelphia, Pa.
5 Turbo-generators provided with cool, clean air through Webster apparatus



THE WEBSTER SPIRAL MIST NOZZLE (PATENTED)

zation of spray water at a pressure of 17 lbs. per sq. in. The mist nozzles are made entirely of brass and have a discharge orifice of $\frac{1}{8}$ in. in diameter. The large water opening makes the mist nozzle practically non-cloggable.

ELIMINATOR—For eliminating the free moisture from the air after it has been subjected to the sprays, a series of vertical baffles are provided and may be constructed of galvanized steel, ingot iron or copper as desired. The front and rear sections of the eliminator are staggered so that the air streams will be split in passing through the same. The construction of the eliminators is such that all entrained moisture is removed from the air being discharged to generator or transformer.



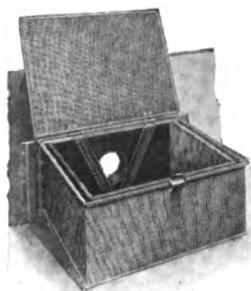
SECTIONAL VIEW OF USUAL FORM OF WEBSTER ELIMINATOR

TANK—It extends under the entire apparatus and is provided with the necessary flanges for fresh water, overflow, drain, suction connections, etc. The tank is usually made 15 in. in depth, which allows ample space for the collection of dust, dirt and foreign matter removed from the entering air. The tank should be cleaned and flushed out daily.

STRAINER—The strainer furnished for sheet metal tank is of the double brass box type with hinged lid and a removable inner basket having a free area 15 times that of the pump suction. The entire strainer is removable for cleansing and inspection. For concrete tanks, the strainer furnished is of the cylindrical type having the same free area through the inner basket.



DOUBLE CYLINDRICAL BRASS STRAINER



DOUBLE BOX BRASS STRAINER

CENTRIFUGAL PUMP—Of the double suction type having horizontally split shell which allows access to the interior parts of the pump without disturbing the pipe connections. The pump is provided with flexible coupling direct connected to motor, both mounted on cast iron base.



DOUBLE SUCTION CENTRIFUGAL PUMP DIRECT CONNECTED TO ELECTRIC MOTOR

APPLICATION—Each installation must be designed for the particular space available and conditions encountered.

Maintenance of Artificial Atmospheric Conditions.

Special apparatus for maintaining artificial atmospheric conditions in industrial plants, where humidifying, dehumidifying, cooling, drying, etc., are involved, is the chief product of the company. The company's engineers are constantly engaged in the investigation of conditions and the design of apparatus for correcting troubles in plants where atmospheric control is essential.

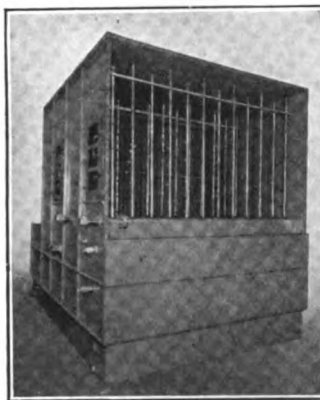
The nature of the problem influences the type and construction of each equipment, which may require apparatus using recirculated water in the simpler forms or may make the use of deep well water necessary. This type of apparatus may be of either the single or double stage type, the latter especially desirable where the quantity of well water is limited.

Where greater cooling effect is necessary and the results to be secured warrant this expense, apparatus can be furnished in connection with which refrigerating equipment is provided.

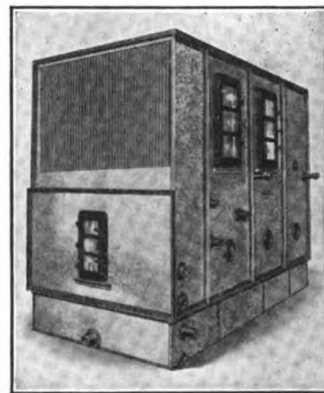
The Webster system of automatic humidity control makes possible the regulation of temperature within 1° Fahr. either way and the control of the relative humidity within 2% of the point for which it is set.

The company's engineers are available at all times for investigation of conditions and consultation regarding the adaptability of Webster apparatus.

No contract ever undertaken where just the results the buyer wishes can not be accomplished.

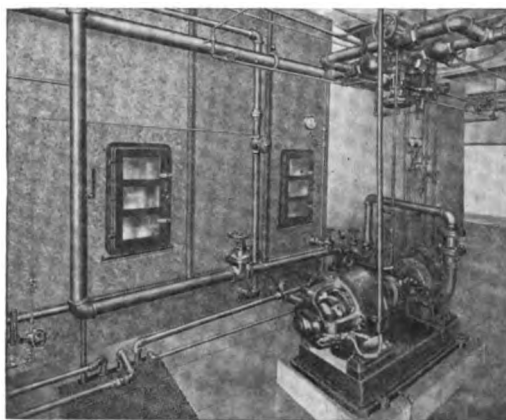


Showing Spray Chamber Side



Showing Eliminator Side

WEBSTER DEHUMIDIFIERS OF THE REFRIGERATION TYPE



WEBSTER HUMIDIFIERS EQUIPPED WITH THE WEBSTER SYSTEM OF HUMIDITY CONTROL

CARRIER AIR CONDITIONING COMPANY OF AMERICA

BUFFALO, N. Y.

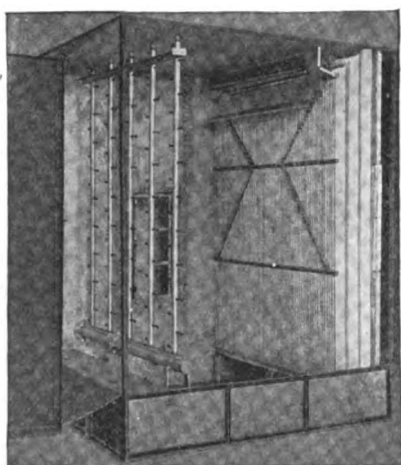
Products.

AIR WASHERS.

Humidifiers, Dehumidifiers, Generator Coolers.

Carrier Air Washers.

Air washers insure pure, clean air by removing all dust with a finely divided water spray. Operated in connection with heating installations a lower temperature may be used, because of the increase in comfort due to proper humidity.

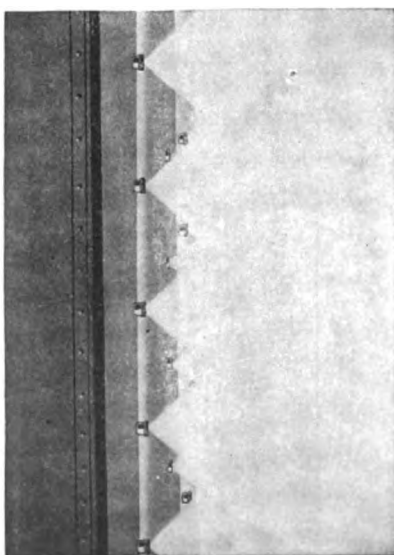


INTERIOR VIEW OF CARRIER AIR WASHER

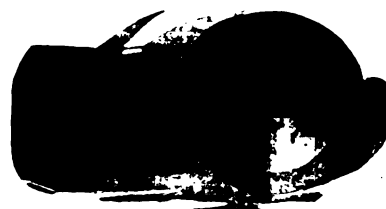
Carrier Air Washers consist of three important elements: first, the Spray System; second, the Eliminators; and third, the Dew-point Control. Each of these is of extreme importance in insuring the proper control of a perfect heating system.

Carrier Spray System.

A fine spray is essential for the intimate intermingling of the water and the air. The Carrier Spray Nozzle is very simple and highly effective. The atomizing effect does not depend upon the size of the nozzle opening, but upon the interior design of the nozzle itself; hence, large openings can be used, which positively prevent clogging. With water pressure as low as 15 lbs. an extremely fine spray is produced.



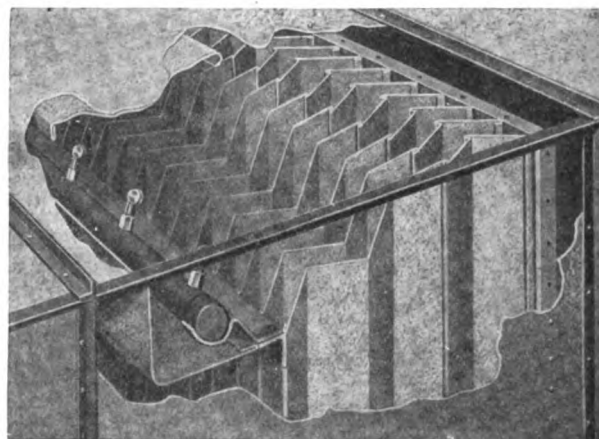
AIR WASHER SPRAY IN OPERATION



SPRAY NOZZLE

Eliminators.

The eliminators of the Carrier Air Washer consist of a series of zigzag, vertical, continuous surfaces, against which the moisture laden air is thrown in its passage through the washer. The free moisture and dirt adhere to the plates and are washed into the settling tank by the continuous spray from the flooding nozzles.



PART OF CASING REMOVED SHOWING ELIMINATORS IN POSITION



FIVE PAILS OF DIRT WASHED FROM AIR DURING ONE WEEK'S OPERATION OF AIR WASHER

Dew-point Control.

The Carrier Dew-point control insures the delivery of air into buildings with just the proper amount of moisture, without variation, during the heating season.

Catalogue.

Carrier Catalogue No. 13 gives complete data and information.

W. L. FLEISHER & CO., INC.

Consulting and Contracting Industrial Engineers for Air Conditioning and Drying

31 Union Square West

NEW YORK, N. Y.

Sales inquiries direct to home office, or the 22 branch offices of the B. F. Sturtevant Co., in principal cities of the United States

Products.

AIR CONDITIONING SYSTEMS: Humidifying, Dehumidifying, Heating, Ventilating.

DRYERS for LIQUIDS: Spray type.

Engineering and Laboratory Service.

W. L. FLEISHER & Co., Inc., employs a staff of chemical and mechanical engineers solely for the purpose of working on problems which arise in the preparation and use of materials such as:

Chemicals	Paints	Wool	Fruits
Drugs	Soaps	Fibers	Milk
Dyes	Silk	Lumber	Meats
Varnishes	Cotton	Leather	Candy

Laboratories, equipped with experimental and model humidifiers, dehumidifiers, washers for the elimination of dust and gases, shelf dryers and spray dryers, are at the service of engineers and contractors.

This company handles each problem from preliminary laboratory work through design to complete installation of the system as an individual problem. Standard apparatus used, any part of which can be easily renewed.

Fleisher Air Conditioning Systems.

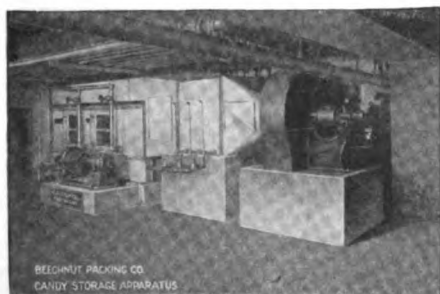
The humidifying, dehumidifying, heating and cooling systems installed by W. L. FLEISHER & Co., Inc., maintain constant atmospheric conditions inside the factory by means of patented devices. They insure an uninterrupted production in spite of adverse winter or summer weather.

Installations are made only after exhaustive tests both in the laboratory and at the factory, and are guaranteed to "deliver the climate" ideal for the specific purpose.

This company carries the problem through from preliminary investigation to completed installation and turns the equipment over in operating condition with guarantees demonstrated. They offer the ideal combination—Fleisher Service and Sturtevant Apparatus.

Dryers for Liquids.

The spray dryers of this company are of the continuous operating type, delivering the product in powder or granulated form. They are inherently simple,



AIR CONDITIONING IN A CANDY FACTORY

SWEET'S CATALOGUE



TRADE-MARKS

fireproof, economical to operate, require no skilled attendance and do not affect the most delicate products.

The spray dryers not only offer their inherent advantages, but their use usually eliminates from the manufacturing process many troublesome and expensive steps, such as filtering, cake drying, grinding and screening.

Dryer House—Built of special insulated steel panels mounted on steel framework. Inner surface of house can be tiled or painted to suit product to be dried. Hopper and conveyors furnished with each installation.

Atomizer Nozzles—Patented spraying nozzles are made in a variety of forms, each adapted to product to be atomized. Viscous materials of nature of glue are atomized by large calibre heat-enveloped nozzles, which minimizes clogging.

Dust Arrester—Dry dust arresters are used in all installations and a dust recovery of 98% is guaranteed. Sturtevant dust arresters for the wet method of dust recovery are used where wet method recovery is indicated.

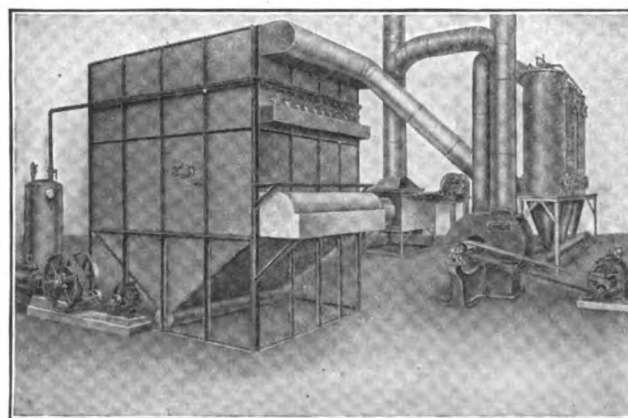
Heater—Air drawn through the dry chamber is warmed by furnace using gas or oil and showing thermal efficiency close to 100% or when steam is used, Sturtevant pipe coil heaters are installed.

Exhaust Fan—Extra heavy steel plate Sturtevant exhausts are used in all Fleisher & Company spray dryer installations.

Control—Patented control systems for regulating temperatures and controlling moisture content of air, are supplied with each installation.

Drying Temperature—Air at temperature between 300° and 400° Fahr. is introduced into drying chamber, but actual drying is done at wet bulb temperature of not over 110° Fahr. Material is subjected to this sustained temperature (110°) for not more than a second or two.

Flexibility—Any unit of dryer may be added to without interrupting its operation. Not only is the Fleisher & Company spray dryer exceedingly compact, but every installation is designed to fit the space available.



FLEISHER SPRAY DRYER INSTALLATION, USING GAS AS A SOURCE OF HEAT

HERSH BROTHERS COMPANY

SUCCESSORS TO BICALKY FAN CO.

GENERAL OFFICES AND FACTORY

654 Mill Street
ALLENTOWN, PA.

SALES OFFICES IN PRINCIPAL CITIES

Products.

Manufacturers of LEHIGH and BICALKY AIR WASHERS, MULTIBLADE FANS, STEEL PLATE FANS, EXHAUST FANS and MUSHROOM VENTILATORS; BICALKY ROOF FAN VENTILATORS.

Also manufacturers of Blowers and Dust Collectors.

Services.

With engineering data, unusually complete, we stand ready at all times to assist engineers in the study of their problems. What may seem a complicated problem may be reduced to a simple proposition through the experience of the HERSH BROTHERS COMPANY engineering department.

Do not hesitate to ask for information.

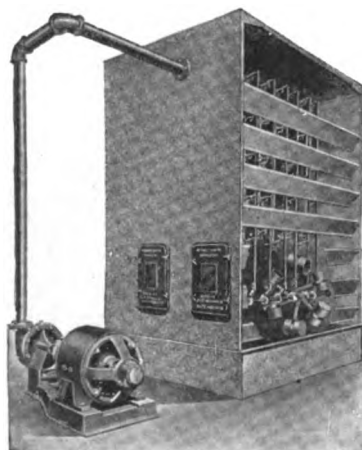
Lehigh Air Washer.

This machine is designed for cleansing and cooling air by passing it through a mist-filled chamber. A series of spray heads placed in a vertical plane across the chamber produce the mist.

The construction and mechanical manipulation of this air washer is such that the mist from the spray heads remains intact while flushing. This is of the greatest importance for the reason that it offers no weak spot in the mist sheets during the flushing operations to permit of any foreign matter passing through the air washer.

Automatic Flushing—

A rigid shaft is placed across the air washer above the sump. This runs freely and is rotated by means of buckets filled with falling waste water from the spray heads. Cams are arranged on this shaft, under each vertical row of spray heads, so as to operate a series of tee iron rods connected with the different rows of heads. When released by the cams these rods fall and produce a hammer blow on the center rods of the spray heads, causing a rush of water through the nozzles, which dislodges any dirt that may have accumulated in hindrance to a perfect mist spray. The cams are set so as to drop one tee at a time, which in turn flushes this vertical row of spray heads.



LEHIGH AIR WASHER

Planing Mill Exhaust Type Fan.

This type is constructed especially for shaving ex-



haust systems in planing mills. The patented wheel construction gives unusual strength and prevents racking. The absence of rivets on the face of the blade insures an unusually long life to the wheel as the rivets otherwise are worn by the abrasive action of the material handled. The construction of the wheel also permits the handling of long, stringy materials without clogging. This type is also constructed as a double fan.

Multiblade Type Fan.

The multiblade fan is particularly designed for use in heating and ventilating systems in public and industrial buildings, where large volumes of air are to be handled at comparatively low pressures. The patented wheel construction is unique among fans combining as it does the desirable features of the older steel plate fan with the large capacity, efficient and quiet operation of the multiblade type.

The unusual strength and ruggedness of construction are readily apparent from an examination of the blades running at a tangent from the central hub of the wheel. These blades are formed of two heavy bent plates riveted together at the center to form bracing angles on the back of the blade and are so placed with reference to the hub as to give the greatest strength in the direction of rotation.

Write for catalogue giving capacity tables, horsepower and characteristic curves.

Steel Plate Type Fan.

The particular advantage of this type is its adaptability for all purposes. The pressure characteristics adapt it particularly to forced and induced suction of pressure systems where the pressure involved is greater than 1½ to 2 oz. Under such conditions this type is preferable to the multiblade.

The efficiency of the wheel is not affected by high pressures as is the case to a certain extent in the multiblade wheel.

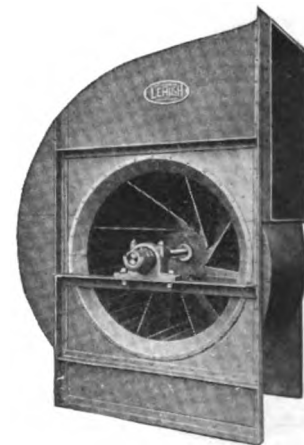
Bicalky Roof Fan Ventilator.

Positive ventilation. Wind propelled.

Mushroom Ventilator.

Built for either concrete or wooden floors. Efficient and noiseless in operation.

Write for catalogue giving complete data.



MULTIBLADE FAN

PARKS-CRAMER COMPANY

Manufacturers of Humidifying Apparatus

FITCHBURG, MASS.

BRANCH OFFICES

BOSTON, MASS., 1102 Old South Building

CHARLOTTE, N. C.

Products.**AIR CONDITIONING SYSTEMS.**

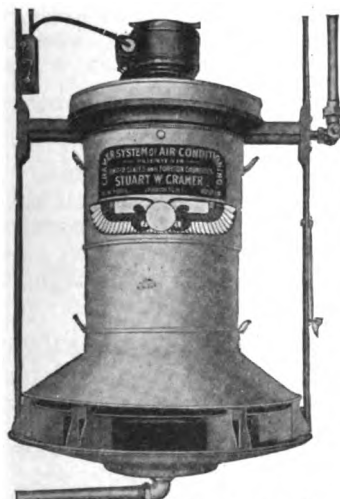
For the Merrill Process of Industrial Heating, see page 1212.

Air Conditioning Systems.

No single air conditioning system will apply to all conditions or requirements of humidifying. There is a right kind for every particular problem. Those described below constitute the complete Parks-Cramer line.

Fan Driven (High Duty) Humidifiers.

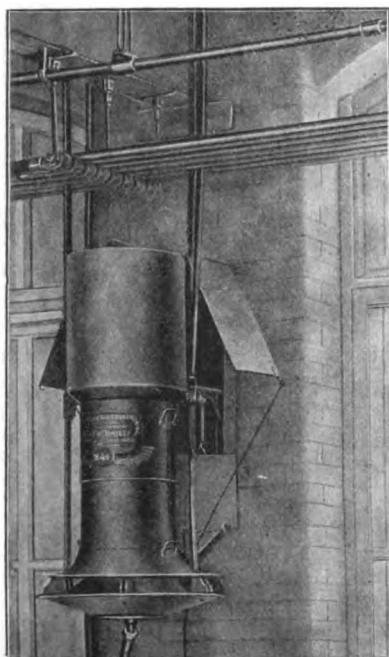
For use with electrically driven fans and made in two types—local ventilating and wall ventilating type.



"HIGH DUTY" COPPER FAN
AIR CONDITIONER

High Duty Fan Air Conditioner—The only really successful fan humidifier. It does not blow out drops of water and has an instantly accessible interior.

Ventilating Fan Air Conditioner—This head will deliver 60,000 cu. ft. of fresh washed and humidified air per hour—reduced in warm weather to the wet bulb temperature, and in winter warm tempered air if hot water is used.



VENTILATING FAN AIR CONDI-
TIONER

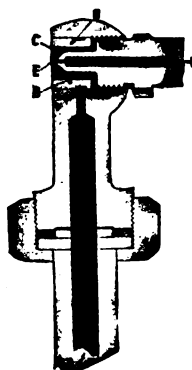
Atomizer Type Humidifier.

For general mill use, best adapted to old or low posted rooms. Special applications such as direct applications of moisture on picker laps, a further refinement being the turbo-sprayer. Compressed air cleaning as a by-product.

Turbo-sprayer—Its fundamental principle is a combination of the old ejector idea and the turbine. Air is applied tangentially and centrifugally, producing complete vaporization of the water.

Humidity Regulating and Indicating Apparatus.

The diaphragm humidity and temperature regulator illustrated, maintains automatically predetermined conditions of humidity and temperature. The range of adjustment can, within wide limits, be anything the user desires.



CROSS SECTION OF
TURBO HEAD

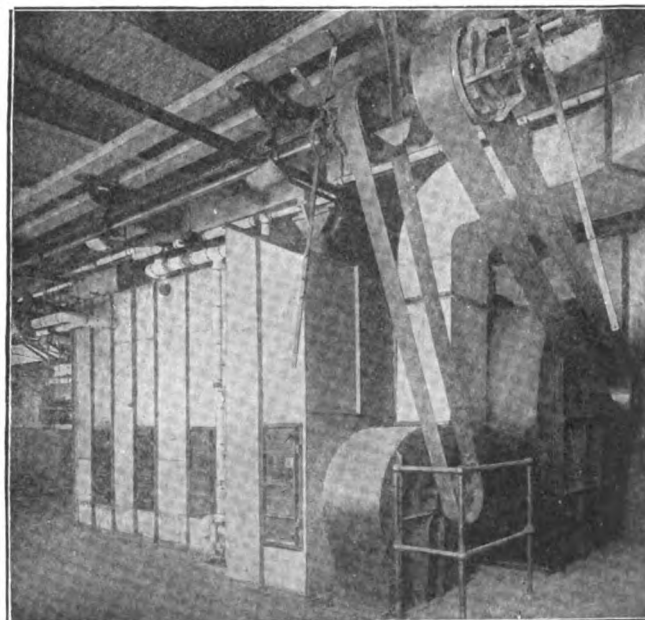


DIAPHRAGM HUMIDITY
AND TEMPERATURE
REGULATOR

Central Station Equipment.

Complete central station equipment includes ventilating, cooling, heating, humidifying, constant regain and air cleaning apparatus.

Having the conditions of temperature and humidity it is desired to secure, and the limits between which they must be maintained, the properly designed central station system with regulation can be installed to give those conditions regularly, positively and with a minimum of attention.



CENTRAL STATION EQUIPPED WITH DOUBLE FAN

SPRAY ENGINEERING COMPANY

Air Washers and Pneumatic Painting Equipment

93 Federal Street
BOSTON, MASS.

Products.

"Spraco" AIR WASHING and COOLING EQUIPMENT; GAS SCRUBBERS; "Spraco" NOZZLES for Highway Construction and Maintenance; "Spraco" PNEUMATIC PAINTING EQUIPMENT; PAINT GUNS.

For "Spraco" System for Cooling Condensing Water, see page 1090.

"Spraco" Air Washing and Cooling Equipment for Steam Turbine Generators and other Electrical Machinery.

With the advent of the modern, horizontal, high speed generators, the matter of the proper ventilation of same has become of great importance. The heat losses per unit of surface, or of active weight, are relatively much larger than in the older machines, making forced ventilation essential. The amount of air required varies with the size and type of the generator, some of the later and larger models using less air per kv-a on account of their higher efficiency.

The necessity of properly conditioning the ventilating air is now recognized by engineers as secondary only in importance to the securing of an ample supply of air. The air should be cleansed of all dirt, cooled, and humidified. To accomplish this in an efficient manner, a water-spray type of air washer and cooler has



been found to be the best device. The SPRAY ENGINEERING COMPANY, pioneers in the design and manufacture of washers essentially for power plant service, has developed and perfected the well-known Spraco air washing and cooling equipments, used almost universally in this country and abroad.

The gain in efficiency and capacity, the saving in maintenance, and the longer life of a generator which result from the use of "Spraco" equipment for cooling and cleaning air for such generators, have all a large monetary value. It makes the installation of an equipment of this kind inevitable in all progressive and up-to-date power plants.

Tests—Following are the results of tests made in various parts of the country and at different times of the year:

TESTS MADE ON AIR WASHERS, GIVING ACTUAL THERMOMETER READINGS

Air entering washer	Air leaving washer	Wet bulb temp.	Degrees cooled	Place	Date
63.8°F.	49.3°F.	49.2°F.	14.5°F.	Penn.	November, 1914
70.0°F.	59.0°F.	59.0°F.	11.0°F.	Penn.	October, 1914
75.1°F.	58.5°F.	58.4°F.	16.6°F.	Mass.	June, 1914
93.0°F.	73.75°F.	73.75°F.	19.25°F.	Tex.	September, 1914

Gas Scrubbers.

The "Spraco" nozzles (for description see page 1090) give highly satisfactory results in connection with furnace gas scrubbers, as the mistlike spray takes out everything which is held in suspension in the gases.

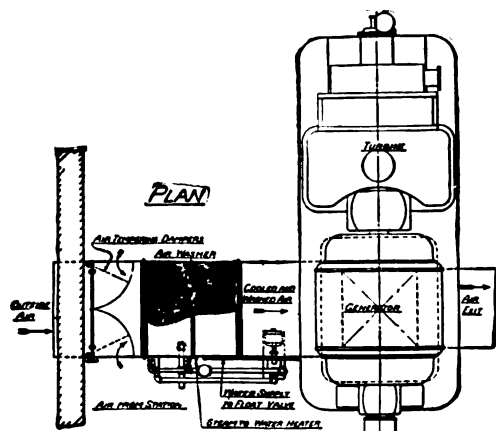
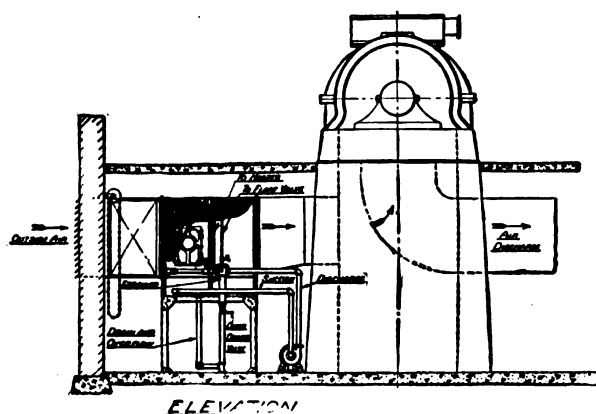
"Spraco" Nozzles for Highway Construction.

"Spraco" nozzles spray at the rate of $\frac{1}{4}$ to $1\frac{1}{2}$ gals. per sq. yd., coating stone evenly. Require little power, do not clog, and are quickly taken apart and reassembled. The cost of a bituminous-bound, macadamized road (two 3-in. layers of No. 1 rock, with double spraying and heavy bituminous binder) can be cut 20%.

"Spraco" Pneumatic Painting Equipment.

The modern method of applying paint and other coatings is by the use of compressed air. It gives better results than the hand brush method, and saves both time and labor. The "Spraco" pneumatic painting equipment is compact, portable, and adapted for either shop or field use.

Some of the Advantages—One workman can do the work of 3 to 12 painters using brushes, depending upon the nature of the work. Uniformly finished coatings free from streaks and brush marks are produced. Rough, irregular and inaccessible surfaces are readily coated. Either a lighter or heavier coating can be obtained than is possible with hand brushes. Standard guns are capable of handling all classes of liquid coatings by using interchangeable caps and nose pieces. The gun and control head may be blown free from paint or cleaned without taking apart. The gun may be mounted on an extension pole for painting surfaces beyond the reach of the operator.



ELEVATION AND PLAN OF AIR WASHER LAYOUT FOR TURBO-GENERATOR

THE ARCTIC ICE MACHINE COMPANY

CANTON, OHIO

AGENCIES

NEW ORLEANS, LA., O. J. MORRIS, 851 Carondelet Street
 NEW YORK, N. Y., F. M. ADAY, Suite 470, 50 Church Street
 DES MOINES, IOWA, C. L. PERCIVAL Co.
 PHILADELPHIA, PA., WINKLER ICE MACHINE Co., 1752
 North 29th Street
 MINNEAPOLIS, MINN., L. E. POLLARD Co., 423 Fifth Street,
 South
 CIENFUEGOS, CUBA, SR. JUAN JOSE HERNANDEZ, Apartado 536

INDIANAPOLIS, IND., WALTER COX

PENANG, MALAY STRAITS SETTLEMENTS, HEIM & Co.
 KANSAS CITY, MO., BERT INMAN, 507 Shukert Building
 CLEVELAND, OHIO, CLEVELAND ICE MACHINE Co., 2187
 Ashland Road
 CHICAGO, ILL., HERBERT HEICHEIMER, 1631 Monadnock Building
 SAN FRANCISCO, CAL., H. F. LYON COMPANY, 24 California Street
 EL PASO, TEX., H. L. STEVENS, 212 West Overland Street
 & SONS, 232 South Pennsylvania Street

Products.

Manufacturers of ICE MAKING and REFRIGERATING PLANTS, for every purpose from 1-ton capacity upwards, and suitable for connection to any kind of power.

Drop Forged Steel Ammonia Fittings, for high pressure work.

Ice Plant Supplies, for every purpose.

Cold Drinking Water Plants, for large industrial institutions.

Chemical Reclamation Plants, for reclaiming benzol and other volatile liquids in gaseous form for re-use; Chemical Precipitating Plants, where certain soluble chemicals are precipitated into solids at low temperatures.

Oil Cooling Systems, for use in connection with large steel heat treating plants or any other purpose.

Roll Cooling Systems, for the rubber industry.

Large Water Cooling Systems, where the temperature is brought down lower than it can be done by cooling towers, or spray ponds.

Gas Condensers, atmospheric, double pipe, submerged and tube types; Solution and Gas Coolers, in styles best adapted to the particular use.

Insulating Material, for every condition.

Heat Exchangers, in all styles: atmospheric, double pipe, submerged, shell and tube.

Pipe Work and Fittings, for every use and pressure.

Arctic Pownall Raw Water System (The Ultimate Plant).

This is the most efficient and up to date ice making plant built in the world. It will produce better ice at less cost than any other.

Power Cost—The current consumption runs from 40 to 55 kw. hours per ton of ice produced, and the current usually costs from $\frac{3}{4}\phi$ to $1\frac{1}{4}\phi$ per kw. hour.

This covers everything, including lights and pumping of water.

Labor—Less than one-half as many men on a shift as required by other type of plant. Only one man required on the tank.

Overhead Expense—Greatly reduced. Insurance is lower. Less chance for fire. Depreciation and repairs greatly reduced on account of modern construction.

Upkeep—Very little, as the wear on motor drive is practically nothing.

Calcium Loss—Virtually eliminated.

The Arctic Junior Line.

Made in sizes from 1 to 20 tons daily refrigerating capacity and can be driven by any kind of power. It is simple and sturdy, requiring a minimum of attention as it is of the splash oiling type.

All points of wear are fitted with replaceable bushings.

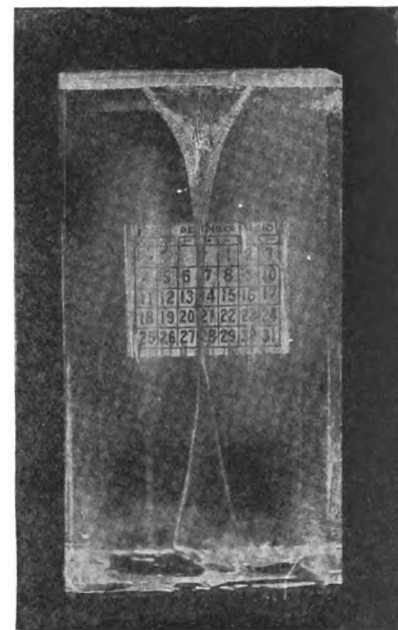
Particularly suited to hotels, apartment houses, small water cooling plants, commissary departments, meat markets and dairies.

Can be fitted to operate automatically.

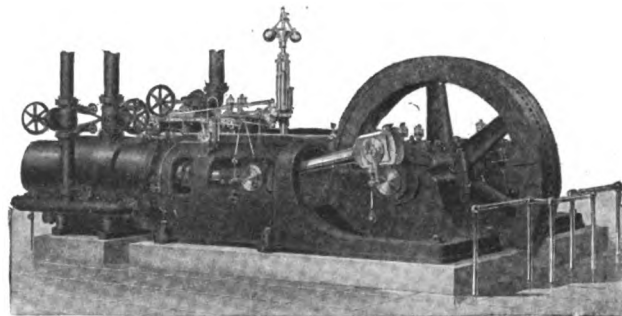
Co-operative Service.

THE ARCTIC ICE MACHINE COMPANY specializes in adapting refrigeration to industrial requirements.

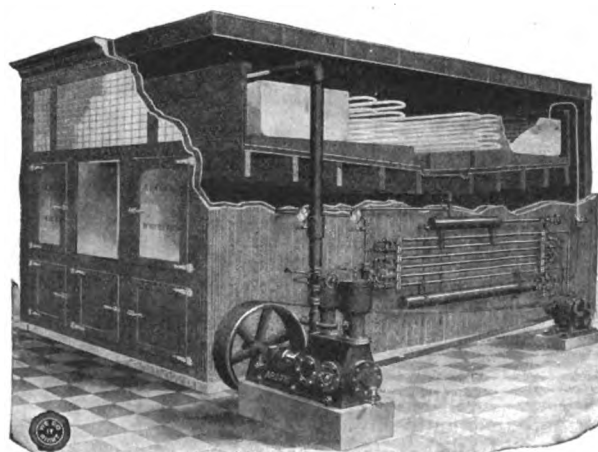
The experience of this organization is at the command of all customers. If in doubt as to the requirements, this company will investigate and guarantee results, advising the most efficient method of removing heat or transferring it from one substance to another.



BLOCK OF "QUALITY ICE" PRODUCED BY ARCTIC POWNALL SYSTEM



ARCTIC HORIZONTAL, DOUBLE-SINGLE ACTING COMPRESSOR Suitable for large installations and adapted for driving by any kind of power



SMALL ASSEMBLED REFRIGERATING PLANT

THE AUTOMATIC REFRIGERATING COMPANY

Automatically Controlled Refrigerating and Ice Making Plants

MAIN OFFICE AND WORKS
HARTFORD, CONN.

BRANCH OFFICES

ATLANTA, GA.
CLEVELAND, OHIO
SEATTLE, WASH.

NEW YORK, N. Y.
CHICAGO, ILL.
ROCHESTER, N. Y.

BOSTON, MASS.
SAN FRANCISCO, CAL.
LOS ANGELES, CAL.

WASHINGTON, D. C.
NEW ORLEANS, LA.
HONOLULU, T. of H.

AGENCIES

HOUSTON, TEX., TENNANT-LOVEGROVE Co.

BALTIMORE, MD., AUMEN MACHINERY Co.

Products.

Manufacturers of complete AUTOMATICALLY CONTROLLED AMMONIA COMPRESSION REFRIGERATING and ICE MAKING PLANTS, including Compressors, Condensers, Coils, Piping and Traps, and Automatic Controlling and Safety Devices for Refrigerating Plants.

Advantages and Scope of Utility.

Chief among the numberless and varied uses of refrigerating and ice making plants are their advantageous application to industrial needs. Automatic refrigerating equipment, designed for large industrial establishments, is eminently adapted for drinking water in factory, restaurants and commissary departments. It is also extensively utilized in special mechanical processes such as tempering and solidifying work.

An Automatic plant can be located anywhere in a building without reference to the location of the engine room. Constant temperatures can be maintained in a number of refrigerators on the one direct expansion system.

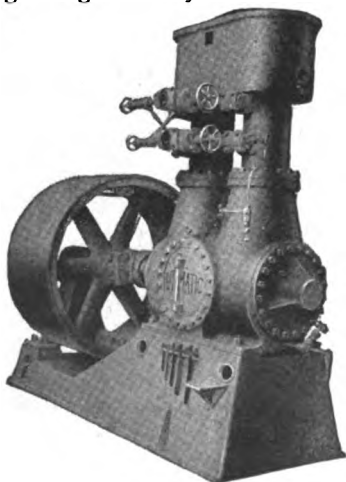
Brine installations are handled with equal facility where conditions warrant that type of plant.

Automatic Refrigerating Plants.

These plants (fully patented) are designed to provide mechanical refrigeration without the necessity of an operating engineer. Automatic devices absolutely control starting and stopping of machine as temperature in boxes rises above, or falls below, predetermined points, and also control feed of ammonia to expansion coils, and feed of water to condenser. Safety devices immediately stop plant in case of trouble with water or electric power service.

Compressors.

They are of the vertical 2-cylinder, single acting, enclosed type; built to accurate dimensions with parts interchangeable. They are provided with patent "safety heads," preventing danger to cylinder heads from non-gaseous substances getting into cylinder. Cylinders and pistons are especially designed to prevent objectionable oil pumping into expansion piping. Single units have from ½ ton to 32 tons refrigerating capacity per 24 hours. The construction is particularly rugged, and all parts are thoroughly tested. Fitting and assembling carefully done by skilled mechanics insure dependable service and longevity.



AMMONIA COMPRESSOR

Automatic Control.

The control equipment is mechanically correct and of rugged construction, therefore thoroughly dependable. It includes a specially designed switchboard, which has automatic safety devices that shut the machine down and cut off all power in the event of trouble in the electric service, preventing danger of damage to motor.

Thermostat.

The thermostat automatically controls the starting and stopping of the machine so as to maintain any desired temperature within a degree or two of a predetermined point, preventing consumption of power except when the temperature requires it. As it is used with the Automatic electric control panel, there is no arcing or pitting of the contact points.

Automatic Expansion Valve.

Automatically controls the feed of ammonia to the expansion coils, thus maintaining the most economical pressure for the expansion of the liquid ammonia in the coils. It is easily adjusted, and functions perfectly.

Automatic Water Regulator.

Automatically controls the flow of water to the condenser, and automatically adjusts the water use to the requirements of the plant. The action of the water valve is powerful and positive, and water waste is eliminated.

Automatic High Pressure Safety Cut-off.

This device automatically stops the machine should the head pressure approach the danger point, due to failure of water supply or any other cause. It puts the plant in operation again when the cause of the high pressure is eliminated.

Condensers.

These are of the double pipe type, with water and ammonia flowing in opposite directions. Atmospheric condensers are used where conditions make them more desirable.

Coils.

Coils are continuously welded, or with screwed or flanged return bends, whichever type is best adapted to the specific installation. All screwed joints are thoroughly "sweated" and tested under high pressure.

Repair Parts.

All parts of Automatic plants are subjected to rigid tests and are interchangeable. A complete stock is always carried, insuring prompt shipment.

Co-operative Services.

The engineering department of this company will gladly co-operate with engineers and architects in the solution of special problems affecting mechanical refrigeration. This service, including preparation of drawings and data, is at the disposal of clients and entails no obligation.

CARBONDALE MACHINE CO.

Manufacturers of Refrigerating and Ice Making Machinery

GENERAL OFFICE AND WORKS
CARBONDALE, PA.

BRANCH OFFICES

NEW YORK, 171-3-5 Christopher Street
BUFFALO, 380 Ellicott Square Building

PHILADELPHIA, 1009 Harrison Building
PITTSBURGH, 1122 Alleghany Avenue
CHICAGO, 1325 Manhattan Building

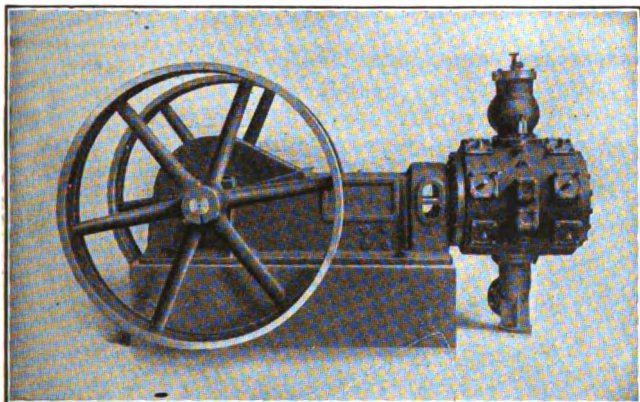
BALTIMORE, 304 Continental Building
LOUISVILLE, 217 Norton Building
NEW ORLEANS, 638 Camp Street

Products and Services.

REFRIGERATING MACHINES (Ammonia Compression and Exhaust Steam Absorption systems); PARAFFIN WAX MACHINERY, consisting of Distillate Chilling Machines, Hydraulic Filter Press, Pumping Equipment, Sweating Pans, etc.

Also manufacturers of Ice Making Plants; Steam and Power Aqua Ammonia Pumps; Ammonia Economizers; Brine Coolers; Ammonia Fittings; Liquid Carbonic Acid Gas Plants.

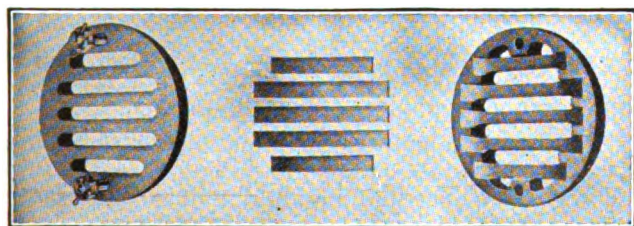
We are prepared not only to furnish these machines but to DESIGN and INSTALL COMPLETE PLANTS.



COMPRESSOR USED IN CARBONDALE AMMONIA COMPRESSION SYSTEM, SINGLE CYLINDER BELT DRIVEN TYPE

Refrigeration.

The line of ammonia compressors, together with the "Carbondale" exhaust steam absorption machine, enables us to meet the requirements of refrigeration for any purpose. The ammonia compressor is the Feather Valve (Reg. U. S. Pat. Off.) ammonia compressor built at the Laidlaw Works of the Worthington Pump & Machinery Corporation for exclusive distribution by us.



WORKINGTON FEATHER VALVE (REG. U. S. PAT. OFF.)
A vital part in Carbondale compression system

Some Advantages of the Worthington Feather Valve (Reg. U. S. Pat. Off.) Used in Carbondale Compression System of Refrigeration.

The steel strips weigh less than a half ounce, making a quiet, durable valve that is in decided contrast to the old heavy, cumbersome types. The valve has no springs, buffer plates or cushioning devices. Seating is by contact—not impact. Pressure on the extremely flexible strips makes the valve tight—no leakage.

We are prepared to furnish Feather Valve ammonia compressors in the following combinations: single cylinder and duplex belt driven; duplex and two-stage direct

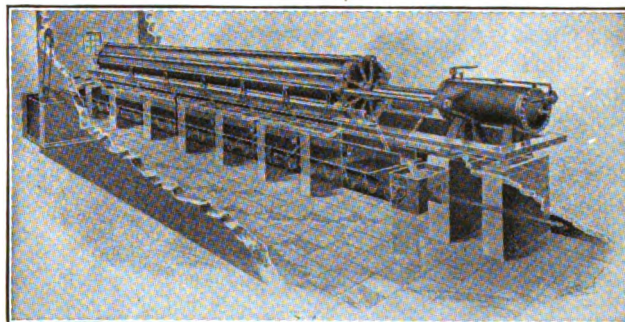
connected to electric motor; and single and duplex steam driven, using slide valve, Corliss, Corliss compound or Stumpf Uni-Flow engine direct connected for operating same.

Advantages of Absorption Refrigerating Machines.

Will operate with exhaust steam under a slight back pressure. No heavy moving parts. Noiseless. No heavy foundations. Very little attention required. Adapted for any floor space or headroom.

Chilling Machine.

The Carbondale patented distillate chilling machine offers the most efficient method of cooling both medium and zero cold test oils. This machine maintains the usual standard of Carbondale quality which has made the Carbondale products so exceptionally successful.



HYDRAULIC ENDED FILTER PRESS
Showing conveying mechanism

Filter Press.

The Carbondale filter press, having flexible plates, is especially adapted for filtering under high pressure.

It is used for the efficient separation of solids from liquids, such as paraffin wax from petroleum distillates, carbon from coal tar and for other purposes where high pressures are necessary in the operation. The steel filter press center plates are designed with special supporting lugs. These plates are assembled with perforated or drainage plates and filtering blankets made of the best quality of cotton duck.

Carbondale Service.

At the works in Carbondale, Pa., we maintain a large staff of engineers specially trained in solving refrigeration problems. This engineering service not only creates and designs the features of Carbondale machinery, but also considers exigencies arising in the various plants where installations are to be made, and plans the installation to meet varying requirements of individual plants. Their services are freely offered to engineers, architects and purchasers without charge. The spirit of co-operation evidenced by this department has been a large factor in placing successful installations in such plants as these: E. I. du Pont de Nemours Co.; Chapin-Sacks Mfg. Co.; Walter Baker Co.; Standard Oil Co.; Armour & Co.; Buffalo Cold Storage Co.; Crane & Co.; La Salle Hotel, Chicago.

Any difficult or unusual problems in refrigerating machinery will be given the closest study by this engineering department on application by responsible manufacturers.

ESTABLISHED 1867

THE VILTER MANUFACTURING CO.

Ice Making and Refrigerating Machinery, Compressors and Engines

1002 Clinton Street
MILWAUKEE, WIS.

BRANCH OFFICES

NEW YORK, 220 Broadway
PHILADELPHIA, 1619 Chestnut Street
PITTSBURGH, 314 Curry Building
CHICAGO, 731 Monadnock Building
SEATTLE, 1015 Alaska Building
ST. LOUIS, 2723 Bennett Court
ATLANTA, GA., 112 South Gordon Street

WELLINGTON, NEW ZEALAND

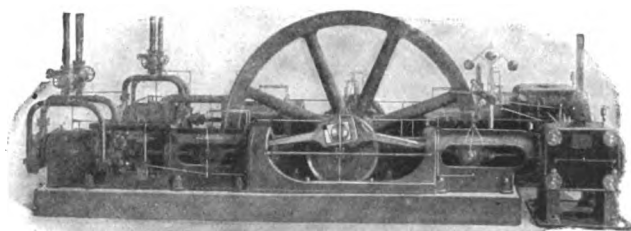
KANSAS CITY, 324 Finance Building
HOUSTON, 519 Beatty Building
LOS ANGELES, 2650 Santa Fe Avenue
(Office and Warehouse)
SALT LAKE CITY, 28 West Broadway
(Office and Warehouse)
HAVANA, CUBA, O'Reilly 9

Products.

VILTER ICE MAKING and REFRIGERATING MACHINERY; AMMONIA COMPRESSORS; PATENTED IMPROVED LOW TEMPERATURE COMPRESSION SYSTEM; POPPET VALVE ENGINES; ROLLING MILL CORLISS ENGINES.

Vilter Duplex Ammonia Compressor.

A duplex steam driven unit, with horizontal double acting ammonia compressors and direct connected to cross compound Corliss engine. Compressor equipped with multiple valve heads, giving maximum area. Stuffing box of the double packed type, with oil seal and pressure release.

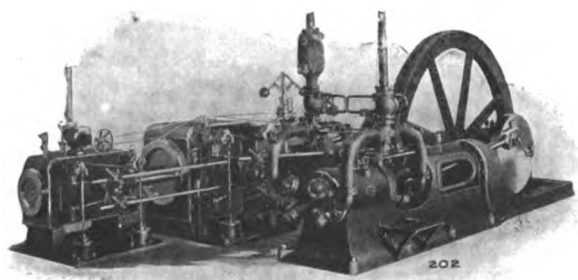


VILTER DUPLEX DOUBLE ACTING CROSS COMPOUND MACHINE

Vilter Single Ammonia Compressors.

This type also built with the Vilter poppet valve high pressure steam cylinder, for high steam pressures and superheat. The duplex type is built in sizes from 125 to 800 tons daily refrigerating capacity.

A single heavy duty steam driven unit, direct connected to tandem compound Corliss engine. The design is wonderfully free from complication, and the construction is such as will insure long life, satisfactory service and freedom from trouble. The heavy duty frame is

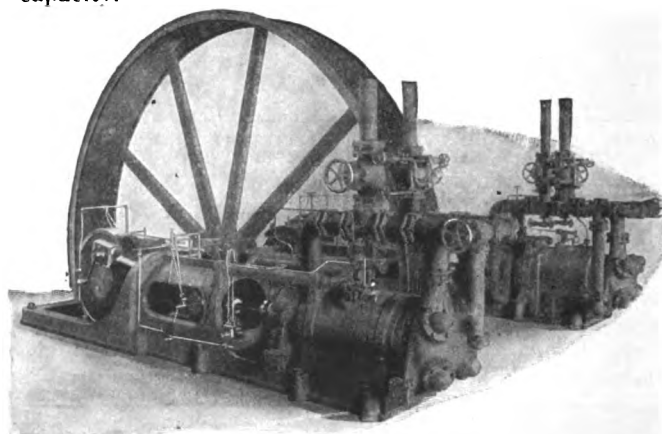


COMPRESSOR DIRECT CONNECTED TO VILTER TANDEM COMPOUND HEAVY DUTY CORLISS ENGINE

designed on straight line principles, of massive construction. The tandem compound engine driven type is built in sizes from 50 to 375 tons daily refrigerating capacity.

Compressor Arrangement for Belt Drive.

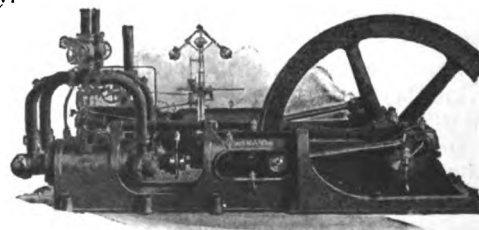
The belt driven machines are furnished in either single or duplex units, and either belt wheels or wheels grooved for rope can be supplied. These units may be driven by any kind of power, such as electric motor, gas or oil engines, etc. Single units are built in sizes from 7½ to 400 tons daily refrigerating capacity; duplex units, in sizes from 15 to 800 tons daily refrigerating capacity.



ROPE DRIVEN DUPLEX COMPRESSOR ROLLING MILL FRAMES

Rolling Mill Type Compressor.

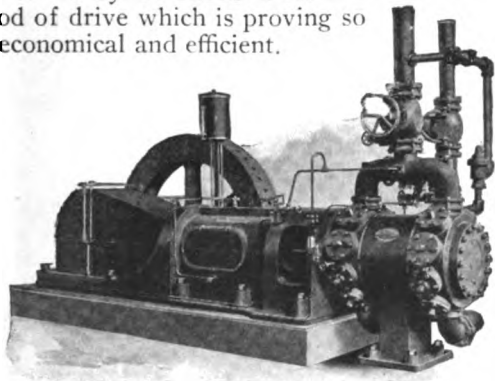
The rolling mill frame machine is built along very heavy lines for all conditions of service. It is used with only slight modifications in all sizes of compressors. Its very appearance gives assurance and proof of its strength and reliability. All parts of the base rest upon the foundation, thus giving a uniform distribution of the load and insuring maximum stability and rigidity.



ROLLING MILL TYPE COMPRESSOR

Vilter Horizontal High Speed Ammonia Compressor.

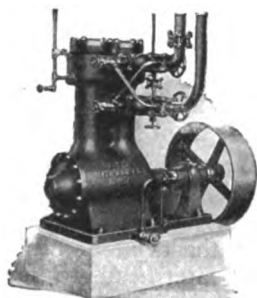
Vilter horizontal high speed ammonia compressors are simple in design, rugged in appearance and in the character of service they give. They are specially designed for direct connection to the newest types of high speed prime movers, and particularly adapted for direct connection to synchronous motors—a method of drive which is proving so highly economical and efficient.



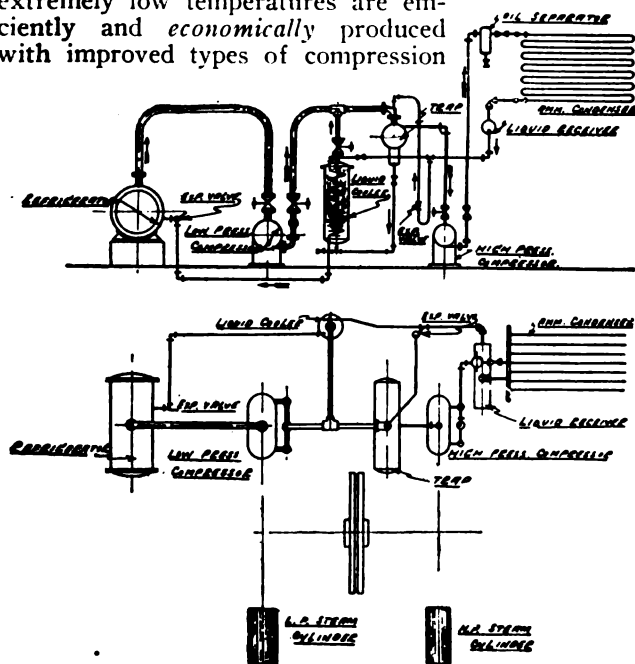
VILTER HORIZONTAL HIGH SPEED AMMONIA COMPRESSOR

Vilter Twin Cylinder Ammonia Compressor.

A vertical compressor, specially designed for users of comparatively small quantities of refrigeration. The design unites the base, main bearing and crank case in a single massive casting, cylindrical sections being used throughout, giving simplicity, symmetry and strength, with a very low center of gravity and perfect alignment. Made in sizes from 1 to 20 tons daily refrigerating capacity.

VILTER VERTICAL AMMONIA COMPRESSOR
Small capacity**Vilter Low Temperature Compression System.**

A system manufactured under D. I. Davis patents; extremely low temperatures are efficiently and economically produced with improved types of compression



DIAGRAMMATICAL ARRANGEMENT OF LOW TEMPERATURE SYSTEM

Showing plan and elevation of the low temperature compression system

SWEET'S CATALOGUE

refrigerating machinery superior to the standard compression machine—the latter costs more and its operation is accompanied with several disadvantageous results.

These economic, detrimental features are overcome in this system by the following methods:

(1) Multistage compression, which increases volumetric efficiency and reduces the power required for operating the compressors.

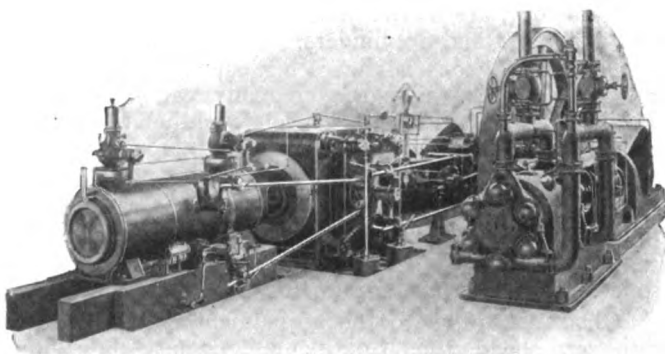
(2) Cooling the liquid before entering the low temperature refrigerator, thus reducing amount of gas handled by low pressure compressor and the power per ton of refrigeration—because the work of cooling is handled by one high pressure cylinder.

(3) Proper traps, etc.

Vilter Tandem Compound Poppet Valve Engine.

Vilter tandem compound engine with poppet high pressure and Corliss low pressure cylinder direct connected to rolling mill compressor frame. The most economical combination known, using high pressure superheated steam.

The latest design of Vilter poppet valve engine embodies the very latest developments to accomplish low steam consumption and simple operation.



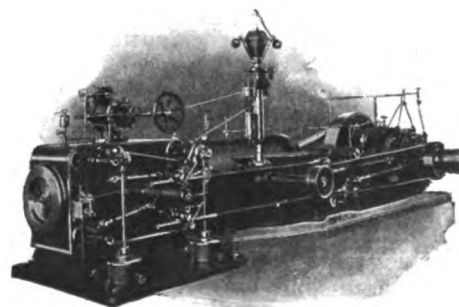
VILTER TANDEM COMPOUND ENGINE

Having poppet valve high pressure and Corliss low pressure cylinders, direct connected to rolling mill type compressor

Vilter Rolling Mill Type Simple Corliss Engine.

The rolling mill frame Corliss engine is of exceptionally massive construction throughout; and is adapted to any class of service from the steady belted load to direct connected electrical service, in which the engine is subjected to heavy and extremely variable loads.

This engine is built for high steam pressures, and high rotative speeds, and may be used with superheated steam up to 100° Fahr. superheat. The valve gear is of the high speed type, and all valves are double ported. Built in all sizes, either simple, tandem, compound or cross compound.



VILTER ROLLING MILL TYPE SIMPLE CORLISS ENGINE

CONTINENTAL MACHINERY COMPANY

Manufacturers of Refrigerating Machinery

1521 Harris Trust Building, 111 West Monroe Street
CHICAGO, ILL.

Products.

"CONTINENTAL" REFRIGERATION: Raw Water Ice Plants, and Accessories, including Ammonia Fittings, Compressors, Refrigerating Equipment.

Scope of Use.

Abattoirs, meat markets, poultry freezing, dairy plants, creameries, marine refrigeration, fur cold storage, skating rinks, drying, confectioners, air conditioning, oil refining, hotels, restaurants, fruit storage, hospitals and morgues, mining operations, mushroom growing, bottling plants, steel tempering, fruit precooling, fish freezing, ice cream plants.

"Continental" Ammonia Compressors.

The "Continental" ammonia compressors, following automobile and gas engine design that has proved so satisfactory, are of the multiple cylinder type, being made with 1, 2 and 3 cylinders. Standard sizes range from $1\frac{1}{2}$ to 60 tons refrigerating capacity. For any plant within this range the company can furnish a machine with just the right capacity, neither too small nor too large.

Safety Head—In case a charge of liquid has been drawn into the cylinders, the safety head opens as well as the discharge valve; thus effectively clearing the cylinders of liquid with no danger to the cylinder heads proper. *Safety is the "Continental" way.*

Clearance—Due to the adjustment for clearance in the crosshead, the "Continental" compressor, with the safety head and single acting construction, is run with less clearance than any other machine now made with *maximum volumetric efficiency* as a result.

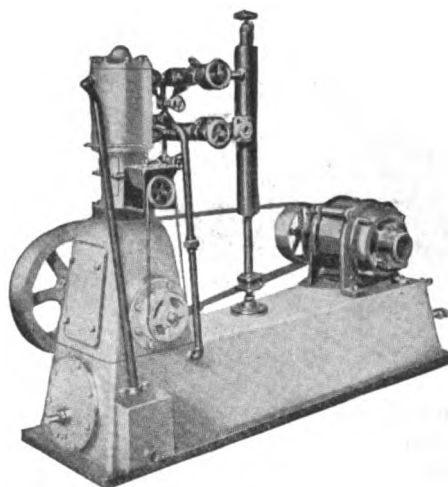
Valves—The valves are flat discs of vanadium steel, light, quick acting, noiseless, absolutely tight and safe. The valves can not fall into the cylinder and wreck the machine. The valve seats are of hardened steel, and with the vanadium discs, enduring, permanent and always dependable.

Bearings—All bearing bushings are die cast and can be adjusted to take up wear or easily replaced. Every bearing is so carefully fitted that a "Continental" is *absolutely noiseless* in operation.

Crank Shaft—The crank shafts are steel forgings very liberally proportioned, giving ample strength and insuring continuous service.

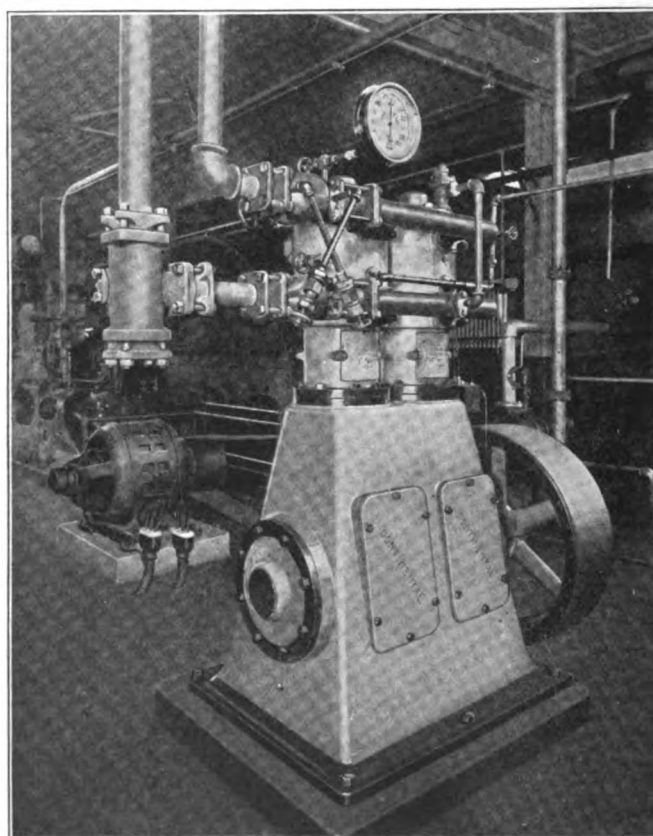
Lubrication—The lubricating system on a "Continental" compressor is ideal. All parts run in a bath of oil, reducing friction losses to the absolute minimum and increasing the life of parts to a maximum. Even the space around the spring in stuffing box is kept constantly filled with oil by the force feed lubricator. The oil in crank case surrounds the working parts there.

Accessibility—Ammonia does not surround the working parts of a "Continental," so they are always easily accessible for inspection or adjustment. Is it not reasonable to assume that a machine constructed thus, will receive better care and last longer than one so built



"CONTINENTAL" SELF-CONTAINED "HIGH SIDE"

that the owner must pump out ammonia, break several gastight joints, and then work with hands and face exposed to burning ammonia fumes? To inspect the cylinder, piston and valves it is only necessary to take off the cylinder head. There are no pipe connections or water heads to be taken down first.



"CONTINENTAL" TWO-CYLINDER AMMONIA COMPRESSOR

HENRY VOGT MACHINE COMPANY

· INCORPORATED

Manufacturers of Refrigerating Equipment and Drop Forged Steel Valves and Fittings

LOUISVILLE, KY.

NEW YORK, N. Y.

BRANCH OFFICES

CHICAGO, ILL.

TULSA, OKLA.

Products.

ICE and REFRIGERATING MACHINERY: EXHAUST STEAM AMMONIA GENERATORS; AQUA AMMONIA PUMPS; DROP FORGED STEEL VALVES and FITTINGS.

For Water Tube and Horizontal Return Tubular Boilers and for Oil Refinery Equipment, see page 771.

Refrigeration.

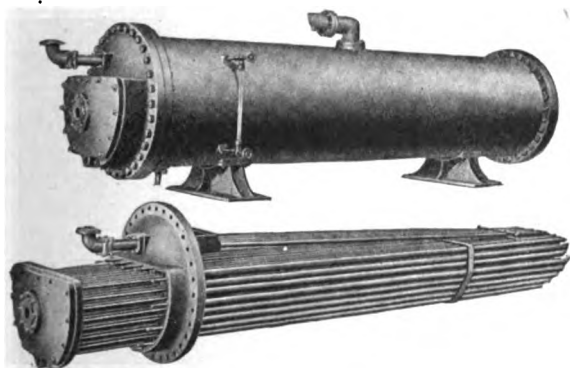
Forty-one years of effort in the design and construction of the Vogt absorption machine has brought forth the present economical and efficient exhaust steam unit.

By an exhaust steam unit is meant a refrigerating machine capable of developing its rated capacity through the use of steam that has already performed useful work. A further economy is effected by combining the exhaust steam refrigerating machine with any mill, light or power plant, the refrigeration or ice so produced being a by-product. When it is understood that the operation of such a machine is possible without the introduction of any complicated parts, our correctness of design is thoroughly established.

The workmanship and materials used in the Vogt machines are the very best; the Vogt drop forged steel valves and fittings being one of the superior features.

Vogt Exhaust Steam Ammonia Generator (Patented).

Designed to operate on lowest possible steam pressure.



VOGT EXHAUST STEAM AMMONIA GENERATOR (PATENTED)

The shell and heads are made of semisteel, this metal being the most durable in contact with hot ammonia.

The coil is made of straight extra heavy wrought iron pipe, and each pipe is closed at one end. The steam is delivered through an inside pipe at the closed end and travels only one time the length of the generator. This eliminates the friction and makes possible operation at minimum pressure.

Vogt

TRADE-MARK

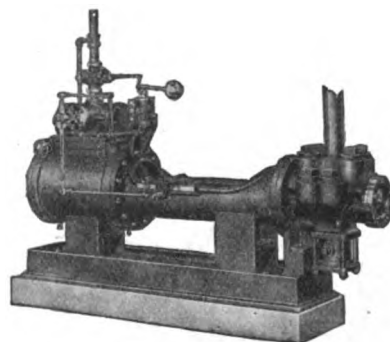
Other special features are: *no* return bends; *no* bent pipes; *no* exposed heating surface; *no* stuffing boxes on steam coils; *no* threaded joints inside of shell.

Vogt Aqua Ammonia Pump.

The Vogt aqua ammonia pump is designed to handle strong aqua ammonia. The steam cylinder is equipped with balanced piston type valve, governed by an auxiliary valve that is mechanically operated. The steam consumption is considerably low for this type pump, and the speed is automatically controlled at any desired number of strokes by means of a Mason regulator. The ammonia cylinder is provided with an extra long stuffing box and water chamber.

The ammonia piston rod is made of special steel and connected with coupling to the steam piston rod so it can be easily removed when necessary.

The pump is mounted on a heavy base.



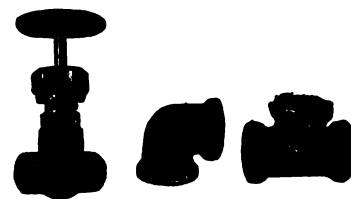
VOGT AQUA AMMONIA PUMP

Vogt Drop Forged Steel Valves and Fittings.

These valves and fittings embody every feature and improvement that assures efficient and enduring service. They fulfill the most exacting requirements of high pressures and temperatures of oil, gas, ammonia, air, water, steam, and superheated steam.

Vogt fittings are absolutely guaranteed not to leak when properly installed. They are scientifically forged from open hearth steel of high tensile strength, which makes them proof against shrinkage cracks, blow or air holes, and other defects and flaws commonly inherent in all gray iron, malleable, cast steel, and other cast fittings.

Vogt fittings are bored out of solid forgings and are tapped accurate to gauge. The metal has an average tensile strength of 60,000 lbs. and, being homogeneous, makes a completed fitting that can not break or crack when tightened up. Cracking and breaking of fittings are caused by inferior metal, which is unable to withstand excessive strains. These conditions are absolutely overcome by Vogt fittings.



DROP FORGED VALVE AND FITTINGS

YORK MANUFACTURING CO.

Ice Making and Refrigerating Machinery

MAIN OFFICE AND WORKS
YORK, PA.

BRANCH OFFICES

BOSTON, MASS., 88 Broad Street
BROOKLYN, N. Y., 42nd Street and 2nd Avenue
PHILADELPHIA, PA., 2222-28 Arch Street
PITTSBURGH, PA., 47-49 Terminal Way, S. S.
CLEVELAND, OHIO, 1106-08 Woodland Avenue
ATLANTA, GA., 116-18 Central Avenue
CHICAGO, ILL., 1113-23 Cornelia Avenue
OMAHA, NEBR., 1213-17 Jackson Street
TORONTO, CAN., CANADIAN ICE MACHINE CO., LTD., Villiers and Munition Streets

ST. LOUIS, MO., 117-19 South 11th Street
DENVER COLO., 2121-31 Market Street
HOUSTON, TEXAS, 2201 Texas Avenue
NEW ORLEANS, LA., 619 Baronne Street
SAN FRANCISCO, CAL., 832-38 Folsom Street
LOS ANGELES, CAL., 306-08 Boyd Street
SEATTLE, WASH., 508 Terry Avenue, North

Products.

ICE MAKING and REFRIGERATING MACHINERY, which includes Compression Refrigerating Machines (Ammonia and Carbon Dioxide), Absorption Refrigerating Machines, Ice Making Plants, Refrigerating Plants, Ammonia Valves, Ammonia Fittings, Ammonia Condensers, Brine Coolers, Aqua Ammonia Pumps, Ice Cans, and all parts needed to equip a complete ice making or refrigerating plant.

Description.

We make, in our own factory, all the machinery and apparatus used in ice making and for general refrigeration, both compression and absorption systems.

Sizes.

The enclosed machine is built in sizes from $\frac{1}{8}$ ton refrigerating capacity upward; the vertical single acting machines from 20 to 600 tons; the horizontal double acting machines from 10 to 600 tons—either belt or steam driven type. Absorption and carbon dioxide plants of any capacity required by the trade.

Application.

York machines can be used wherever ice making or refrigeration is required, the style of machine being determined, to a great extent, by local conditions.

The enclosed machine is particularly adapted for residences, apartment houses, small hotels, creameries, ice cream factories, etc.

Valves and Fittings.

York ammonia valves and fittings are guaranteed to give satisfaction under all usual working pressures.

Service.

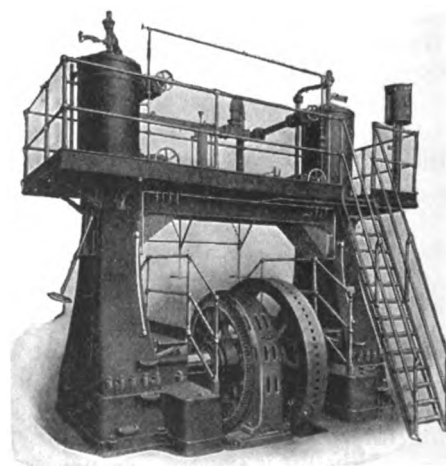
All our agencies carry in stock a complete line of ammonia valves and fittings; also a line of enclosed machines.

What a service department is to the owner of an automobile, the York Sales Organization is to the user of ice making and refrigerating machinery.

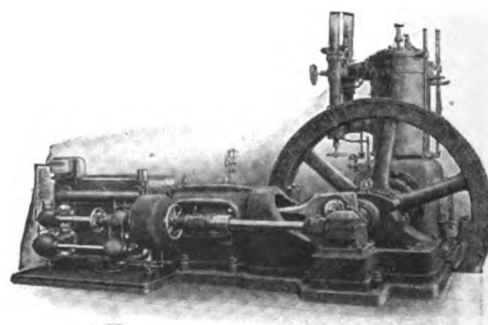
Both *quality* and *service* can be secured by patronizing the York Organization.



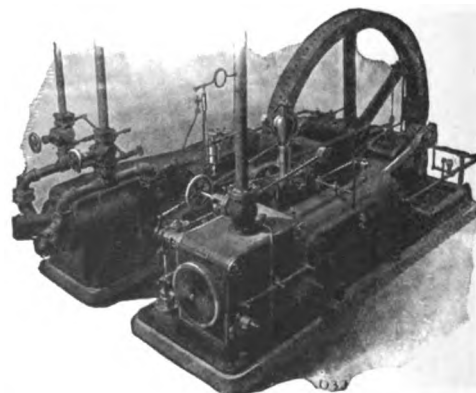
VERTICAL SINGLE-ACTING
ENCLOSED REFRIG-
ERATING MACHINE



SEMIENCLOSED VERTICAL SINGLE-ACTING REFRIGERATING
MACHINE
With direct motor mounting



ENCLOSED SINGLE-ACTING REFRIGERATING MACHINE
Direct connected to Uniflow engine



HORIZONTAL DOUBLE-ACTING REFRIGERATING MACHINE
Direct connected to Corliss valve engine

ARMSTRONG CORK & INSULATION COMPANY

Cold Pipe Covering and Cold Storage Insulation

126 Twenty-fourth Street
PITTSBURGH, PA.

BRANCH OFFICES IN THE LARGER CITIES

Products and Services.

NONPAREIL CORK COVERING for brine, ammonia, refrigerated drinking water and all low temperature pipe lines.

NONPAREIL CORKBOARD INSULATION for cold storage plants.

CONTRACTORS for heat and cold insulation.

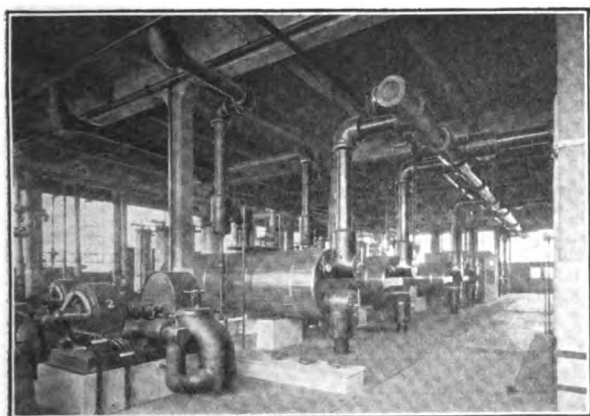
For Nonpareil High Pressure Covering and Insulating Brick, see pages 792-93.

Nonpareil Cork Covering.

Nonpareil Cork Covering is made of clean, granulated cork, compressed and baked in molds to fit pipes of the different sizes and the various fittings in general use. No foreign binder is used. The natural gum in the cork wood, liquefied by heat, cements the mass firmly together, and covering each granule with a shellac-like film, renders it practically impervious to moisture. The covering is then coated inside and out with a mineral rubber finish, ironed on. As a result, Nonpareil cork covering, properly applied and cared for, will last for many years without deterioration from moisture and frost. It effects a saving of approximately 80% of bare pipe losses, and is the most efficient, durable and economical insulation for low temperature lines.

Nonpareil Covering is supplied in molded covers for practically all fittings, screwed and flanged and in split sections, 36 in. long, for straight runs of pipe. It is made in three thicknesses—Standard Brine Covering for lines carrying refrigerant between 0° and 25° Fahr.; Special Thick Brine Covering for temperatures below 0° Fahr.; and Ice Water Covering for refrigerated drinking water lines and others where temperatures are above 25° Fahr.

A 64-page book, "Nonpareil Cork Covering," contains complete detailed information and specifications invaluable wherever refrigeration is used. A copy of this book and a sample of the covering will be sent free on request.



NONPAREIL CORK COVERING ON BRINE AND AMMONIA LINES IN THE PLANT OF THE SINCLAIR REFINING COMPANY, EAST CHICAGO, IND.

Note clean-cut and substantial appearance of covering on both pipes and fittings

Drinking Water Systems.

The refrigerated drinking water system has in recent years become firmly established not only as a

modern convenience, but as a requisite of economy and efficiency in mills and factories, hotels, office buildings and other public and semi-public buildings. Such a system delivers properly cooled water in exactly the quantity required, when and where wanted. It occupies little space, saves time and money, and is clean and sanitary, eliminating the waste and mussiness of the ordinary ice water tank or the "bucket and dipper" method. In manufacturing plants, particularly, the excellent results of the refrigerated drinking water system contribute in a very positive way to increased morale and efficiency, and reduced labor turnover and time lost by sickness.

Nonpareil Cork Covering in Ice Water Thickness is especially adapted for the insulation of the distributing lines and apparatus. It is neat in appearance, vermin-proof and moistureproof and fire retardant. Its high insulating efficiency insures a minimum use of refrigeration and power, and its durability is a guarantee of long life in service.



DRINKING WATER DISTRIBUTING LINES INSULATED WITH NONPAREIL CORK COVERING, ICE WATER THICKNESS, IN THE WASHBURN-CROSBY MILLS, MINNEAPOLIS, MINN.

Engineering data not available elsewhere are contained in the 48-page book, "Drinking Water Systems," which will be sent on request and without charge. The information regarding water, power and refrigeration required, data on installing the system, approximate operating costs, etc., will be found of unusual value and assistance.

Nonpareil Corkboard Insulation.

Nonpareil Corkboard is supplied in boards 12 in. by 36 in. and 1, 1½, 2, 3, 4 and 6 in. thick.

The peculiar cellular structure of cork gives Nonpareil Corkboard its remarkable insulating efficiency. For the same reason it will not absorb moisture, and hence keeps free from rot, mold and offensive odors. Moreover, Nonpareil Corkboard is strong, fire retardant and easy to erect in any type of building. Nonpareil Corkboard is reasonable in first cost, and, in the long run, is the most economical insulation that can be used. Properly erected, it will last as long as the building.

Samples and literature and further information will be furnished on application.

BANNER ROCK PRODUCTS CO.

Manufacturers of Cold Storage and Heat Insulation

ALEXANDRIA, IND

Products and Services.

ROCK CORK; ROCK CORK STUCCO SHEATHING; ROCK CORK LATH; ROCK WOOL QUILT.

Contractors for application of our products in all kinds of cold storage installations, or, with the insulation, a competent superintendent to direct application.

Rock Cork.

Description—A board made of rock wool, bound with waterproofing crude paraffin binder, and in volume 88% air cells. Formed in slabs 16 by 36 in., and $\frac{1}{2}$, 1, $1\frac{1}{2}$, 2 and 3 in. thick. Can be applied to brick or concrete walls in portland cement mortar and to lumber surfaces in asphalt insulating cement. Permanent walls and partitions are constructed by erecting 2 layers in portland cement mortar, and plastering both sides. Portland cement plaster adheres tenaciously to Rock Cork. Rock Cork is non-inflammable, being a mass of minute air cells, having walls of indestructible mineral.

Rock Cork Stucco Sheathing—Made from Rock Cork composition $\frac{1}{2}$ in. thick, for application on exterior walls of dwellings or buildings receiving stucco finish. On brick, tile or concrete walls, apply in portland cement mortar. On lumber walls, nail with 3d nails and tin or galvanized caps, allowing 3 nails per sq. ft. Cover with 2-in. chicken netting or other wire fabric. Apply stucco finish direct in 2 coats, following usual compositions. Rock Cork stucco sheathing $\frac{1}{2}$ in. thick insulates a building from heat and cold equivalent to 8 in. brick veneer, and protects from moisture and sound. Use 1, $1\frac{1}{2}$ or 2 in. thickness of suitable widths of Rock Cork in connection with stucco sheathing, for raised panels, pilasters, vertical or horizontal borders, and water tables.

Rock Cork Lath—A painted metal lath embedded in Rock Cork composition $\frac{1}{2}$ in. thick, made in 4-ft. lengths, 18 in. wide. Can be nailed to interior or exterior studs on 16- or 12-in. centers, and receive plaster or stucco finish for partition construction for outside stucco

finish. Resists heat, cold and moisture. Sound resistance is increased and weight of partition is but 60% of solid construction when granulated Rock Cork mixed with plaster composition is used. For hospitals, hotels and apartment houses.

Roof Insulation—For 1-in. thickness, use 16- by 36-in. sheets. This thickness conducts about one-half as much as two $\frac{7}{8}$ -in. boards with paper between. The 1-in. Rock Cork weighs $1\frac{1}{4}$ lbs. per sq. ft.

Floor and Partition Deadening—Lay Rock Cork on floors, or granulated Rock Cork between strips. Apply to tile, brick or metal lath partitions in portland cement mortar, and plaster. Partitions for any purpose that have great sound resistance can be constructed as indicated above.

Insulating Efficiency—Many tests by different observers and by different methods place Rock Cork as one of the most efficient insulating materials known. Proof against water, fire and decay. The test of time, for 11 years, demonstrates its permanency. It is backed by a record of successful service in many leading cold storage warehouses, packing plants, ice storage rooms, ice cream plants, creameries, etc.

Rock Cork is acknowledged to give more insulating efficiency per dollar expended than any other material or composition known.

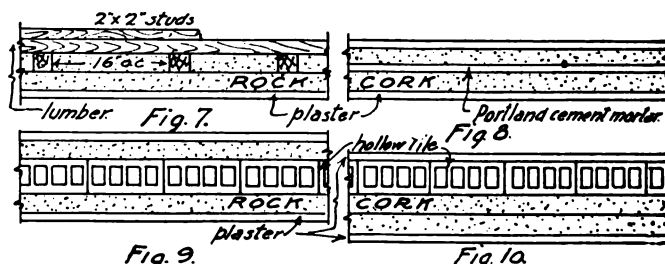
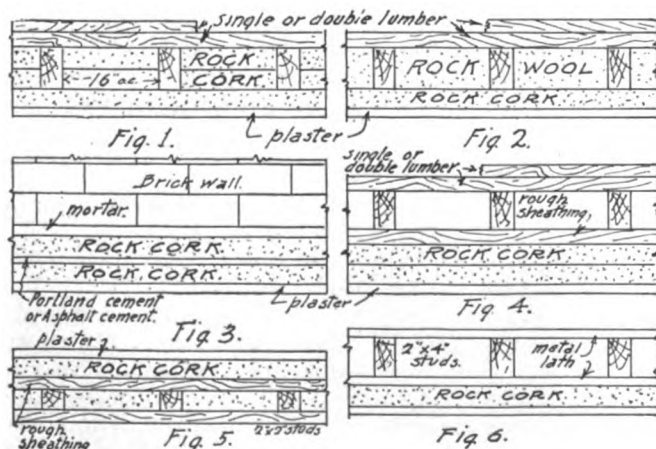
Rock Wool Quilt.

A flexible insulation for high temperatures, on boilers, furnaces, tanks, thickness, $1\frac{1}{2}$ or 2 in. Stock size, 3 by 8 ft. Other sizes made to order. Can be finished, if desired, after installation, with any plaster composition.

References.

Rock Cork has been installed in 32 states and in Mexico. Below are some of our oldest installations:

Grocers' Ice & Cold Storage Co., Louisville, Ky.
Geo. D. Mansfield Co., Milwaukee, Wis.
Milwaukee-Waukesha Brewing Co., Milwaukee, Wis.
Syracuse Cold Storage Co., Syracuse, N. Y.
Cincinnati Abattoir Co., Cincinnati, Ohio
Burge Machine Works, Chicago, Ill.
Indiana Ice & Dairy Co., Anderson, Ind.
Schalk Bros. Ice Co., Anderson, Ind.
Indianapolis Abattoir Co., Indianapolis, Ind.
Kuhner Packing Co., Muncie, Ind.



FIGS. 1 TO 10 WALL AND PARTITION CONSTRUCTION WITH ROCK CORK

Figs. 1, 2, and 7 are designs for vestibules and passageways faced with lumber finish. Figs. 6 and 8 are partitions between rooms requiring plaster finish on both sides. Fig. 5 reduces lumber to minimum, is more substantial and as cheap to erect as laying up insulation in portland cement mortar with plaster on both sides, as Fig. 8. Figs. 3 and 4 are wall insulations

UNION FIBRE CO., INC.

Manufacturers of Insulating Materials

WINONA, MINN.

BRANCH FACTORY: YORKTOWN, IND.
AGENTS IN EVERY LARGE CITY

Products.

INSULATING MATERIALS: LINOVELT; FIBROVELT; WATERPROOF LITH; UNION LITH PIPE COVERING; UNION ROCK WOOL.

Engineering Data and Service.

In every large city we maintain offices, in charge of expert insulation men, capable of analyzing any problem and suggesting proper treatment. Full data as to requirements for any condition, together with complete estimates on materials, or workmanship, freely furnished. The practical experience of twenty years in handling the most difficult problems in insulation, condensation, machine vibration, acoustic correction, etc., is at the service of customers.

Linovelt.

A heat resisting quilt for sheathing buildings. Prevents passage of heat or sound through walls, floors, or ceilings. Chemically treated flax fiber, immune from decay, firmly stitched between layers of tough, Kraft paper, or of waterproof paper, muslin or burlap, as may be required. Uniform in thickness and quality, germ-proof and verminproof, and the most efficient heat and sound insulation on the market. From $\frac{1}{4}$ to 1 in. thick, in various widths and lengths. Special types for acoustic work, fireproof construction, etc.

Fibrovelt.

A light, self-sustaining, flexible insulating felt, in board form, from selected straw fiber. Odorless, sanitary, germproof and verminproof. Easily cut and applied like lumber. Especially adapted for prevention of roof condensation. Deadens sound and vibration in factory machinery.

Waterproof Lith.

A standard insulating block for refrigerating plants, cold storages, packing houses, creameries, ice storages, etc., composed of selected flax fiber and annealed rock wool. This wool, comprising 40% of Lith, contains 8% stone fiber and 92% entrapped air. Flax fiber adds insulating efficiency and necessary tensile strength not found in other wool blocks, or other cold storage insulation. Thicknesses are from $\frac{1}{2}$ to 3 in.; blocks 18 in. wide by 4 ft. long. Heat transmission, per inch thickness, per degree difference in temperature, per day, is 6.60 B.t.u's.

Union Lith Pipe Covering.

For ice water, brine, and refrigeration pipe and fittings, moulded to exact form from same material as Lith. Made in three thicknesses: Regular Brine, $2\frac{1}{2}$

in. thick, for zero to 25° Fahr.; Heavy Brine, $3\frac{1}{2}$ in. thick, for below zero service; Ice Water, $1\frac{3}{4}$ in. thick, for cold liquids between 25° and 50° Fahr. Unusually efficient, extensively used.

Union Rock Wool.

Blown from virgin rock by exclusive patented annealing process, it is the most durable and efficient wool obtainable. Recent infringement prosecutions prove its superiority. Furnished in bags, 50 lbs. each, in carloads or less, f.o.b. Yorktown, Ind. Wool packs in service to 14 lbs. per cu. ft. Excellent insulation, and especially adapted for filtration of chemicals, acids, etc.

Economy of Insulation.

A half-inch thickness of any of our products, used to prevent escape of heat through walls, roofs, etc., will easily save one-third its cost *every* year, in fuel alone, and maintain uniform temperatures. In cold storage service, its cost is only a fraction of the cost of the refrigeration it eliminates. For sound absorption, acoustic correction, etc., our products rank highest in every test, and compared with former methods, are absurdly inexpensive. A proper application under heavy, vibrating machinery adds years to the life of both buildings and machines.

Elimination of Roof Condensation.

In the coldest climate, under extreme conditions, one-inch thickness of Fibrovelt, applied in hot asphalt on concrete roofs, will absolutely prevent condensation, which for years has been so destructive. Hundreds of applications prove it. Any ordinary form of roofing can be used over the insulation, in the ordinary manner. Such treatment, by retaining interior heat, prevents roof concrete from attaining cold temperature at which condensation takes place, thus removing its cause.

Refrigerator Insulation.

Practically all efficient household refrigerators, fully 60% of the refrigerator cars in the country, and a very large percentage of the cold storage plants, packing houses, etc., in all parts of the country, are, and have been using our specially adapted products for years, with unqualified success. During the past year 82% of our shipments were to former customers, proving their satisfaction.

Estimates, etc.

Complete data and estimates for any requirements freely furnished on request, together with personal service of any of the engineering forces.

ENGBERG'S ELECTRIC & MECHANICAL WORKS

Manufacturers of Engines, Dynamos, Generating Sets

ST. JOSEPH, MICH.

Products.

ENGBERG ENGINES, GENERATORS and DIRECT CURRENT GENERATING SETS.

Standards of Design.

The design of Engberg engines and generators are the result of 20 years' experience in perfecting and producing the most reliable, and at the same time, the most efficient, generating sets obtainable.

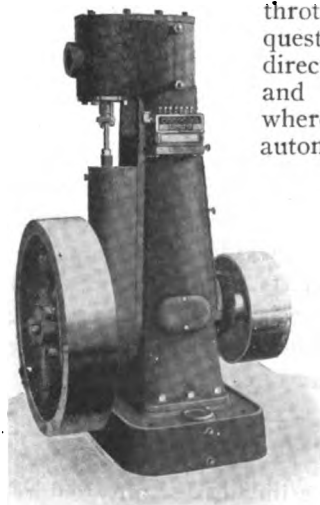
For dependability, economy in steam and oil, and low cost of maintenance, Engberg direct current generating sets are a most remarkable piece of equipment.

The workmanship and materials can not be excelled. We invite careful inspection and investigation because the general principles, as well as the smallest details, have never failed to attract the attention of the most critical buyer.

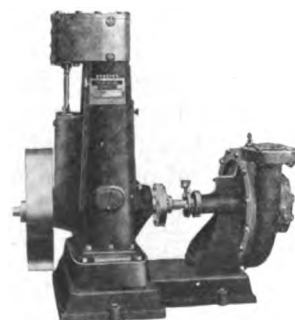
Engines.

Guarantee—Engberg engines are guaranteed to be free from defective workmanship, material and design, and to do the work they are intended for. We will repair or replace, without cost to the purchaser, any part or parts of engines which shall prove defective within one year from date of shipment, while operating under normal conditions and under proper supervision and attendance.

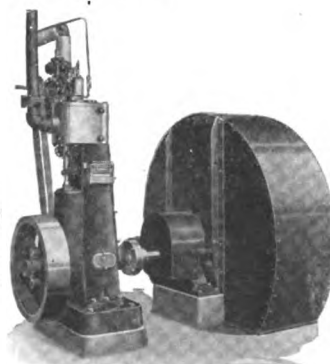
Range—The engines are manufactured from 3½ by 3½ in. to 12 by 10 in., with either the automatic or throttle governor, and on request, specially equipped for direct connection or belt drive, and for all lines of service where a vertical, self-oiling automatic engine is adaptable.



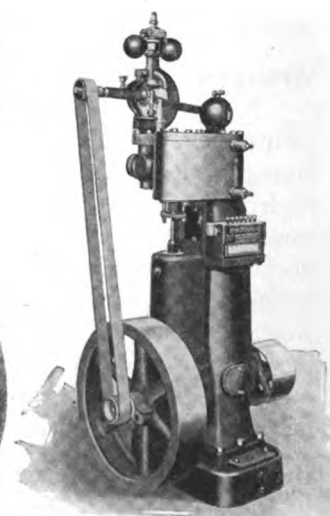
ENGBERG ENGINE



ENGINE CONNECTED TO PUMP



ENGINE CONNECTED TO FAN



ENGBERG THROTTLE ENGINE

Construction—Simplicity combined with dependability and successful performance has been our aim in producing Engberg engines. Accessibility and ease of adjusting all working parts are distinctive. The principal features in construction and design follow:

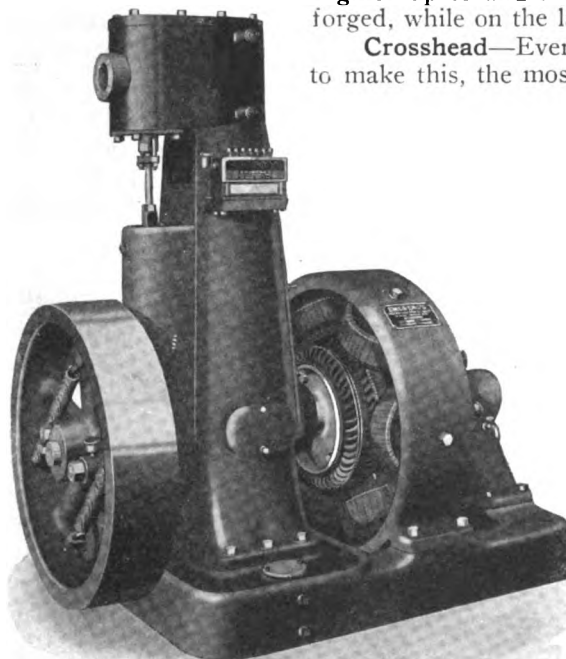
Connecting Rod—This is undoubtedly the heaviest and most substantial rod used on this type of engine. It is made of special connecting rod steel and on all engines up to and including frame D, the rod is drop forged, while on the larger sizes of cast steel.

Crosshead—Every precaution has been exercised to make this, the most vital part of the engine, exceptionally strong, and most suitable for dependable and continuous performance.

Valve—The valve is of the balanced piston type of close grained iron and is ground to a perfect fit in the valve chamber. It is accurately fitted to the valve rod, and is secured by a nut and lock nut. The lower end of the valve rod is threaded and screws into the valve slide and is secured by the use of a lock nut. By merely loosening on the lock nut, the valve can be easily adjusted or set.

Lubrication—On all engines larger than frame A, the lubricating system is made up with oil pump in base of engine, pumping oil from oil reservoir in base of engine up into distributing oil trough on side of engine frame. This trough is provided with adjustable sight feeds to each bearing. Then oil is re-drained back into base, refiltered and repumped.

In addition to direct feed to each bearing, the supply pipe leading to crosshead slides, etc., is so liberal as to cause constant dripping on to counterbalances, causing all reciprocating parts to operate in a constant spray.



ENGBERG D.C. GENERATING SET
1 to 50 kilowatt

Dynamos.

Guarantee—Their rating, stability and performance are guaranteed, and we will, without cost to the purchaser, within one year from shipment, repair, or at his option furnish another part, f.o.b. our works, in exchange for any part or parts of machine that shall, under normal conditions of operation and under proper supervision and attendance, prove defective.

Impregnated Windings—The shunt and series coils of the Engberg generator are impregnated under vacuum process with a waterproof compound, after which they are subjected to a thorough baking process.

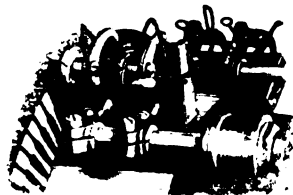
The armature coils are saturated with an insulating waterproof varnish and carefully baked.

All windings are taped and protected to insure satisfaction, even when subjected to unusually rough usage.

Armature—Of the iron clad ventilated type, with laminated core, built of electrical sheet steel, thoroughly japanned before assembling. Drum and core are provided with air ducts, permitting thorough circulation of air. Nothing but best double cotton covered magnet wire of highest conductivity is used, and the insulation is waterproof.

Commutator—Made of copper bars, insulated with best grade mica plate, and is very heavy, insuring years of continuous operation without renewal. Built up on separate sleeve and bolted to armature drum, so the shaft can be removed without disturbing the windings.

Brush Holder Rigging—The brush holder yoke is a heavy iron casting, attached to end bearing, and is of ample strength to insure firm support for the brushes. The brush holders are of the reacting type, and of most modern design. The best grade of carbon brushes for the purpose are used.



BRUSH HOLDER RIGGING

WEIGHTS AND DIMENSIONS OF GENERATING SETS

Engine Frame	K. W.	No. of Poles	Size of Engine	Steam Pressure	Rev. Per Minute	Diameter Pipes		Weight		Code Word 110-125 Volts	Code Word 220-230 Volts
						Steam	Exhaust	Net	Crated		
A	1	4	3 1/2 x 3 1/2	90	750	1	1 1/2	550	600	Bacoad	Olfoad
A	1 1/2	4	3 1/2 x 3 1/2	90	750	1	1 1/2	575	625	Edcoad	Rogoad
A	2 1/2	4	3 1/2 x 3 1/2	90	750	1	1 1/2	625	690	Fecaad	Spraad
B	3 1/2	4	4 1/2 x 4	90	500	1 1/2	1 1/2	995	1065	Ihcaad	Urqaad
B	5	4	4 1/2 x 4	90	700	1 1/2	1 1/2	985	1040	Jicaad	Wigaad
C	5	4	4 1/2 x 4	90	400	1 1/2	2	1825	1925	Licaad	Xugaad
C	7 1/2	4	6 x 5	90	500	1 1/2	2	1845	1950	Oucaad	Yvgaad
D	8	6	6 x 6	90	375	2	2 1/2	2860	2985	Pacaad	Asgaad
D	10	6	6 x 6	90	450	2	2 1/2	2900	3025	Srecaad	Bygaad
D	10	6	7 x 6	90	350	2	2 1/2	3000	3125	Tecaad	Fakaad
D	12 1/2	6	7 x 6	90	425	2	2 1/2	3050	3175	Uucaad	Hekaad
D	15	6	7 x 7	90	400	2 1/2	3	4840	5040	Vucaad	Idkaad
F	17 1/2	6	8 x 7	90	400	2 1/2	3	4850	5050	Yxcaad	Jekaad
G	20	6	8 x 8	90	325	3	3 1/2	5400	5600	Arcaad	Lpkaad
G	25	6	8 x 8	90	400	3	3 1/2	5450	5650	Dagaad	Nikaad
G	25	8	9 x 9	90	325	3	3 1/2	6800	7000	Ebgaad	Ojkaad
I	30	8	10 x 9	90	300	3	3 1/2	7000	7200	Higaad	Sukaad
I	40	8	10 x 10	90	300	3	3 1/2	9650	9950	Ilgcaad	Upkaad
J	50	8	12 x 10	90	275	3	3 1/2	10750	11050	Ligaad	Vpcaad

Adaptability of Engberg Generating Sets.

Direct current, direct connected generating sets can be furnished from 1 to 50 kw.

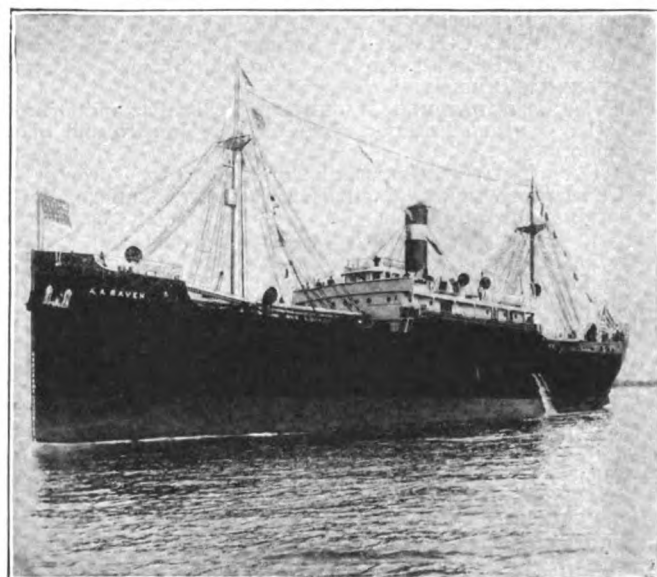
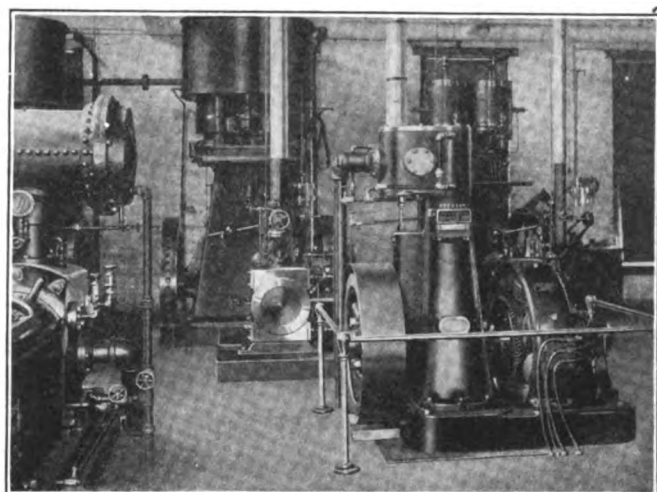
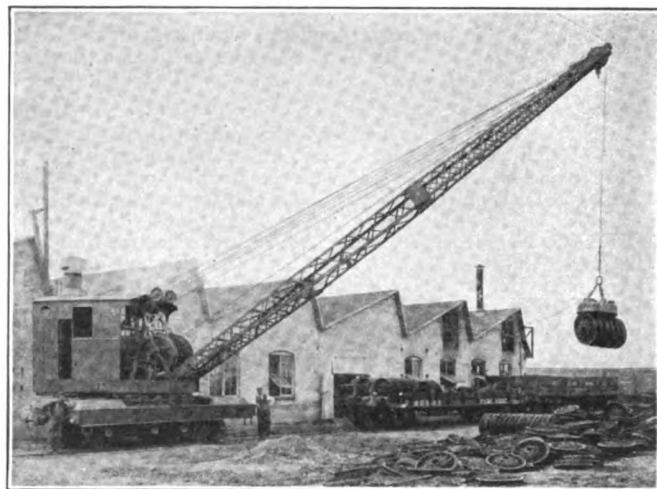
Alternating current, direct connected generating sets are built from 20 to 75 kv.a., in any standard phase, voltage and cycles.

Engberg direct connected generating sets are operating all lines of industry where quality and dependable performance are the first consideration.

For marine lighting sets they are unexcelled, because very compact, requiring little floor space, and will operate continuously with practically no attention.

Practically all builders of dredges, steam shovels and magnet cranes, as well as the leading contractors, railroad and steel corporations have adopted the Engberg set as standard.

They are used extensively for lighting and power service in factories, hotels and office buildings.



A FEW ADAPTATIONS OF ENGBERG GENERATING SETS

GENERAL OFFICE
SCHENECTADY, N. Y.

SCHENECTADY, N. Y. LYNN, MASS. NEWARK, N. J. WATSESSING, N. J. ERIE, PA.
PITTSFIELD, MASS. HARRISON, N. J. CLEVELAND, OHIO FORT WAYNE, IND.

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G-E Sales Office or G-E Foreign Representative nearest the writer

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ral Electric Co.	s Service Shop

120 Broadway, NEW YORK, N. Y.; SCHENECTADY, N. Y.; 83 Cannon St., LONDON

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AUSTRALIA: AUSTRALIAN GENERAL ELECTRIC Co., LTD., Sydney and Melbourne
BELGIUM AND COLONIES: SOCIETE D'ELECTRICITE ET DE MECANIQUE PROCEDES THOMSON-HOUSTON & CARELS SOCIETE ANONYME, Brussels
BOLIVIA: INTERNATIONAL MACHINERY Co., La Paz and Oruro
BRAZIL: GENERAL ELECTRIC, S. A., Rio de Janeiro and Sao Paulo
CANADA: CANADIAN GENERAL ELECTRIC Co., LTD., Toronto
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CHINA: ANDERSEN, MEYER & Co., LTD., Shanghai; INTERNATIONAL GENERAL ELECTRIC COMPANY, INC. (general representatives for the Far East, excluding China and Japan), Shanghai
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FRANCE AND COLONIES: COMPAGNIE FRANÇAISE THOMSON-HOUSTON, Paris, France
GREAT BRITAIN AND IRELAND: BRITISH THOMSON-HOUSTON Co., LTD., Rugby; INTERNATIONAL GENERAL ELECTRIC Co., INC., London
GREECE AND COLONIES: COMPAGNIE FRANÇAISE THOMSON-HOUSTON, Paris, France

INDIA: BRITISH THOMSON-HOUSTON Co., LTD., Calcutta and Bombay; INTERNATIONAL GENERAL ELECTRIC COMPANY, INC., Calcutta

ITALY AND COLONIES: FRANCO TOSI SOCIETA ANONIMA, Milan

JAPAN: SHIBAURA ENGINEERING WORKS, Tokyo; TOKYO ELECTRIC Co., LTD., Kawasaki

MEXICO: MEXICAN GENERAL ELECTRIC COMPANY, Mexico City and Guadalajara

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GENERAL ELECTRIC COMPANY

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Products.

The products of the GENERAL ELECTRIC COMPANY comprise practically every kind of apparatus and machinery used in the generation, transmission, distribution and use of electrical energy. It is entirely practicable, therefore, for an engineer to standardize with G-E equipment. By this procedure, all parts interrelate and there is unified responsibility for their proper operation, as well as the advantage of having all electrical equipment built by one company, ready for immediate installation.

Engineering Service.

The engineers of the GENERAL ELECTRIC COMPANY and its facilities for manufacturing and research are at the disposal of all engineers in authority or responsible for the design, erection or operation of manufacturing or engineering equipment. At each G-E district office, specialists welcome the opportunity to co-operate with such persons wishing authoritative advice on all electrical matters. Catalogues, special bulletins and prices are also readily obtainable.

Guarantee.

The name "GENERAL ELECTRIC COMPANY" on any electrical device is a guarantee of quality, backed by



TRADE-MARK

more than a quarter century's experience in electrical manufacturing.

The thousands of G-E products are in use in all parts of the world, and, as commercial installations have been made in almost every section, prospective purchasers can be referred to equipment in actual service.

It is a well recognized fact that a knowledge of the many functions wherein electricity enters into modern engineering practice is essential to every engineer and to every official in charge of manufacturing operations.

Most manufacturing plants maintain their own engineering departments, but only the largest of them have engineers devoting their attention exclusively to electrical problems.

The purpose of the following pages is to show in a broad way the scope of utility of electrical equipment, to suggest various decisions relative to electrical equipment that the average industrial engineer or official may be called upon to make, and to show how the GENERAL ELECTRIC COMPANY may co-operate by furnishing engineering service, as well as equipment.

It is manifestly impossible to display all the products manufactured by this company, but descriptions and illustrations of typical apparatus are given, sufficient to decide regarding their application, together with references to further information in most cases.

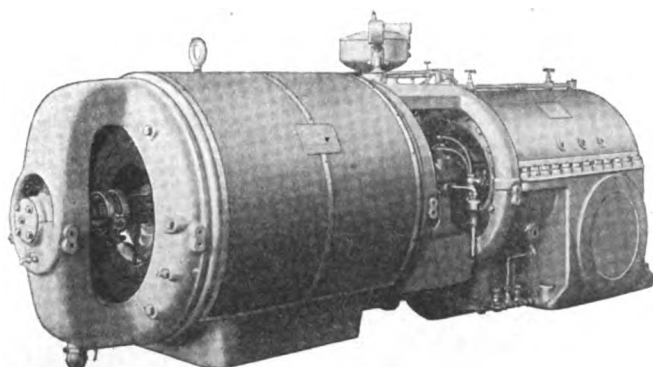
Curtis Steam Turbines.

Hand in hand with high pressure steam, the use of the superheater and condensers for high degrees of vacuum, comes the steam turbine. Its advantages have long been recognized, and, as a result, practically all the electric power produced by large steam stations is generated by turbines. The Curtis steam turbine as manufactured by the GENERAL ELECTRIC COMPANY, is distinguished by its low cost of operation and reliable service.

No internal lubrication is necessary, and since the oil is circulated through the bearings in a closed system, the cost of oil is very small. The exhaust steam from the turbine is free from oil and may be used for heating the boiler feed water, for heating the building, or for other low pressure industrial purposes.

The speed is controlled by means of a centrifugal or inertia governor which operates the steam admission valves through suitable mechanism.

As an independent mechanism, a protective emergency governor is supplied, which provides against the possibility of excessive speed. This governor is so simple in design that there is practically nothing about it to get out of order.



300-KW. CURTIS STEAM TURBINE

Curtis turbines give the maximum of power with a minimum of floor space and head room. They are built in sizes of 10 kw. upward, for driving direct current generators, and from 100 kw. upward for alternating current generators.

A special form of this turbine is widely used for driving centrifugal pumps, blowers and other like apparatus.

The low pressure turbine is designed to take exhaust steam from engines, pumps, air compressors, hoists, etc., and convert it into useful power. The mixed pressure turbine, in addition will carry all or any portion of its rated load on high pressure steam. Low and mixed pressure turbines are of the same general construction as the high pressure machines and embody all the well-known advantages of the Curtis type of turbine.

Bulletins 42010 and 42201A give further information on sizes from 10 to 3500 kw. For information on larger sizes, consult the nearest G-E office.

Headlight Turbine Generator Sets.

To meet the rigid requirements of steam locomotive headlight service, a turbine generator set has been designed especially to supply power for the headlight and cab lights, although its use may be extended also to other applications including steam shovels, derricks, wrecking cranes, oil well drilling outfits,



500-WATT TURBINE GENERATOR SET

launches and tugboats. This set consists of a single-stage Curtis turbine direct-connected to a compound-wound generator which delivers energy at practically constant voltage under different loads.

For industrial applications, the set is made in a 500-watt, 110-volt capacity for operation on 70 to 170 lbs. boiler pressure. For locomotive headlight service, the set is made in a 500-watt, 32-volt capacity for operation on 125- and 225-lb. boiler pressures.

Parts are interchangeable so that sets of either voltage can be furnished to operate on either range of boiler pressure when requested. Bulletin 82014A.

Water Wheel Driven Generators.

This company manufactures units ranging in capacity from 30 kv-a. to 40,000 kv-a. Both horizontal and vertical types are individually designed to meet most efficiently the various requirements imposed by the supply of water available for any given development and the operating conditions involved in either constant or fluctuating hydraulic heads. Bulletin 40601 gives information on sizes 30 to 625 kv-a. Large installations are illustrated in Bulletin 40600A.

In addition to water wheel driven generators, the GENERAL ELECTRIC COMPANY

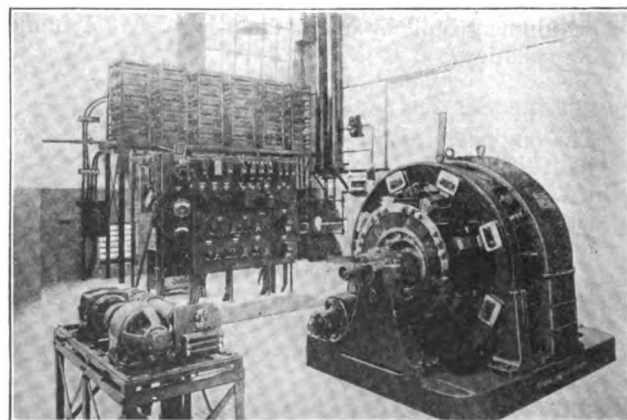


32,500-KV-A. WATER WHEEL GENERATOR

manufactures complete electrical equipment for hydro-electric stations and the service of the company's engineers is always at the disposal of prospective customers to assist in selecting apparatus which will insure safety and reliability in operation and the most efficient utilization of the water power.

Automatic Station Equipment.

Automatic stations offer opportunity for new and important economies in the generation, control and distribution of electrical energy. They have been successfully developed to meet a wide variety of conditions. More than 100 automatic stations are now operating. They show automatic switching equipment to be successful in a variety of applications, the more important being the control of synchronous converters, synchronous motor generator sets and induction motor



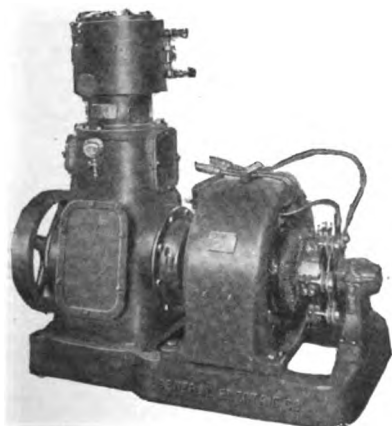
SYNCHRONOUS CONVERTER SUBSTATION WITH G-E AUTOMATIC CONTROL EQUIPMENT

generator sets for railway, industrial and mining service, also synchronous condensers, hydroelectric generators and battery charging sets for general service.

Bulletins 47730 and 40604 give further information regarding the applications of G-E automatic station control equipment. Information on the operation of automatic railway sub-stations is given in Bulletin 44092B. Full details can be obtained from the nearest G-E office.

Steam Engine-Driven Generating Sets.

Made for small plants and for lighting construction operations in isolated places requiring 72 kw. or less. In addition to many specific points of superiority, these



G-E ENGINE DRIVEN GENERATOR SET

sets have the great advantage of being manufactured completely at one factory, insuring perfect fit, uniformity of finish, and a thorough test of the combined unit before shipment is made. They are used extensively for both power and lighting service.

The direct current generators are regularly wound for line voltages of 110 to 125 volts, flat or over-compounded. The alternating current generators are wound for 2300 volts. Both can be furnished for other voltages on special order. Bulletin 42300.

Belt Driven Generators.

The GENERAL ELECTRIC COMPANY manufactures belt driven direct current generators in capacities from a fraction of a kilowatt to 300 kw. capacity in standard voltages. Alternating current generators are designed for various frequencies, voltages and phases from 7½ to 550 kw.

Detailed information covering these generators will be supplied upon request to nearest G-E office stating capacity needed and service required.

Switchboards.

The GENERAL ELECTRIC COMPANY offers a complete line of switchboards for all systems of electrical distribution. Industrial and consulting engineers are invited to confer with switchboard specialists stationed in the principal branch offices of the company. Sketches, detailed drawings and specifications of any such special boards, or the adaptation of standard unit panels will



TYPICAL STANDARD UNIT SWITCHBOARD

Standard Units Panels—These have been developed to meet certain conditions which have been found

be cheerfully and quickly furnished on request.

All equipments on G-E switchboards are made by a single company, thus centralizing responsibility for behavior of the entire switchboard.

to occur repeatedly in connection with control and distribution of electric power. They have not been developed for voltage above 1200 D.C. or 3500 A.C.

It is advisable whenever possible to use standard unit panels, for they are less expensive than the other classes, requiring less time to build and ship.

Standard unit panels may be ordered simply by one or more catalogue numbers, taken from the GENERAL ELECTRIC COMPANY's switchboard bulletins. Each bulletin is complete in itself and covers panels in a distinct class. They are shown in outline and the equipment is specified in every detail necessary to enable one to select just what is needed.

The following bulletins are available covering designs for several classes of service. Brief information on these types is given in Index Bulletin 47001A.

One or more Generators up to 240 kw. D.C.....	47050B
600 to 1200-volt D.C. Panels for Railway Service.....	47010
Three-wire Lighting Circuit, 10 to 100 kw. D.C.....	A4189
Double Polarity, Generator and Feeder, D.C.....	47070A
480 to 600 volts A.C., with Oil Circuit Breakers.....	47133
Small General Service up to 2300 volts A.C.....	47135A
Small General Service, 240 and 480 volts A.C.....	47131
Induction Motor Panels up to 2200 volts.....	47140A
A.C., General Power and Lighting Service.....	47190A
3-phase, 3-wire, 240, 480, and 600 volts, Oil Circuit Breakers on Panel.....	47163
3-phase, 3-wire, 240, 480, 600 volts, Oil Circuit Breaker on Pipe Framework.....	47164

Safety Enclosed Switchboards—Marked progress has been made in developing means which will prevent accidental contact with oil circuit breakers and other parts while alive, and this development has also increased the efficiency of operation by giving greater ease of inspection, adjustment and replacement. The GENERAL ELECTRIC COMPANY has given much attention to questions of safety in switchboard design and has developed several types of safety panels which have proved very successful in service.

Enclosed Truck Type Panels—These make a most desirable switchboard from the standpoint of safety to

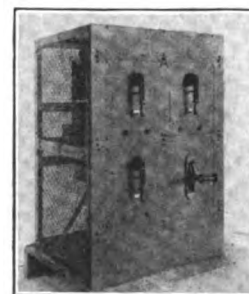


SAFETY ENCLOSED TRUCK TYPE PANEL

life, the elimination of fire risk and continuity of service.

Each complete unit consists of 2 elements—the truck or movable element carrying the panel, oil circuit breaker and instrument transformers; the stationary or housing element enclosing the truck (when it is in an operative position), the buses and the terminals of the incoming and outgoing cables. All current carrying parts are completely enclosed when alive, and when withdrawn for inspection or repairs the wiring and apparatus on the truck are accessible from all sides and electrically dead. Bulletin 47100.

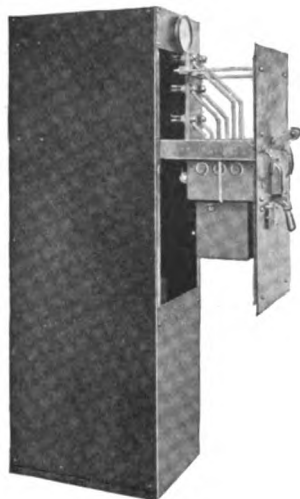
Enclosed Dead Front Stationary Panels—These are standard unit panels especially



ENCLOSED DEAD FRONT STATIONARY PANELS

applicable where inexperienced or unskilled employees have access to the switchboard. A sheet steel door on the steel front of each switch unit directly back of the operating handle can not be opened when the switch is closed. The switches can also be locked open.

These panels may be combined into a switchboard which presents a pleasing appearance and offers all the advantages of dead front safety operation. Made up with switches and air circuit breakers in capacities desired, 250 or 600 volts. Bulletin 67110.



FK20 CIRCUIT BREAKER
MOUNTED ON DRAW-
OUT PANEL

Safety Enclosed Draw-out Panels—An industrial type oil circuit breaker enclosed in a steel housing and so interlocked with the housing that the panel can be drawn out only when the breaker is in the "off" position and electrically dead. The interlock also prevents the panel from being pushed back into the operating position when the breaker is in the "on" position.

Bulletin 67105A gives further information on this latest type of safety panel.

Switchboard Devices.

This company is prepared to furnish with switchboards all of the various devices used in conjunction with them. These include alternating current and direct current relays of various types to function on overload, underload, overvoltage, undervoltage, reverse power, reverse phase, etc.; meters and instruments of all types, together with instrument transformers and other accessories; air break switches, air and oil circuit breakers, etc. These devices are also furnished separately.

Requests for information regarding them should be addressed to the nearest G-E sales office.

Oil Circuit Breakers.

A thorough knowledge of circuit conditions and years of experience in designing and building oil circuit breakers have enabled the GENERAL ELECTRIC COMPANY to place on the market a complete line of these units which fulfill every requirement in long continued service.

This line includes breakers for service on potentials up to 220,000 volts, and in current capacities up to 5000 amps. They are liberally designed, strong in construction and combine every essential for reliability and satisfactory operation.

G-E oil circuit breakers have parts accurately constructed in order to insure perfect adaptability to any like breaker or to any similar function of the same breaker.

They can be equipped with circuit opening and circuit closing auxiliary switches for electrical interlocking, for indicating or for controlling an auxiliary circuit; bell alarm switches; undervoltage device for tripping breakers and relays for every purpose.

It is impracticable to give fully the details of application and service limitations of the several types of G-E oil circuit breakers. The adjacent table is therefore compiled to refer to descriptive bulletins giving full information on the complete line. These will be mailed on request by bulletin number from readers interested in certain types and sizes.

LIST OF OIL CIRCUIT BREAKERS

Type and Bulletin	Amperes	Volts	Poles	*Application	Operation
FK13 47443	200	3300	2, 3 and 4	Power and lighting service in small plants requiring low interrupting capacity.	Manually operated, automatic and non-automatic.
FK5 47444	200 300, 500 300, 500, 800	4500 7500 600	1, 2, 3 and 4	Of moderate capacity for power station service.	Manually and solenoid operated, automatic and non-automatic.
FK12 47448	200 300, 500, 800 1500	22,000 15,000 4500	1, 2, 3 and 4	Similar to FK5 but higher interrupting capacity.	Manually and solenoid operated, automatic and non-automatic.
FK35 47445	400, 600 400, 600, 800	7500 600	Single-pole standard units for combining into required number	Similar to FK5 but has standard unit construction.	Manually and solenoid operated, automatic and non-automatic.
FK32 45450	400, 600 800, 1200	15,000	Single-pole standard units for combining into required number.	Similar to FK12 but has standard unit construction.	Manually and solenoid operated, automatic and non-automatic.
FK34 67453	2000	4500	Single-pole standard units for combining into required number.	An extension of the single-unit design	Manually and solenoid operated, automatic and non-automatic.
FK25 47471	3000, 4000 5000	600	3	Where it is not desirable to break currents in air	Solenoid operated.
FK24 47469	300	35,000	3	Framework mounted, relatively low interrupting capacity	Manually and solenoid, automatic and non-automatic
FK52A	400, 600 800, 1200	15,000	3	High interrupting capacity, especially suited for limited floor space	Manually and solenoid, automatic and non-automatic
FK52B 47482	400, 600 800, 1200 1600, 2000 400, 600, 800	15,000 15,000 25,000			
FK30	Same rating as FK52	Same rating as FK52	3	Similar to FK52, but higher interrupting capacity	Manually and solenoid, automatic and non-automatic
FK36A FK36B and C 47478	400, 800 400, 600	Up to 220,000	3 single pole standard unit elements	Very high interrupting capacity, outdoor or indoor service	Manually and solenoid, automatic and non-automatic
PH3 PH6	Up to 2000 Up to 4000	15,000	3	Very high interrupting capacity, indoor service	Motor operated, automatic and non-automatic
FP10 47419A	50	600	3 and 4	Controlling induction motors of 25 h.p. or less	Manual or shipperod, automatic or non-automatic
FK20 47433	60, 200, 300 60, 200	2500 2500	3 4	Same as FP10 except higher capacity and automatic type can be made non-automatic and vice versa	Manually operated
FP15 67424	50	600	3	Especially for controlling textile mill motors.	Manual or shipperod. Non-automatic only
FP4 47415	200	7500	1, 2 and 3	For vertical flat-service mounting in manholes or where there is danger of flooding	Manually operated, non-automatic
FP7 47417	200	15,000	2, 3 and 4	Outdoor breaker for pole mounting for sectionizing feeder systems, cutting out transformers, etc.	Manually operated, non-automatic

*Relays or attachments can be furnished to enable breaker to function on overload, underload, reverse current, undervoltage, etc.

Air Circuit Breakers.

The satisfactory operation given in all kinds of railway, industrial and building service is an indication of the quality and excellent design of G-E air circuit breakers. They come mounted on G-E switchboards or may be purchased separately.

For direct current systems, the use of air circuit breakers is universal as an automatic device for taking care of abnormal conditions on machine or feeder circuits. Some of these conditions are taken care of directly by breaker as a self-contained device, and some by use of auxiliaries acting to trip breaker either mechanically or electrically.

For alternating current systems above 440 volts, air circuit breakers are only rarely employed, since the oil circuit breaker covers the larger part of this field. The conditions most commonly taken care of are overload and under voltage.

The manually operated air circuit breaker is most commonly used, but with remote control breakers, the station main wiring can very often be laid out to better advantage, resulting in a large saving of cable. For such conditions, electrically operated breakers are available.

All G-E air circuit breakers are approved and listed by the Underwriters' Laboratories, Inc. and will carry full rated loads continuously without exceeding the heating limits specified in the standardization rules of the A. I. E. E.

Self-contained solenoid operated breakers up to 3500 amps. A.C., and 6000 amps. D. C., are listed below with references to descriptive bulletins. For breakers above these capacities, refer to the General Office for information.

Lever Switches.

Enclosed Lever Switches—Types LM-4 and LM-5 enclosed switches with fuse connections, externally operated as shown, have current carrying parts completely enclosed and inaccessible while alive. These switches give positive safety protection and are well suited as

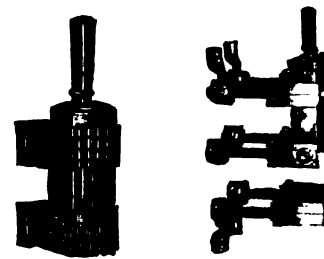
feeder switches for industrial motors and to all lighting and power circuits within their rating. For alternating current and direct current service, 250 volts up to 600 amps., made double-, triple- and 4-pole; for alternating current service, 500 volts, up to 400 amps., triple-pole only. Group mounting of these switches, making an enclosed switchboard, provides an ideal control for a number of feeder circuits from a central point. Bulletin 67381A.



LM5 SAFETY SWITCH

Types LR-4 and LR-5 switches are also enclosed and can be mounted as units on a panel making an enclosed deadfront switchboard. A steel cover allows access to the fuses from the front of the panel, but only when the switch is open. Made for 2 to 600 amps., 250 volts, plain lever, and 600 volts quick-break for either alternating current or direct current.

Open Type Switches—For direct current circuits, the use of lever switches is general—as a circuit breaking device within certain capacities, as a motor starting device (in connection with starting resistances) and as a disconnecting device in series with circuit breakers. For alternating current circuits, their use is limited as a circuit breaking device, oil circuit breakers being recommended for large capacities and for circuits above 440 volts.



G-E LEVER SWITCHES

All G-E lever switches are constructed to withstand severe and constant usage and meet all the requirements of the National Board of Fire Underwriters. The open types are made either single- or double-throw, 1-, 2-, 3-, or 4-pole.

LIST OF AIR CIRCUIT BREAKERS

Types and Bulletins	Class of Service	Amperes	Volts	Poles	Functions
DIRECT CURRENT					
Type CP 47530	High grade switchboard. Breakers of medium capacity for any service.	15-1200 15-1200	250 650	S-P. and D-P. S-P.*	CP Reverse current Overload and reverse current Underload Overload and underload CP, CK and CK2 Overload † Shunt trip Attachments, Low voltage release Shunt trip coil Auxiliary switches Mechanical interlocks Relays
Type CK 47540	High grade switchboard. Breakers of large capacity for any service.	1500-6000	250	S-P. and D-P.	Overload † Shunt trip Attachments, Low voltage release Shunt trip coil Auxiliary switches Mechanical interlocks Relays
Type CK2 47540	High grade switchboard. Breakers of large capacity for any service.	1500-10,000	650	S-P. and D-P.	Overload † Shunt trip Attachments, Low voltage release Shunt trip coil Auxiliary switches Mechanical interlocks Relays
Type CG 47520	For motor driven machine tool application, cranes, rectifiers, etc. For light duty. To be used for power and lighting service on isolated boards not over 76 in. high. Should not be used to line up with panels containing Type C P, C K or C K2 breakers.	3-300	550	S-P. and D-P.	Overload † Shunt trip Underload Overload and underload Overload, low voltage and reverse current Low voltage and reverse current Attachments, Low voltage release Shunt trip coil Auxiliary switches Relays

† Can be made non-automatic by omission of overload parts.

Types and Bulletins	Class of Service	Amperes	Volts	Poles	Functions
ALTERNATING CURRENT					
Type CP 47530	For motor driven machine tool application, cranes, rectifiers, etc.	15-1200 15-1200	480 650	S-P., D-P. and T-P. S-P. and T-P.	Overload † Shunt trip Underload Overload and underload Overload, low voltage and reverse current Low voltage and reverse current Attachments, Low voltage release Shunt trip coil Auxiliary switches Relays
Type CK 47540	For light duty. To be used for power and lighting service on isolated boards not over 76 in. high. Should not be used to line up with panels containing Type C P, C K or C K2 breakers.	1500-3500 1500-3000	480 480	S-P., D-P. and T-P.	Overload † Shunt trip Underload Overload and underload Overload, low voltage and reverse current Low voltage and reverse current Attachments, Low voltage release Shunt trip coil Auxiliary switches Relays
Type CG 47540	For light duty. To be used for power and lighting service on isolated boards not over 76 in. high. Should not be used to line up with panels containing Type C P, C K or C K2 breakers.	1500-3500	650	S-P. and D-P.	Overload † Shunt trip Underload Overload and underload Overload, low voltage and reverse current Low voltage and reverse current Attachments, Low voltage release Shunt trip coil Auxiliary switches Relays

Types and Bulletins	Class of Service	Amperes	Volts	Poles	Functions
SOLENOID OPERATED BREAKERS †					
Type CP3 67550	High grade switchboard. Breakers of medium capacity for any service.	15-1200 D-C. 100-1200 D-C. 800-1200 A-C. 100-1200 A-C.	650 650 650 650	S-P. S-P. S-P. S-P.	Overload or non-automatic Overload or non-automatic
Type CK3 67550	High grade switchboard. Breakers of large capacity for any service.	2000-6000 D-C. 2000-3500 A-C.	650 650	S-P. S-P.	Overload or non-automatic Overload or non-automatic

† Alternating and direct current circuit closing relays can be used to trip solenoid breakers, the contacts of the relays completing the circuit of the trip coils of the breakers.

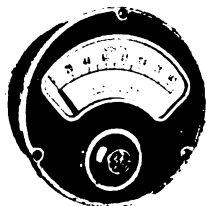
* Double pole 250-volt breakers can, with slight changes, be made suitable for 650-volt service.

Switchboard and Portable Instruments.

The GENERAL ELECTRIC COMPANY has developed and perfected a complete line of indicating and recording switchboard instruments for all classes of work. These are of such mechanical excellence that they have become the standard for highest grade instruments.

For information on instrument transformers, see description on page 559.

Round Pattern Instruments—For use on direct current circuits. Wide opening in cover, together with large needle, facilitates reading the indications. Equipped with zero adjusting device. Cases are cast iron and dustproof. Constructed on the well known D'Arsonval principle. Ammeters ranging from 80 to 3000 amps. are furnished with external shunt. Bulletin 46017.

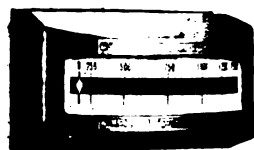


ROUND PATTERN
VOLTmeter

Round pattern voltmeters and ammeters for use on alternating current circuits, although primarily for alternating current work, can also be used on direct current. They operate on the Thomson inclined coil principle and are neat and pleasing in design. Bulletin Y-492.

Horizontal Edgewise Instruments—G-E horizontal edgewise instruments are exceedingly accurate and may be relied upon to give long and satisfactory service. Instruments are of uniform size, presenting a pleasing appearance when installed.

Primarily designed for alternating current service,



HORIZONTAL EDGE-
WISE AMMETER

but can be used on direct current. Voltmeters and ammeters constructed on the well known Thomson inclined coil and D'Arsonval principles; wattmeters on the direct reading dynamometer principle. Made for back connection only, in dull black finish. Bulletin 46016.

Curve Drawing Instruments—Portable and switchboard types. They have high torque, give accurate results and clear, unblotted records. Furnished for front or back connection. Voltmeters can be furnished with extra tap on resistance for use on both alternating current and direct current.



CURVE DRAWING
AMMETER

Capacities of ammeters, up to and including 200 amps.; voltmeters, up to and including 750 volts alternating current or direct current.

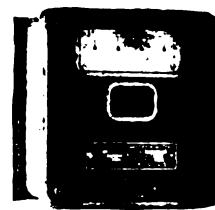
Described in Bulletin 46021.

Frequency and Power Factor Indicators—Horizontal edgewise instruments with same style of case as the voltmeters, ammeters and wattmeters. The type H frequency indicator shows on direct reading scale the cycles per second of any alternating current system. Adjustable for characteristics of circuit on which installed. Standard instruments wound for 100 to 125-volt circuits only; up to and including 650 volts if desired. Bulletin 46016.

Power factor indicator shows on direct reading scale the power factor, lagging or leading, of balanced 3-wire 2-phase, 3-wire 3-phase or 4-wire 2-phase systems. Furnished for any potential up to and including 650 volts. Bulletin 46016.

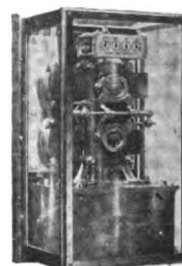
Synchronism Indicators—For synchronizing 2 or more alternating current machines. Can be furnished with swinging brackets and lamps for mounting on side of panel or with pivoted brackets and lamps for mounting at top of panel. Bulletin 46015.

Watt-hour Meters—The GENERAL ELECTRIC COMPANY builds a complete line of watt-hour meters for all classes of service, i. e., direct current and alternating current, single-phase and polyphase, for switchboard, house or portable service. For further information on the single-phase meters, send for Bulletin 46201A. Bulletin 46253A describes the polyphase types.



WATT-
HOUR METER

Astatic Watt-hour Meters—Thomson direct current instruments especially designed for switchboard use. Made in back connected form only and enclosed in rectangular glass case. Covers are removable from the front. Armatures and damping magnets are astatically arranged, thus minimizing the effect of stray fields. Damping magnets are enclosed in a laminated iron shield, thereby protecting them from the effects of short circuits. Meter is provided with spherical armature and field coils, gravity control brushes and small commutator. Finish is dull black. Write for additional information. Bulletin 66351.



ASTATIC WATT-
HOUR METER

Type DP2 Indicating Voltmeters and Ammeters—Designed for secondary standards and general testing purposes on direct current. Constructed on the well-known D'Arsonval principle. Ammeters are self-contained up to and including 30 amps.; higher capacities furnished with 200 millivolt portable shunts. Contained in polished mahogany case.



PORTABLE VOLTmeter

Type P3 Voltmeters, Ammeters and Wattmeters—Extremely accurate for laboratory and general testing purposes. Voltmeters and wattmeters made on the dynamometer principle, ammeters on the Thomson inclined coil principle. Designed for alternating current but can be used on direct current by taking reverse readings. Magnetically damped and protected from spray fields.



WARREN
MASTER CLOCK

Type CP Curve Drawing Voltmeters, Ammeters and Wattmeters—Used for motor testing and other work where desirable to make periodical or temporary arrangements for testing.

For further details on G-E portable instruments consult the nearest G-E sales office.



PORTABLE CURVE
DRAWING INSTRU-
MENT

Warren Master Clock.

This device enables an operator to maintain the speed of alternators at a constant average value. It comprises a high grade pendulum clock and a small self-starting synchronous motor. Each actuates independently a hand on the dial of the master clock. When the frequency is correct, the hands rotate at the same speed. The operator adjusts the generator speed so that the hands are always together.

Aside from the advantages accruing from better frequency regulation, this system offers a means of obtaining an accurate measure of time through the use of a small synchronous motor connected anywhere on that system. Further details given in Bulletin 46037.

Flow Meters.

G-E flow meters provide a means of accurately measuring the flow of steam, water, air, gas, oil, etc., through pipes. Flow meters can be furnished in the following types:

High pressure up to 300 lbs. gauge:

Type F recording
Type F-2 recording, integrating
Type F-3 indicating, recording
Type F-4 indicating, recording, integrating
Type F-5 indicating

Low pressure up to 65 lbs. absolute:

Type F-6 recording
Type F-7 recording, integrating
Type F-8 indicating, recording
Type F-9 indicating, recording, integrating
Type F-10 indicating



INDICATING, RECORDING, INTEGRATING FLOW METER

Type T Portable testing meter, high or low pressure furnished with carrying case.

Details regarding the various uses for flow meters are given in Bulletin 46501-C and Booklet B3464.

Voltage Regulators.

Generator Voltage Regulators—Designed to control alternating current or direct current stations having a capacity as high as 200,000 kw. The principal advantages of a steady voltage are: more economical lamps may be used; fewer lamp renewals; saving in energy; no loss of revenue; reduction in number of switchboard attendants. These regulators are intended for switchboard use, but certain types can be mounted on pedestals. Described in Bulletin 45450.



Bracket Type



Panel Type



Pedestal Type

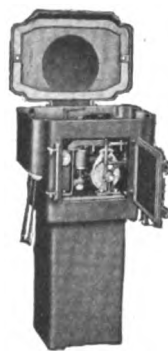
GENERATOR VOLTAGE REGULATORS

Feeder Voltage Regulators—Voltage on each feeder may be maintained constantly at normal by installing an induction voltage regulator in each feeder. These regulators are designed for the control of single-phase or polyphase circuits of any standard voltage, frequency or current capacity. Supplied for hand or

motor (remote) control. Motor operated regulators can be made automatic by addition of certain auxiliaries. Adapted for outdoor use by addition of covers to protect auxiliary apparatus.

Principal advantages: Improved service; savings in installation costs; line drop can be correctly compensated for under all conditions of load. Full description in Bulletin 45450.

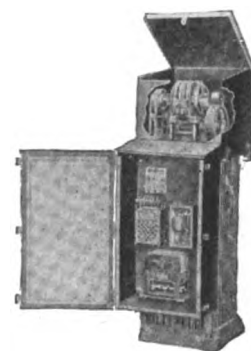
Regulators suitable for pole mounting at or near center of load can be used advantageously for regulating voltage of a feeder taken from a transmission or power system and supplying a small village or community. Bulletin 45450.



Pole Type



For Indoor Service



For Outdoor Service

FEEDER VOLTAGE REGULATORS

Synchronous Condensers.

Synchronous condensers are used for power factor correction and also for power factor control, the latter application retaining all the advantages of the former and in addition maintains constant receiver voltage over the entire range of load for which it is designed.

A regular attendant is not always available at the point where the synchronous condenser should be located, and in the smaller installations the expense of additional operators may amount to a considerable part of the saving. Such installations may be provided with automatic starting and control equipment for operation without attendants other than occasional inspections.

The GENERAL ELECTRIC COMPANY has designed and standardized a complete line of synchronous condensers. These are described in Bulletin 41311. Bulletin 41312 gives a partial list of G-E installations.

Static Condensers.

The GENERAL ELECTRIC COMPANY has recently developed and perfected a static condenser designed primarily for improvement of power factor. The advantages of static condenser equipment over synchronous apparatus are most pronounced for capacities of 500 kv-a. and less, although in several cases they are more economical at 1000 kv-a. or higher ratings. Other advantages are: Comparatively low cost in the smaller sizes; extremely low losses; practically no attendance; long life due to absence of moving parts.

Static condensers have been standardized for circuits ranging in frequency from 40 to 125 cycles, in voltage from 220 to 2300, and in capacities from 30 to 300 kv-a., although they can be supplied for other voltages and capacities whenever necessary. These units are described fully in Bulletin 49714C.



3-PHASE STATIC CONDENSER

Lightning Arresters.

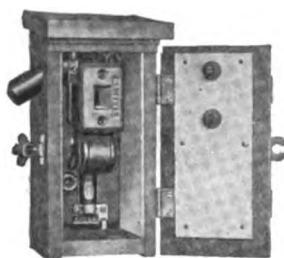
Protection against lightning is required to insure continuity of service. The most commonly used types of lightning arresters and their service are mentioned below.

Aluminum Cell and Oxide Film Arresters—For the protection of important generating and transforming alternating current apparatus of large stations of any voltage.

On account of high speed of discharge and enormous discharge capacity, they are capable of quickly and thoroughly relieving lines of dangerous surges. They are made for all voltages above 1000 volts.

The oxide film arresters are made especially for the protection of isolated stations and outdoor transformer installations.

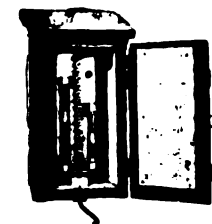
The aluminum cell arresters are described in Bulletin 45601A, and Bulletin Y1441A gives further information on the oxide film type.



MAGNETIC BLOW-OUT ARRESTER

Magnetic Blow-out Arresters—For the protection of electric railway equipments. For average conditions, the magnetic blow-out type of arrester will give the desired protection when placed on the cars and along

the line at intervals of at least 4 per mile. Where lightning disturbances are especially severe so that the problem of lightning protection becomes of vital importance the selection of the aluminum arrester is advisable. Bulletin 44712.



GRADED SHUNT RESISTANCE MULTIGAP ARRESTER

Direct Current Aluminum Arresters—Built to withstand the rigors of service on railway cars. They combine the advantages of a condenser and the safety valve effect of the aluminum cell. Having no gap in series, the aluminum arrester operates upon the slightest rise in potential. Bulletin 44712.



COMPRESSION CHAMBER MULTIGAP ARRESTER

Graded Shunt Resistance Multigap Arresters—Suitable for indoor or outdoor installation on circuits up to 15,000 volts. Should be installed in stations and substations, on feeders at receiving points for the protection of motor and transformers and on lines for the protection of power and lighting transformers. Bulletin 45603A.

Compression Chamber Multigap Arrester—For the protection of power and lighting distribution transformers. Designed to meet the demands for an arrester which would give good protection and at such a cost that it could be placed at the terminals of even the smallest transformers.

This arrester is efficient because the multigap principle of design is carried out to the highest degree. Its construction and the materials used are such that the arrester is not only light and compact but also waterproof and fireproof, features which make inspection unnecessary. As long as the arrester is intact, it is in operating condition. Described in Bulletin 45603A.

Vacuum Tube Arresters—For railway signal, police and fire alarm circuits. Bulletin 45600A.

Horn Gap Arresters—For series arc and incandescent circuits. Bulletin 45602.

Choke Coils—For use with lightning arresters on alternating current circuits. Described in Bulletin 45606.



CHOKE COIL FOR 15,000-VOLT CIRCUITS

Current Limiting Reactors.

Current limiting reactors can be applied to all classes of service where it is desired to control short circuits or limit the current, as in generator-leads, bus bars, tie and feeder circuits, etc. Under the abnormal conditions which may occur in a system as the result of short circuits, either 3-phase or single-phase, the energy liberated may be of such a magnitude as to exceed the safe rupturing capacity of oil circuit breakers or the mechanical strength of generators, transformers, bus bars, etc. A further use of reactors is to give greater continuity of service by limiting the larger part of the short circuit disturbances to the section of the system in which they originate. Bulletin 45300.



3-PHASE REACTOR

Power Constant Potential Transformers.

G-E transformers embody features which have made them preferred by the large central stations of this country.

Reliability has always been the first consideration and the many thousands of kv-a. capacity now in service are evidence of their ability to operate continuously with minimum losses and maximum factor of safety.

G-E transformers may be broadly divided into 2 classes—self-cooled and water-cooled. The former are usually used in small and moderate sizes and in larger units where cooling water is expensive or difficult to obtain. The latter are used in large sizes where the cooling water is easily available.

Units have been built for commercial use up to 220,000 volts. For distribution service on light and power circuits, the Type H transformer is used. Made in standard sizes from 1½ to 200 kv-a.

Further information concerning the use of transformers can be obtained from Bulletin 45110A or by addressing the nearest G-E district office.

Constant Current Transformers—For information on transformers for street lighting see page 575.

Oil Fuse Cut-outs.

D & W oil fuse cut-outs combine accurate overload protection with high interrupting capacity. They are designed to protect all classes of circuits and especially for junction and primary protection near the source of current. Made in pole and subway types, standard and heavy service. The subway types are protected against the entrance of moisture and water.



TYPE H TRANSFORMER FOR POLE MOUNTING

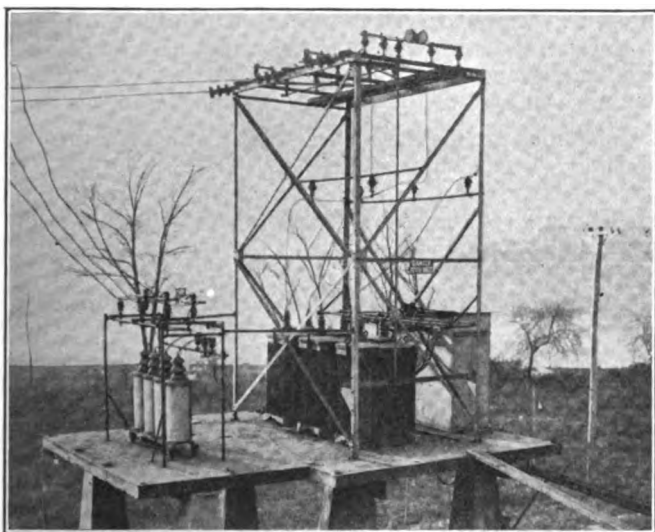
Oil Conservators.

Oil subjected to transformer heat tends to carbonize, and "breathing" of transformers and moisture condensation in the main tank tend to decrease the original insulating qualities of the oil. These troubles and the danger of explosion by ignition of the gas mixture formed are overcome by the G-E oil conservator, which has been adopted as standard equipment, particularly for the larger transformer sizes. Its use is equally effective for the smaller sizes and intermediate voltages. Described more fully in Bulletin 49706.

Transformer Substation Equipment.

Where electrical energy is needed in locations remote from a low voltage distribution system, but accessible to a high voltage transmission line, the outdoor transformer substation offers a means of securing service with low initial cost and maintenance expense, where otherwise the cost would be prohibitive.

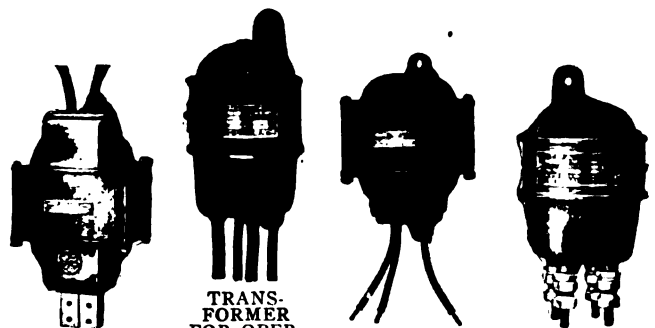
G-E outdoor substation apparatus consists of high tension switching and protecting equipment, transformers, automatic feeder voltage regulators (when required), low tension protective switching and measuring apparatus, and housings for secondary apparatus. This equipment is assembled ready for use or separate units can be purchased for assembly by customer. Described in Bulletin 47706A.



OUTDOOR SUBSTATION WITH STEP-DOWN TRANSFORMERS AND PROTECTIVE EQUIPMENT

Small Constant Potential Transformers.

Type M miniature air-cooled transformers meet the demand for low voltage transformers for capacities up to 500 volts; 15 to 5000 watts, 60 cycles, and 11 to 3000 watts, 25 cycles. They give perfect satisfaction in the following applications: electric welding, speed varia-



TRANSFORMER FOR HEAVY CURRENTS AT LOW VOLTAGE

TRANSFORMER FOR OPERATING STOP MOTION OF TEXTILE MACHINERY

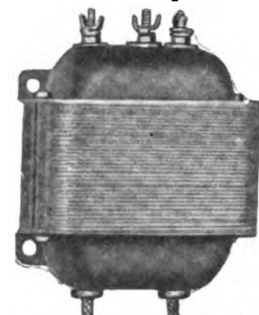
AUTO TRANSFORMER FOR 2- OR 3-WIRE SERVICE

TRANSFORMER FOR SIGNAL LIGHTING

tions of motors, railway signal lighting, 2- to 3-phase transformation; operation of small low voltage motors from high voltage circuits, insulating lighting from power circuits, telephone circuits before rectification; operating stop motion of textile machinery, etc.

By substituting these transformers for batteries or magneto generators, no maintenance or replacement charges, due to wear, are incurred, less space is required and cleanliness and reliability are assured. Bulletin 65105.

Wayne Bell Ringing Transformers—Made in household sizes and 50- and 100-watt sizes for operating signal systems requiring considerable power. The installation cost is very small; the equipment is permanent. Described in Booklet B3572.



"WAYNE" BELL-RINGING TRANSFORMER

Portable Instrument Transformers.

TYPE P2 PORTABLE CURRENT TRANSFORMER

Current Transformers—Type P2 has standard ratings of 50, 100 and 200 amps. primary with 5 amps. secondary; also 25, 50 and 100 amps. primary with 5 amps. secondary. Type R2 is designed for 1000-amp. turns

at full load rating with 5-amp. secondary winding, giving a ratio of 1000:5 with one primary turn passing through the core. Bulletin 46030.

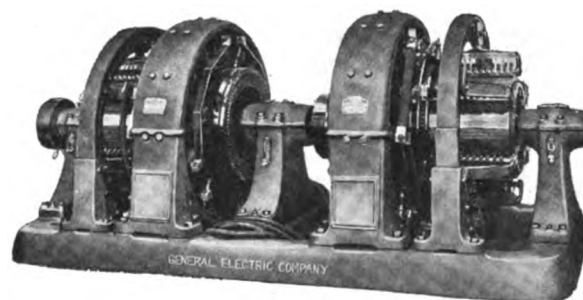
CABLE TESTING TRANSFORMERS—Made in 125- and 250-amp. capacity. Bulletin 46030.

Potential Transformers—Type E4, 50- and 200-watt capacity and Type E6, 25-watt capacity. Bulletin 46030.

Motor Generator Sets.

The GENERAL ELECTRIC COMPANY has developed a large number of motor generator sets, including a wide range of sizes and types adapted to different purposes. These are described fully in Bulletin 42552A.

Motor generator sets may be divided into 3 general classes: those made up of direct current machines, those made up of alternating current machines and those made up of both alternating and direct current machines. The last is perhaps the most important and certainly the largest of the 3 classes. With most power being generated and distributed as alternating current, there is required a motor generator set, a synchronous converter or some form of rectifier to change to direct current. Practically all street cars are driven by direct current motors; some of the newest and most up-to-date railroad electrification work is direct current. For power work,



DIRECT CURRENT MOTOR GENERATOR BALANCER SET

where variable speed is required, direct current is now generally installed and for electrolytic and battery-charging, direct current is absolutely necessary.

The first class mentioned above includes the balancer sets used for equalizing direct current line voltages, booster sets for raising the potential of railway feeders extending to distant points of the system, high current sets for electrolytic work and battery charging sets. See page 567 for further reference to G-E equipment for battery charging.

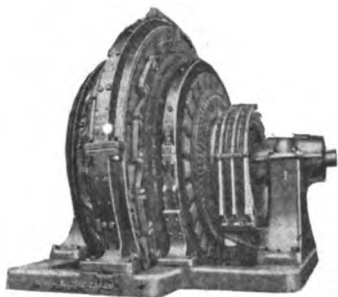
The alternating current machines, or frequency converter sets, are designed to change power from one frequency to another and tie in between different power systems, for example, when a small town laid out for 25-cycle operation is absorbed by a power company which operates on a 60-cycle basis.

Synchronous Converters.

G-E synchronous converters are well-known through their extensive use by railroads, electric light and power plants, large industrial projects and electrochemical operations in all sections of the country.

The commutating pole synchronous converter, introduced by the GENERAL ELECTRIC COMPANY, has been so successful in operation that it is now practically a standard design for all the larger sizes. These machines in the smaller sizes are especially suitable where substation equipment is subjected to infrequent peak loads. The momentary overload capacity of the small commutating pole machines, 3 times normal load, allows the selection of substation units with less regard to the limitations imposed by occasional peaks.

For low voltage industrial and electrolytic work, the regulating pole or booster type of synchronous converter is recommended. For industrial service, it is often desirable to transform a small amount of power from alternating to direct current, in which case Type TC, 30 to 75-kw. capacity units may be specified. Bulletin 42500.



BOOSTER TYPE SYNCHRONOUS CONVERTER

Portable Substations.

On electric railways having certain sections where it is necessary to handle heavy traffic occasionally, or where traffic can be normally handled by one machine, economy in operation is obtained and the cost of equipment reduced by the use of a portable substation. Such a substation can be easily transported to any point

where additional power is necessary, and, in some cases, saves the cost of a spare unit in several substations.



500 KW. PORTABLE SUBSTATION. 60,000 VOLTS A.C.; 1200 VOLTS D.C.

Many G-E portable substations, consisting of synchronous converter, transformers, switchboard and accessories are in successful operation. Described more fully in Bulletin 42500.

Wires and Cables.

The GENERAL ELECTRIC COMPANY manufactures wires and armored cables suitable for use under various conditions. All wires and cables are tested before shipment. A pressure test of at least twice the working pressure is applied. After the pressure test, an insulation test is made with a 250-volt battery and delicate reflecting galvanometer. General information on this G-E line is given in Bulletin 49305.

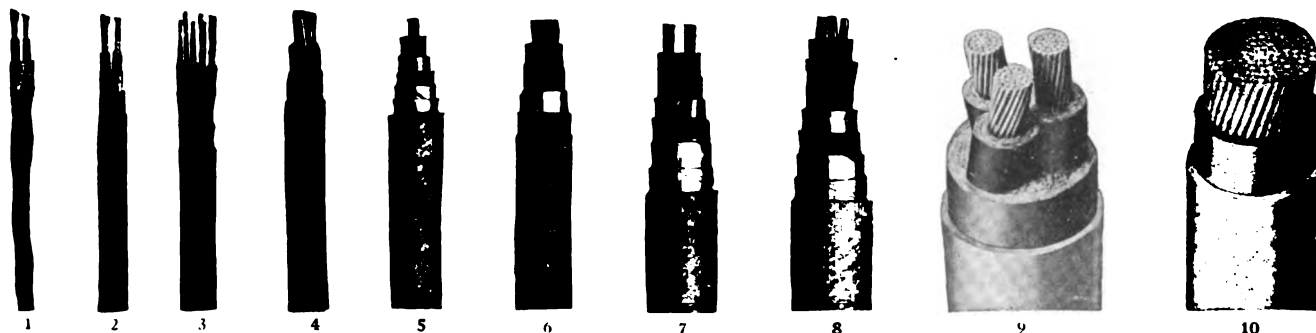
Rubber Insulated—Three types of rubber insulation have been standardized:

"Red Core" is a high class insulation used primarily on wires for house wiring, and is superior to the requirements of the National Board of Fire Underwriters.

"Tricoat" insulation was designed for those desiring a very high grade wire, somewhat better than "Red Core," but less expensive than the "30 Per Cent Hevea."

"30 Per Cent Hevea" insulation meets the 1907 Specifications of the Rubber Covered Wire Engineers' Association and is the best rubber compound for absolutely high grade work. The core may be white or black, as desired. Bulletin 49306.

Braided Wire—All wires and cables with N. E. C. rubber insulation, No. 8 B. & S. and smaller carry a single braid, while No. 6 B. & S. and larger are regularly made with either 2 braids, or 1 tape and 1 braid; and in accordance with underwriters' requirements, are equal to double braid and suitable for conduit work. If 1 tape and 2 braids are required, orders must so specify, and extra charge for extra braid will be made.



1. Heater Cord (Type H.)
2. Deck Cable
3. Border Cable (Type B.)
4. Cable Rubber—Insulated—D. B.

- G-E WIRES AND CABLES
5. } Band Steel Armored Cables
 6. }
 7. }
 8. }

9. Three Cord Paper Insulated Cable
10. Single Cord 2,000,000 CM Cambric Leaded

N. E. Code, "Red Core," braided, twin wire is finished with talc, which insures ease in pulling wire into conduits; no extra charge made for this feature. All the braided, rubber covered wires may be finished in this way, if desired, without additional cost.

These rubber covered braided wires and cables are distinguished by 1 red and 1 black thread woven parallel in braid.

Weatherproof and Slow Burning Wires and Cables—Standard weatherproof wires and cables are manufactured strictly in accordance with the requirements of the National Board of Fire Underwriters, with 3 braids placed directly over the copper core, thoroughly impregnated with a black, weatherproofing compound, and then polished to remove all superfluous compound and give a smooth exterior finish. Double braid weatherproof wire furnished on order.

When the number of braids is not specified, wire with 3 braids, commonly called triple braid, is always furnished; if double braid is required, requisitions or requests for quotations should so state. A stock of triple braid wire is carried.

Slow burning wires and cables are similar to the triple braid weatherproof in construction except that the impregnating material is a white, flameproof compound.

Band Steel Armored Cables—The conductors are double taped with mild band steel between two wraps of asphalted jute. Our standard practice is to apply these steel tapings in the same direction, the outer tape covering the joints of the inner. However, if required, the steel tapes may be applied in reverse directions without additional cost, but we do not recommend this construction. A final wrap of asphalted jute protects the armor from corrosion. These cables are especially adapted for mine use, subways and tunnels; on bridges, generally in iron pipe; and overhead through city streets.

This cable is also furnished lead incased suitable for direct burial in earth without conduit. It can be applied to any voltage up to 25,000 volts. Its principal use is for ornamental lighting systems for parks, residential districts and small towns. Bulletin 49308.

Steel Wire Armored Cables—Similar in construction to band steel armored, except that one layer of wire is used between the jute wrappings instead of band steel. The cable is designed so that the armor will carry the weight of the cable, if necessary to install in a vertical position. Armored cables without lead may be used in dry mines and subways where cable is subjected to mechanical injury. By lead incasing under the armor this type of cable becomes the standard for submarine work or for use in wet mines. This cable is also adaptable for direct burial in the soil.

Asphalted Jute Cables—Depending upon conditions, these consist of leaded or unleaded cables covered with jute coverings and asphalt compound. Such cables are recommended for use in mines, when not exposed to mechanical injury, in wet ducts and for direct burial in the soil, where a tile or board laid over it will give sufficient mechanical protection.

Varnished Cambric and Paper Insulated Cables—Varnished cambric cables are manufactured for all voltages and with either a braided or leaded finish, or if desired, special finishes such as band steel or wire may be applied. Paper insulated cables are also manufactured for all voltages with a lead finish or special finish if required. Paper cables are not made without lead, as the paper absorbs moisture. Bulletin 49307.

Cable Connecting Devices—A standard line of cable connecting devices of reliability and convenience is also manufactured. It includes copper cable connectors, end bells, cast iron coupling boxes, junction boxes and fuse boxes. Bulletin 49309.

Motors and Control.

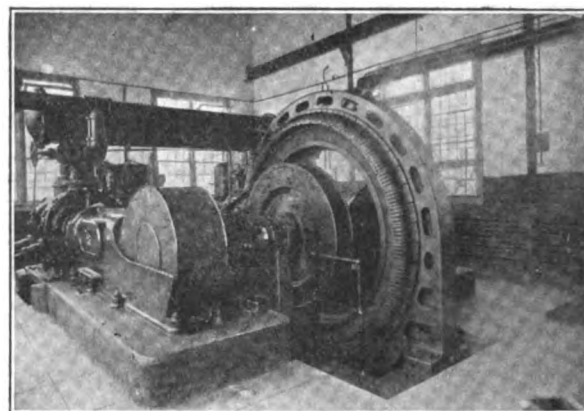
The GENERAL ELECTRIC COMPANY has developed a complete line of motors suitable for every kind of service. A few of the many types are described here. For further information, consult the nearest G-E office or send for bulletins referred to.

Reliable and efficient starting and controlling apparatus has also been developed for the successful operation of motor installations. Some of the many control equipments recommended are listed on the pages following, together with brief descriptions. For further information, descriptive bulletins will be gladly furnished on request.

Synchronous Motors.

While the synchronous motor may be applied to most any industrial service, its greatest value is obtained when used on circuits which need power factor correction. This condition is often indicated by the need for greater generator, transformer or feeder capacity.

Synchronous motors are particularly desirable when power is purchased at a rate which is dependent upon the power factor of the load. They are also suitable where dirty operating conditions make a small motor air gap inadvisable.



G-E SYNCHRONOUS MOTOR DRIVING COMPRESSOR

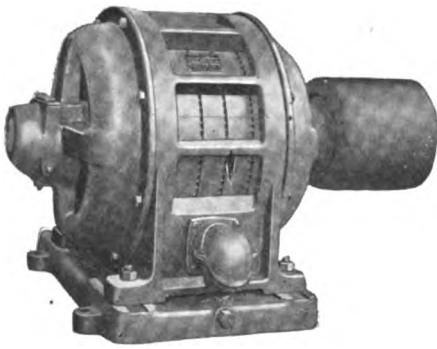
The GENERAL ELECTRIC COMPANY has designed a complete line of synchronous motors covering a wide range of speeds and capacities which are in extensive use in many industries driving rolls, compressors, pumps, grinders, crushers, blowers, fans, conveyors, etc.

Details of construction are given in Bulletin 41309. Bulletin 41310 gives a partial list of G-E synchronous motor installations.

Constant Speed, Induction Motors.

Type KT polyphase induction motors are built with riveted or skeleton frames in sizes from $\frac{1}{2}$ to 750 h.p., standard voltages. They are adaptable for driving all classes of machines requiring constant speed. Sizes 1 to 200 h.p. are described in Bulletin 41302A.

Type KT multispeed induction motors are wound for 60-cycle 3-phase service only, standard voltages. They can be furnished up to 12 h.p. at 4 constant speeds—1800, 1200, 900 and 600 r.p.m. Constant horsepower motors are suitable for machine tools, etc., and constant



TYPE KT CONSTANT SPEED INDUCTION MOTOR

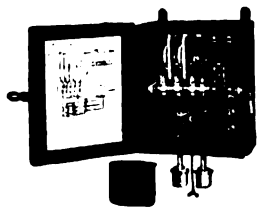
torque motors for operating fans, blowers, printing presses, etc.

Control for Type KT Motors—Many of the smaller sizes of these motors can be thrown directly on the line. For motors up to 5 h.p. the CR 1038

safety starting switch, described on page 565, is recommended.

For controlling induction motors of 25 h.p. or less, but not above 50 amps., the Type FP10 oil circuit breaker is widely used. Made for automatic or non-automatic operation with provision for overload protection. Described fully in Bulletin 47419A.

Starting compensators, hand and automatic, and magnetic switches for automatic starting with distance control, are also available. Some of these devices are illustrated below.



CR 7006 STARTING SWITCH WITH OVERLOAD PROTECTIVE RELAYS

For use with accessories for remote control. Bulletin 68415A



CR 1034 HAND OPERATED STARTING COMPENSATOR WITH UNDERVOLTAGE RELEASE AND OVERLOAD PROTECTION

Bulletin 68304



CR 7052 AUTOMATIC STARTING COMPENSATOR WITH METAL ENCLOSING CASE

Gives overload and undervoltage protection. Bulletin 68434

Variable Speed Induction Motors.

Type MT motors with phase wound rotors and external resistance are adapted for service requiring frequent starting under load or starting of loads with high inertia. High starting torque is obtained with a comparatively small amount of current from the line.

These motors have standard ratings up to 200 h.p. standard frequencies. Special rating to 6000 h.p. for heavy duty such as driving steel rolling mills.

High speed type MT induction motors, ranging from 75 to 350 h.p., for direct connection, can also be furnished.

Control for Type MT Motors—CR 1260 and CR 1261 speed regulating rheostats are suitable for the secondary circuit of slip-ring induction motors up to 1 h.p., 2- or 3-phase. Capable of reducing speed 50% from normal. Described in Bulletin 68333.

CR 1023 and CR 1024 starting rheostats control the secondary circuit of 2- and 3-phase motors for light starting duty. For use with motors up to 50 h.p. Bulletin 68331.

CR 3204 drum type controllers, also for secondary circuit control, are designed for frequent service and will stand harder use than the dial type rheostats mentioned above. Bulletin 68205.

For manual control of both primary and secondary

circuits, the CR 3202 drum type controllers are recommended. Can be used for either reversing or non-reversing service. Bulletin 68200B.

When the service is too severe to be handled by a drum controller, a magnetic equipment consisting of panel and master switch can be furnished. The CR 2351 and CR 2352 automatic starting panels for 5- to 200-h.p. motors, are designed for manual or automatic operation by means of switches located at remote points. Bulletin 68406A. See "Accessories for Remote Control" on page 565 for G-E devices used with these panels for pumping and air compressor installations.

Special equipment is available for controlling Type MT motors in larger sizes, such as automatic regulating sets for controlling speed of large steel mill motors. Information on control equipment for such service will be furnished on request from the General Office at Schenectady, N. Y.

Centrifugal Pump Induction Motors.

Motors with closed box-frame construction, making them especially adapted for pump service where moisture is often present and in case of mine installations where water often drips upon the motor. Special moisture resisting insulation is used in winding. The motors are self-ventilating and have high efficiency and power factor. Made in capacities from 75 to 400 h.p.

These motors are made in both squirrel cage and slip-ring types. The control equipment used is similar to that recommended for constant speed and variable speed induction motors on these pages. Bulletin 61301.

High Speed Induction Motors.

Special high speed motors operating as high as 25000 r.p.m., taking power from special frequency-changer motor generator set. These motors are constructed similar to the standard squirrel cage motor but having rotors of the cast alloy type and being very compact and reliable. Can be made an integral part of the machine.

Successful application of these motors has been made to woodworking machines, such as shapers, saws, tenoners and drills, and other uses requiring speeds from 7200 to 12,000 r.p.m. Bulletin 41521A.

Mine Type Induction Motors.

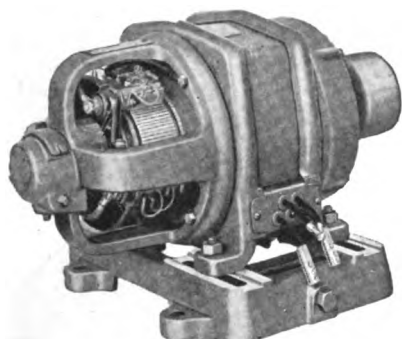
Type HI motors, specially designed for mining service, have high starting effort and large capacity for over loads. Their strong construction fits them admirably for driving breaker and tippie machinery and for service under severe operating conditions as found in mine work. Built for constant and for variable speed, in standard sizes from 5 to 75 h.p., 3-phase, with or without back gearing.

Control for Type HI Motors—For ordinary starting of squirrel cage or constant speed type, the CR 1034 hand operated compensator, Bulletin 68304, or the CR 7052 automatic compensator, Bulletin 68434, is used. These are illustrated under "Control for Type KT Motors." For starting the slip-ring type motors CR 3202 drum controllers are recommended. These are described in Bulletin 68200B.

Single-phase Induction Motors.

Type RI, constant speed, single-phase motors are furnished in sizes ½ to 15 h.p. For reversing service, they are furnished in sizes ½ to 7½ h.p. The non-reversible motors may be made reversible with reduced rating by simply adding 4 leads and re-setting brush yoke. The reversible motors are especially useful for application to elevators, small cranes and hoists, laundry machinery, etc.

Type RI motors will start and accelerate loads having two and one-half times full load torque and will stand a 50% momentary overload. Other characteristics are given in Bulletin 61508 on reversing motors and Bulletin 61200 on standard constant speed motors.



TYPE RI SINGLE PHASE INDUCTION MOTOR

Control for Type RI Motors—Any of these motors may be thrown directly on the line, but for sizes above 5 h.p., it is recommended that a starting rheostat be used. While the ordinary fused switch will start and stop the motor, greater protection to the motor and safety to the operator are obtained by using the Type FP10 oil circuit breaker illustrated below, or the CR 1038 starting switch described on page 565.



FP10 OIL CIRCUIT BREAKER WITH OVERLOAD TRIP COILS FOR CONTROLLING SMALL INDUCTION MOTORS



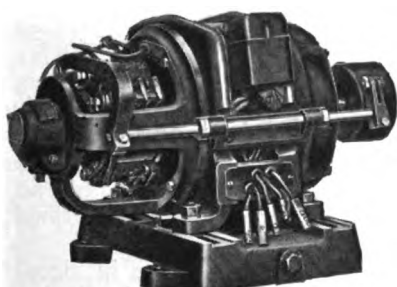
CR 1025 RESISTANCE STARTER BUILT FOR ALL SIZES OF TYPE RI MOTORS
Provides undervoltage protection

Alternating Current Brush Shifting Motors.

Type BTS 3-phase Motors—These motors give high efficiency at a large number of speeds. Speed changes and starting and stopping are obtained by merely shifting the brushes. They have been developed in sizes from 10 to 100 h.p. inclusive for 60 cycles. Slow speed, 100, 125 and 150-h.p. motors can be furnished for 25 cycles.

CONTROL FOR TYPE BTS MOTORS—CR 6055 brush shifting controller gives a variation of 50% below synchronous speed or any intermediate speed. Movement of controller handle, to which is attached a chain for moving brush rigging, also opens and closes the line circuit as required and can reverse direction of motor.

Type BSS Single-phase Motors—Furnished in sizes $\frac{1}{4}$ to $7\frac{1}{2}$ h.p., 1200 and 1800 r.p.m., 60 cycles,



TYPE BSS SINGLE-PHASE BRUSH SHIFTING MOTOR

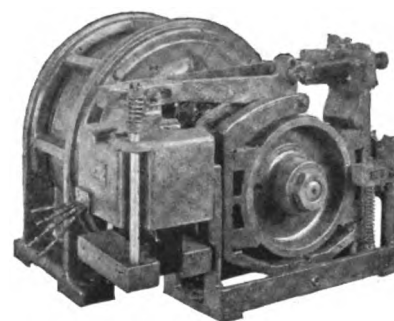
interchangeable on 110- or 220-volt circuits. Suitable for constant torque, belt or chain drive (fans and blowers, printing presses, refrigerators and laundry machinery, etc.), and will permit 50% speed reduction against full load or three-quarters load torque. These motors will start and accelerate loads having two and one-half times full load torque. They accelerate fast and have an overload capacity of 50% momentarily. Bulletin 61401.

CONTROL FOR TYPE BSS MOTORS—The same as for BTS motors described above.

Alternating Current and Direct Current Hoist Motors.

Alternating Current Variable Speed Hoist Motors

—Type MTC A.C. motors give a maximum torque for a given weight and are very strong mechanically. They are used for hoists and similar service of an intermittent nature where the limiting feature depends upon the frequent starting and accelerating torque required. Regularly furnished with open frames and taper shafts on each end for gear and solenoid brake. Made 2- and 3-phase, for standard frequencies, in standard capacities of 1 to 300 h.p. Bulletin 48119.1.

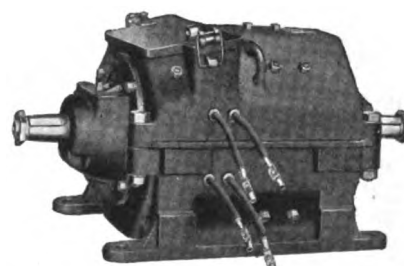


A. C. HOIST MOTOR AND SOLENOID BRAKE

Direct Current Crane and Hoist Motors—

CO 1800 D.C. crane and hoist motors are designed for intermittent service requiring a maximum torque of ample overload capacity. They are especially suited for variable speed crane and hoist service as applying to bridge and cargo cranes, winches, derrick hoists, ore bridges and unloaders, etc.

Suitable for floor, wall or ceiling mounting and furnished with or without back gear. All parts are arranged to facilitate easy repair and inspection. Made in sizes from 2 to 100 h.p., standard voltages. Bulletin 68100A.



CO 1800 CRANE AND HOIST MOTOR

Control for Hoist Motors—Complete lines of drum type controllers and magnetic equipments are available for all classes of hoisting service.

Direct current crane protective panels protect also the motors which are individually controlled by equipment of either drum or magnetic type. The CR 4409 panels for this purpose provide overload and undervoltage protection. They are standardized for 3-, 4- and 5-motor cranes with maximum capacity of 300 h.p. Bulletins 68414, 68417 and 68424.

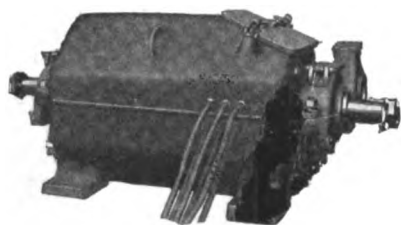
CR 3202 controllers are regularly furnished for hand control. Bulletin 68200B. For information on magnetic control, address the nearest G-E office.

Electric brakes for controlling the hoist motor to insure a quick positive stop can be supplied of half or full torque capacity. These are described on the following page.

Alternating Current and Direct Current Mill Type Motors.

Types MI and MD motors of special design for severe steel mill service. In addition to cranes and reversing auxiliary machinery in steel plants, G-E mill type motors are successfully applied to shears, ore and coal bridges and unloaders, charging machines of all types (coke pushers, levelers, etc.), heavy duty fabricating and erecting shop cranes, electric shovels, dipper dredges, capstans, gates, valves, draw and lift bridges, small heavy duty hoists, etc.

Mill type motors are furnished totally enclosed in sizes from 3 to 150 h.p. alternating current and 4 to 175 h.p. direct current. The open type motors are built from 25 to 150 h.p. A. C. and 30 to 210 h.p. D. C. for continuous duty. Bulletin 48121.1.



MILL TYPE MOTOR

Control for Mill Type Motors—CR 3202 drum controller is suitable for controlling alternating current or Type MI mill motors for general applications. Bulletin 68200B.

For general use with the direct current mill type motors, either series, shunt or compound wound, CR 3100 drum controllers are recommended for either starting or speed regulating duty, reversing or non-reversing. Bulletin 68202A.

For heavy mill work, magnetic control equipments, CR 4241 and 4261 have been designed to secure various characteristics of operation necessary in this service. This line of control panels is fully described in Bulletins 68428 to 68432.

For mechanical braking of mill type motors, the CR 9510 solenoid brake is widely used. Described briefly below.

Electric Brakes for Hoist and Mill Motors.

CR 9510 solenoid brakes, for comparatively quick stopping, are usually mounted on the driving motor shaft, although, in case it is desired not to mount the brake on the motor, they can be furnished for mounting on the floor or separate foundation. When power is cut off, the brake sets by gravity or spring and applies the retarding force through friction on the brake shoes. These brakes are extensively used in connection with cranes, hoists, elevators, draw and lift bridges, turn tables, printing presses, line shafting, etc., to save time in stopping, to prevent overtravel or to stop accurately at definite points, to hold loads without consumption of power and to make emergency stops. They can be attached to G-E crane and hoist and mill type motors, either alternating current or direct current when motors

are built with proper end shields and brake pads. For application to motors of other than G-E manufacture, they are furnished for floor mounting.

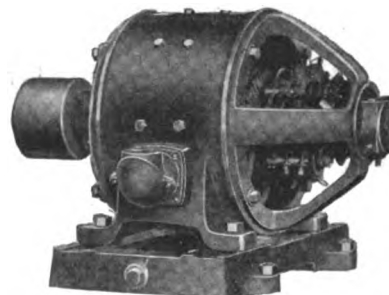
Where required for operation by hand or foot lever, the CR 9510 brakes without solenoid are well adapted. Bulletin 68010A.



CR 9510 SOLENOID BRAKE

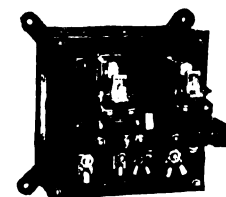
Direct Current Constant Speed Motors.

The Type RC motor may be classed as the universal direct current motor. Furnished for constant speed; shunt wound for conditions requiring close speed regulation; compound wound for heavy starting torque or where violent power fluctuations occur; series wound where load either possesses fixed values or may be made subject to automatic or manual control. Made open, semi-enclosed and totally enclosed. Shipped for floor installation but can be readily arranged for wall or ceiling suspension. The ½- to 200-h.p. sizes are described in Bulletin 41013A.

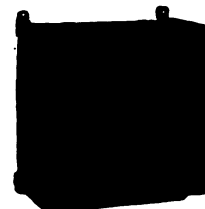


TYPE RC CONSTANT SPEED DIRECT CURRENT MOTOR

Control for Type RC Motors—Various forms of control can be furnished for use with Type RC motors. Dial type rheostats for ordinary starting, drum controllers for more severe service and automatic starters for control from remote points by accessories such as thermostat, float switch, pressure governor, pressure switch, push button, etc. Some of the commonly used general purpose starters are illustrated below.



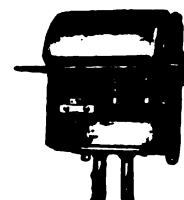
AUTOMATIC STARTER
FOR USE WITH REMOTE
CONTROL ACCESSORIES
Bulletin 68409A



HAND OPERATED
RHEOSTAT FOR START-
ING DIRECT CURRENT
MOTORS



AUTOMATIC STARTER WITH
DUSTPROOF SHEET IRON
ENCLOSING CASE
Bulletin 68433

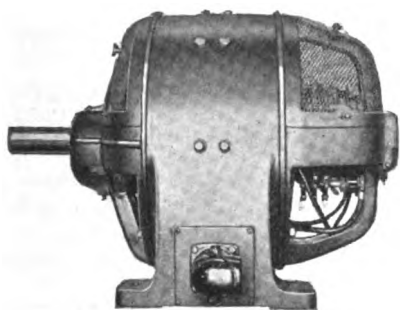


AUTOMATIC SAFETY
STARTER FOR
SMALL DIRECT
CURRENT MOTORS

Direct Current Adjustable Speed Motors.

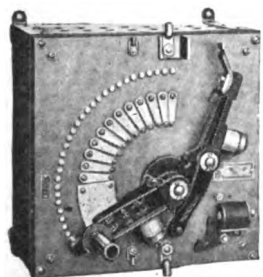
Type RF adjustable speed, commutating pole motors have been designed for machine tool and similar service where wide variation and adjustment of speed independent of load is required. Made in sizes from 2 to 50 h.p., 230 volts and 550 volts. Speed adjustment by field 2 to 1, 3 to 1, or 4 to 1. Described in Bulletin 41021A.

Type RA motors are made in sizes from ½ to 1½ h.p., 115 and 230 volts. Speed adjustment, 2 to 1 or 3 to 1.



TYPE RF DIRECT CURRENT ADJUSTABLE SPEED MOTOR

Control for Type RF Motors—For light duty, dial-type speed regulating rheostats can be furnished for shunt field regulation, while where service is severe, drum or magnetic type controllers with both field and armature resistance are recommended. The magnetic controllers can be equipped to protect against sudden starting after failure of voltage or against overloads.

CR 1200 SPEED REGULATING RHEOSTAT FOR FIELD CONTROL OF LIGHT DUTY DIRECT CURRENT MOTORS
Bulletin 68336CR 3105 MOTOR CONTROLLER FOR MACHINE TOOL SERVICE
Armature and field resistors mounted on back.
Bulletin 68204A

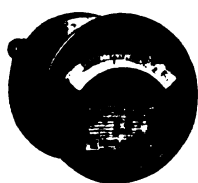
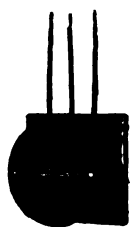
Accessories for Remote Control.

Various devices have been developed for controlling electric motors from remote points automatically according to pressure, temperature or other conditions affected by the operation of the motor. These include the following devices, some of which are illustrated.

The CR 2931 float switch gives liquid level control from either tank or sump, for automatic pumping equipments. Used for connecting small motors direct to the line and with an automatic starter for the larger motor sizes. Bulletin 68501A.

For controlling motors driving liquid pumps or air compressors, the CR 2922 pressure governor or CR 2925 pressure switch can be used. The former, described in Bulletin 68411, can be used only in the control circuit of a standard automatic starter while the pressure switch can be used also for controlling small motors thrown directly on the line. Described in Bulletin 68502A.

The CR 2990 thermostat, for use only with magnetic equipments, provides automatic control of motors according to temperature variations. Being unaffected by moisture, it is particularly adapted for refrigerator work. Bulletin 68500.

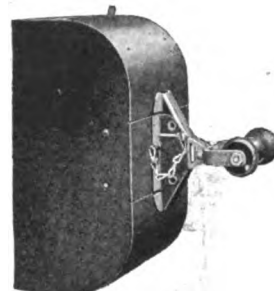


THERMOSTAT PRESSURE SWITCH PRESSURE GOVERNOR

SWEET'S CATALOGUE

Safety Starting Switches.

The CR 1038 safety switch is a single-throw, totally enclosed, quick-make-and-break switch for use with motors up to 5 h.p. Operating parts are interlocked to prevent accidents and protective plugs guard the motor against objectionable overloads and single-phase operation. A push opens and a pull closes this switch. Accidental closure is impossible. Bulletin 68305B.



CR 1038 SAFETY SWITCH

Solenoid Operated Valves.

For the remote or automatic control of liquids or gases under pressure. Suitable for operating steam or air whistles, controlling the application of brakes operated by compressed air or oil, such as are used on large hoists, controlling the flow of fuel fluids to furnaces, etc. These valves may be operated from a distance by means of a snap switch, float switch, thermostat or push button station. Coils for all commercial voltages and frequencies can be supplied.



ELECTRICALLY OPERATED VALVE

Fractional Horsepower Motors.

The GENERAL ELECTRIC COMPANY has studied extensively problems of electric motor application to small tools, etc., and is, therefore, in a position to help other manufacturers in similar problems. Almost innumerable are the applications in the plant, machinshop and laboratory for G-E fractional horsepower motors which, although built as small as 1/200 h.p. embody the same quality and accuracy of construction as the larger G-E motors. G-E control devices—push buttons, lever switches, rheostats, etc., can be furnished with all types.

Type SA, 1/20 to 1/4 h.p. A. C. and Type SD, 1/20 to 1/4 h.p. D.C., are for corresponding ratings mechanically interchangeable. Bulletins 61510 and 61511.

Type SDA motors for alternating current or direct current are series wound and the alternating current and direct current motors of corresponding ratings, being built in the same frames, are mechanically interchangeable. These are furnished in sizes from 1/200 to 1/15 horsepower. Bulletin 61512.

Types SA and RSA are constant speed, single-phase motors and can be furnished for standard frequencies. The RSA motors are furnished in sizes from 1/12 to 1/4 h.p. Bulletin 61509.

Following is a partial list of industrial applications of fractional horsepower motors. These applications may in themselves not solve all problems, but may suggest a means whereby they can be solved.

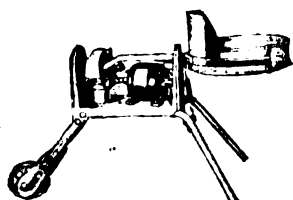
Air compressors	Valve operations
Bag filling machines	Nailing machines
Fans, blowers and exhausters	Lathe drive
Boiler tube cleaners	Machine tools
Conveyors	Oscillators
Drill presses	Riveting machines
Portable drills	Saw setters or trimmers
Flow surfacers	Spinning machines
Buffers, grinders and polishers	Automatic switches
Weighing machines	Pipe cutters
Winding machines	Planers
Centrifuges	Punch presses
Screwdrivers	Shears
Vibrators	Stone dressers
Boring machines	Saws: hack, band, circular, jig
Drying drums	Pumps: liquid, air and vacuum

Continued on next page

Some of these applications are illustrated below. The devices are not manufactured by the GENERAL ELECTRIC COMPANY, but show uses for which the small G-E motor is admirably adapted.



Disk Grinding Machine



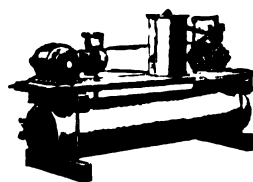
Factory Riddle



Power Saw



High Speed Drill



Air Compressor



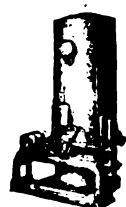
Tapping and Drilling Machine



Bench Riveter



Portable Electric Drill



Water Pump



Portable Riveter



Water Wheel Governor

A FEW APPLICATIONS OF G-E FRACTIONAL HORSEPOWER MOTORS

Electric Locomotives.

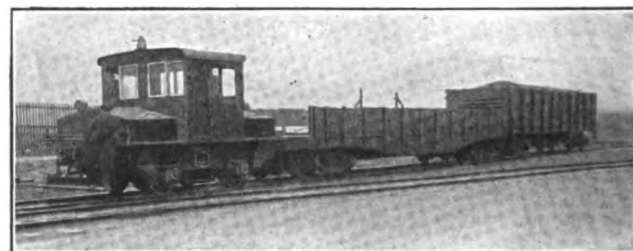
The GENERAL ELECTRIC COMPANY builds electric locomotives for moving all classes of rolling stock. The largest type for heavy freight service built by this company is a 280-ton locomotive. The G-E electric locomotives in service on the Chicago, Milwaukee & St. Paul Railway are described in Bulletin 44013A.

Electric Switching Locomotives—A standard type of 25-ton electric locomotive is designed to meet the service conditions where trains of medium weight have to be hauled over tracks which do not include excessive grades. Its weight may vary anywhere between 22 and 35 tons, according to the service requirements. Locomotives of this type have been extensively used as switching units in large industrial plants and for switching service in the terminals of interurban roads. The design is such as to give maximum economy in materials of construction and at the same time maximum strength and rigidity. In general, the electric equipment comprises four 40 to 75 h.p. motors. Bulletin 44250.

Almost every interurban road will find an electric locomotive a useful adjunct to its regular equipment.

With a reserve unit of this kind to switch freight at terminals and to haul trains, the regular motor cars are released from this class of duty, and the equipment of the locomotive, being specially designed for freight service, is capable of performing it in a more satisfactory and economical manner.

Industrial Electric Locomotives—The electric locomotive is admirably adapted to fulfill the transportation requirements of all industries. It possesses the following advantages over steam locomotives, animal

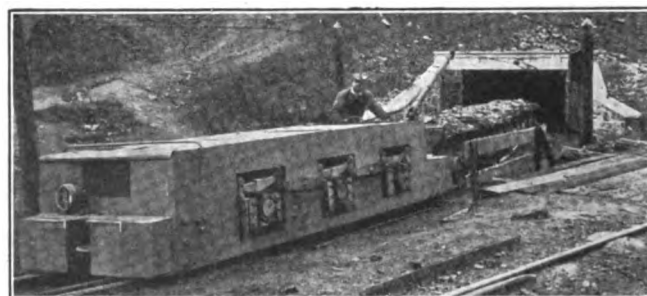


G-E 15-TON STORAGE BATTERY LOCOMOTIVE

haulage, hand trucks, etc.: Consumes power only when in actual operation; can be operated by one man of ordinary intelligence; ready for use at all times; has large momentary overload capacity; possesses an easy and perfect system of control; has comparatively few wearing parts and consequently low maintenance cost; requires attention only when actually in use; can be run inside a building and in other localities where smoke and fire risk of a steam locomotive would forbid its use.

The inter-factory transportation of large plants with buildings scattered over considerable areas can be most satisfactorily and economically handled by small locomotives. It is equally well adapted for service in brickyards, stone quarries, cement plants, etc., in getting ore from mines to stamp mills, hauling log trains to saw mill, in large public works and in tunnel driving. G-E locomotives in industrial service of many kinds are illustrated in Bulletin 44251.

Mine Locomotives—G-E electric mine locomotives have been in active service for many years, which is proof of their strong construction and of their ability to stand up under the most trying conditions. The two-motor locomotive is recognized as the standard type for mine work. Sparkless commutation is assured by the use of special motor construction.



TROLLEY TYPE 20-TON G-E ELECTRIC MINE LOCOMOTIVE

Electric gathering locomotives are also available for short haulages between the working face and entry of mines where the seam is thin. A new type of gathering locomotive has recently been developed with special features embodied in the control, cable reel and springs. This unit is described in Bulletin 64200.

G-E mine locomotives of the trolley type have

spring construction with equalizing bar, which gives a more equal distribution of wheel load and increased pulling power.

Storage Battery Locomotives—Well adapted for short distance hauls at low speeds, handling material in and about factory buildings. By providing the elevators with tracks, they can be effectively used to distribute material on different floors and can be safely used where sparks would involve danger. Large types up to 30 tons are built for heavier service. Bulletins 64250 to 64257.

Line Material.

The GENERAL ELECTRIC COMPANY has developed a complete line of material used in the construction of overhead trolley systems and track return for electric railways in every service. This includes pole brackets, suspensions and ears of many types, strain and feeder insulators, splicing sleeves, trolley frogs and crossings, section switches and insulators, turn buckles, rail bonds, bonding tools, etc. Special forms of these devices have been developed to meet the special conditions of mines and other industrial properties.

These devices have been designed to meet every possible condition and have been thoroughly tested. Sherardizing is the standard finish and protection for all iron and steel parts of G-E line devices. Japan finish can be furnished for use where devices are subject to the deteriorating effects of acids. For further information on these devices for mine and industrial haulage, send for Bulletins 44005A and 44004B.

Rail Bonds—Owing to the many types and the variation in dimensions of rails and joint plates in common use, a great variety of forms of bonds has been developed. Occasionally exceptional cases arise requiring some modification of one of the standard forms in order that the best results may be obtained. The GENERAL ELECTRIC COMPANY will gladly submit recommendations showing how best to meet any bonding conditions and its engineering department is always at the service of customers to give advice. Bulletin 44002A gives detailed information on G-E rail bonds and bonding tools.

Battery Charging Equipment.

The GENERAL ELECTRIC COMPANY is prepared to furnish charging equipment for all classes of service.

Individual Vehicle Battery Charging M-G Sets—These sets can be furnished for service on various frequencies, either single-phase or polyphase circuits of standard voltages and in suitable capacities for charging lead batteries of 44 cells and under or Edison batteries of 60 cells and under. The selection of the proper set for any particular charging work depends upon the make of battery and type of cell, as well as

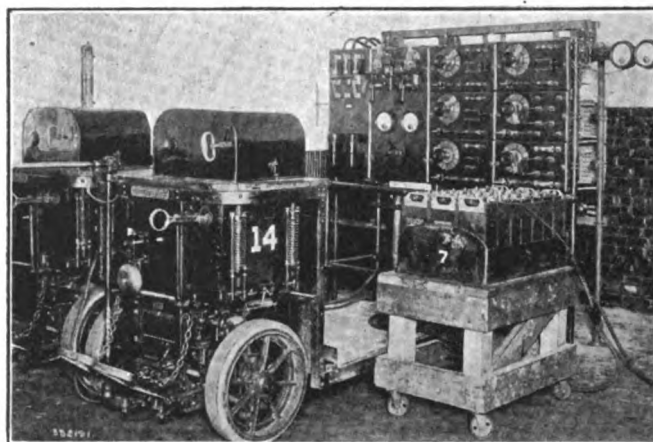


MOTOR GENERATOR BATTERY CHARGING SET.

the frequency, voltage and number of phases of the alternating current supply. Bulletin Y1532.

Multiple Battery Charging Sets—These motor generator sets are for charging simultaneously 2, 3 and 4 industrial trucks or tractors. When charging 2 or more batteries in multiple, they are used with multiple circuit switchboards, necessarily different from the control panels for the individual charging sets, in order that batteries of different degrees of discharge can be properly handled. Bulletin Y1364A.

Starting and Lighting Battery Charging Outfits—The motor generator sets for charging automobile



4-PANEL 6-CIRCUIT BATTERY CHARGING SWITCHBOARD IN OPERATION

starting and lighting batteries consist of a small, compact 4-bearing motor generator set on which is mounted a small steel switchboard completely equipped. These outfits are furnished in capacities of 250, 500 and 750 watts, giving a range of sizes the smallest of which will charge any combination of one to four 6-volt batteries and the largest any combination of three to twelve 6-volt batteries. Larger sets wound for 37½ volts, 20, 30, 50, 75 and 100 amps., in 3-bearing construction with common base are also available. Booklet B3432A.

Charging Outfits for Large Garages—The problems for selecting battery charging outfits for large garages present conditions so diversified in character that it is best to take each case up individually with the supply department of the GENERAL ELECTRIC COMPANY.

Mercury Arc Rectifier Battery Charging Sets—For charging automobile, signal or telephone batteries. Made in 3 standard sizes of 10, 30 and 50 amps. capacity and in direct current voltages ranging from 10 to 100 volts when operated at 110 volts A.C., and from 20 to 175 volts when operated from 220 volts A.C. Special rectifiers furnished for higher direct current voltages than the foregoing from 220 volts A.C. and up to a maximum of 350 volts D.C. in capacities up to and including 50 amps. Suitable for 60 cycles or more, although special rectifiers can be furnished for operation on 25, 30 or 40 cycles.



SINGLE-PHASE MERCURY ARC RECTIFIER

Tungar Battery Chargers—Another charging device for garage or service station use is the Tungar rectifier, operating on the principle of the emission

of small particles of negative electricity from an incandescent filament in a bulb filled with inert gas. This charger is simple in construction, light in weight, self-starting and requires no expert attendance. Its first cost and operating expense are very low. The smaller sizes connect with any alternating current lamp socket.

Made in 4 sizes described in G-E bulletins as follows: 12-amp. 75-volt size, Booklet B3585; 6-amp. 75-volt size, Booklet B3487; 5-amp. 30-volt size, Booklet B3529; 5- and 2-amp. 75-volt sizes, Booklet B3532A.



6-AMP. 75 VOLT
TUNGAR BATTERY
CHARGER

PORTABLE TUNGAR BATTERY
CHARGER

Industrial Heating Equipment.

The GENERAL ELECTRIC COMPANY has developed a very extensive line of industrial heating apparatus which is being successfully applied in many different processes requiring heat. The following are some of the numerous operations which have been improved by the adoption of electric heating with automatic temperature control:

Annealing copper, brass, and carbon and nickel steels.

Baking japan, enamel, foundry cores, grinding wheels, insulation and furnace lining.

Drying chemicals, paints, varnishes, acid-washed metals, brake lining, crucibles and steel wire.

Drawing temper of carbon nickel and high speed steels.

Hardening carbon and nickel steels.

Heating rivets, glue, oils and compounds.

Melting brass, copper, aluminum, non-ferrous metals, lead and tin alloys, pitch, paraffin and compounds.

Vulcanizing tires.

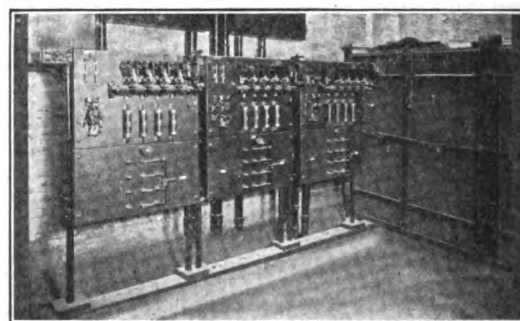
Electric Oven Equipment—Electrically heated ovens are economical, they permit close control of temperature, even distribution of heat and insure a uniform product and high quality of finish, results which can

not be attained in the same degree with other means of heating. Electric ovens are clean and easy to operate and they reduce fire hazard materially.

In many processes they are used in conjunction with continuous electrically operated conveyors which move the charges in and out of the oven according to requirements and facilitates handling. Conveyor type ovens are extensively used for heat treating glassware and steel, drying clay products and enameled ware, roasting a variety of products ranging from ores to foods, baking japan, etc.

G-E electric oven heaters of 3 types are made—wall, floor and the universal for either floor or wall mounting. These units consist of flat resistance, ribbon wound, on insulating blocks made of a compound which retains its insulating qualities at the temperature to which subjected and will not crack or break. The heaters, assembled on steel frames for convenience in installing, are furnished in capacities from 1.3 kw. to 12.3 kw. for voltages up to 600 volts. Temperature range extends to 950° Fahr. in the oven. Bulletin 48709.

Electric Oven Control Panels—Arranged for either hand or automatic operation from either direct current or 3-phase alternating current circuits. In cases where it is desired at times to operate the oven at a lower temperature than ordinarily used or at less than

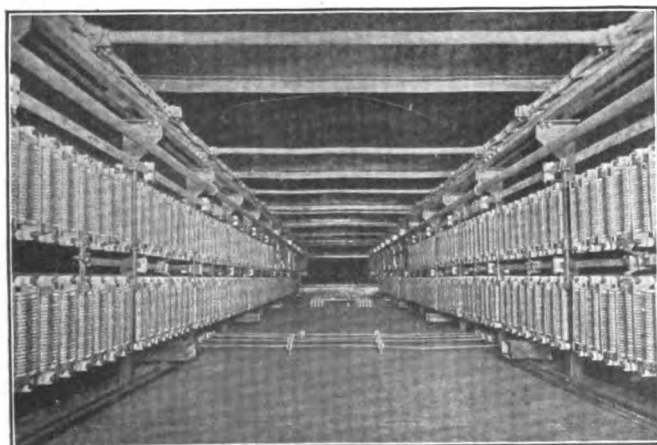


CONTROL PANELS FOR DRYING OVENS

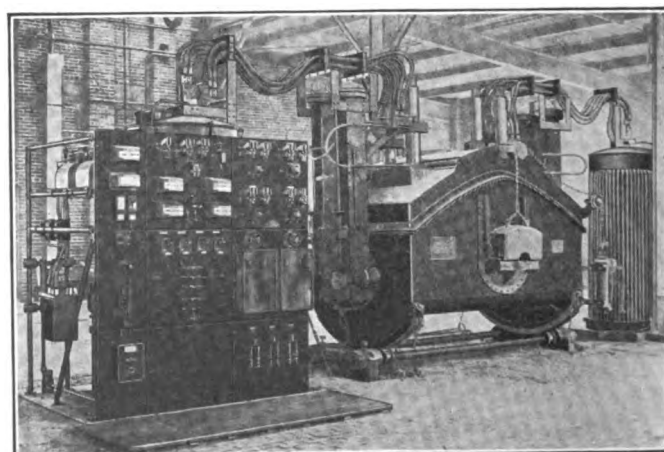
normal load, the control panel is provided with a switch placed in the heater circuit by means of which the energy input can be reduced to one-quarter or one-third of the normal input. This enables the operator to cut down the maximum demand at such times and reduces the current which is thrown on and off as the temperature in the oven falls or rises.

Electric Melting Furnaces—The principal characteristics of this electric furnace for melting non-ferrous metals and alloys are:

Temperature of heat source controllable at will.



INTERIOR OF CONTINUOUS TYPE JAPANING OVEN EQUIPPED WITH G-E ELECTRIC HEATERS AND AUTOMATIC TEMPERATURE CONTROL



BRASS MELTING FURNACE WITH CONTROL PANEL AND TRANSFORMER

Heat generated is of the "soaking" type, uniformly distributed, and any workable temperature gradient may be maintained, between charge and heat source.

The charge is heated from all sides.

Bath is shallow and large surfaces are exposed to receive heat by conduction as well as radiation.

Has normally a reducing atmosphere, which may readily be made neutral or oxidizing.

Automatic control of power permits one man to operate several furnaces.

Furnace atmosphere free from contaminating gases.

Dead atmosphere exists in furnace normally as there is practically no circulation of air through furnace.

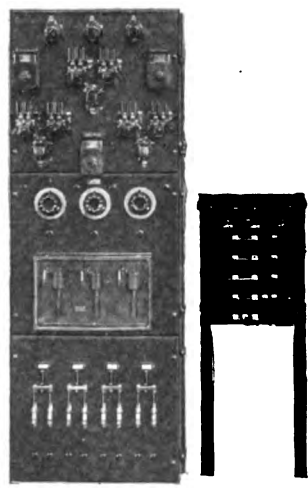
Temperature controllable and prevents formation of slag cinders, hence metal may be readily recovered without crushing operation.

Furnace may be "forced," i.e., heat may be fed to metal as fast as latter will absorb it and a high rate of melting results, with many of the advantages and none of the disadvantages met in fuel-fired furnaces.

Arc Furnace Equipment—The GENERAL ELECTRIC COMPANY can supply all the electrical equipment needed in connection with any type of electrical arc furnace, including such specialties as automatic electrode regulators, motor operated multiple pole switches, voltage regulating devices, special cables, special transformers, reactances, etc. Described in Bulletin 48710A.

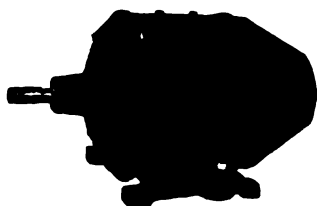


PRIMARY
CONTROL
PANEL

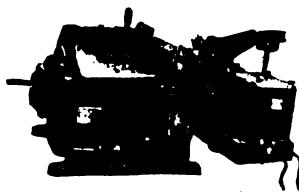


AUTOMATIC AND AUXILI-
ARY ELECTRODE REGULAT-
ING PANELS

Designers of furnaces for reduction of ores, for production of abrasives, production of ferro-alloys, steel, electrolysis of fused salts, fused silica products, carbon bisulphide, calcium carbide, fixation of atmospheric nitrogen, and a multitude of other electrothermic developments, will find experience of G-E engineers in this line of value. The furnace specialists of the GENERAL ELECTRIC COMPANY will cooperate with regard to the proper design of furnaces from the electrical engineering point of view, advising as to all the latest improvements in regulating devices, transformers, etc., and as to the best utilization of the sources of energy at your disposal.

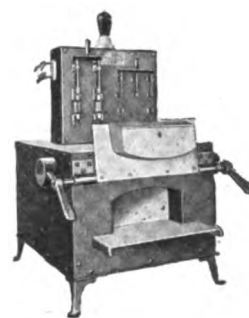


ELECTRODE MOTOR



TILTING MOTOR

Electric Heat Treating Furnaces—The G-E electric muffle furnace meets the demand for a convenient, economical and durable furnace for temperatures up to about 1550° Fahr. For heat treating carbon steel, experimental purposes, etc., this furnace is very economical. Bulletin 69706.



MUFFLE TYPE HEAT
TREATING FURNACE

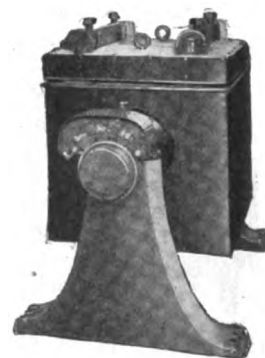
For heat treating furnaces using temperatures from 900° to 1800° Fahr. such as harden-

ing, drawing and annealing carbon steel, drawing high speed steel, annealing brass and copper, and baking vitreous enamels, the GENERAL ELECTRIC COMPANY has developed electric heating equipment with automatic temperature control. This company furnishes electric equipment only, furnace structure to be provided by purchaser.

Some of the advantages of electrically equipped and controlled heat treating furnaces are: Automatic control of the temperature, giving minimum temperature variation in the furnace; maximum rate of heating the charge; maximum efficiency in heat treating and elimination of scale due to oxidation.

Heat treating problems should be referred to the industrial heating specialists located in the nearest G-E office.

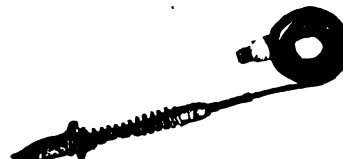
Electric Sherardizing Machines—Metal to be rendered non-corrosive is sherardized by being electrically heated in the presence of zinc. In order to secure the best results and obtain uniformity as well as durability of coating, it is necessary to have unvarying quality of zinc dust and to maintain a certain correlation between the composition of this dust and the sherardizing temperature. Electric heat is ideal for this purpose, as the temperature can be maintained with absolute certainty. Articles so coated may be bent, swaged or otherwise deformed at ordinary room temperature without injury to the coating. Bulletin 48926 gives other points regarding this process.



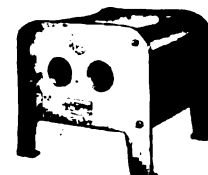
ELECTRICALLY
HEATED SHERARDIZ-
ING MACHINE

Oil Tempering Baths—The oil tempering bath for tempering carbon steels is safe, efficient and easy to operate. It is made in different sizes, heats up very quickly and can be held at any temperature. Bulletin 69700.

Electric Soldering Irons—The electric soldering iron is efficient and convenient. For light or intermittent work, it is one of the most useful of the electrically heated devices for industrial purposes. G-E soldering irons have been on the market for a number of years and have given general satisfaction. Made in various sizes. Booklet B3514.



ELECTRIC SOLDERING IRON



SOLDERING IRON
FURNACE

Electric Muffle Furnace for Soldering Irons—

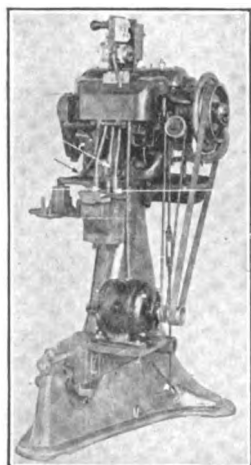
For moderate and heavy duty work, it is frequently desirable to use the ordinary soldering copper which must be heated in a furnace or open flame. Appreciating that fuel fired furnaces have many disadvantages, such as noxious fumes, excessive heat, a high fire risk, etc., an electrically heated 2-compartment muffle furnace for this purpose has been developed.

Made in 2 sizes: 1500 watts, suitable for irons up to 2½ lbs. per muffle, and 2000 watts for heavier irons.

A 3-way switch provides 3 heats on 110 volts. On 220 volts, the furnace can be operated only on one heat, as both the muffles are in series. Bulletin 69702.

Cartridge Heating Units

—For concentrated or localized heating, the cartridge unit provides a more efficient method of heating than gas or steam. G-E cartridge units can be furnished for operation on any commercial voltages from 100 to 250 volts. They are now being used extensively in many process machines such as shoe, cigarette and paper box machinery and for heating glue pots, soldering irons, small boilers, moulds, stills, sterilizers, steam radiators, etc. Bulletin 69704.



SHOE MACHINE
EQUIPPED WITH G-E
CARTRIDGE UNITS

Metal Melting Pots—A self-regulating metal melter for melting lead, babbitt, and similar metals. The automatic regulation, which is the principal feature of this melting pot, has been obtained by making the heating element of wire with a positive temperature coefficient, i.e., when the temperature of the heating element rises, its resistance rises proportionately and limits the current. When cold metal is put into the container, it is melted quickly by the initial rise of current, after which the current automatically decreases to a value just sufficient to keep the metal molten. Bulletin 69703.



30 LB. ELECTRIC
METAL MELTER

Electric Glue Pots—

Electric glue pots are being widely and successfully used in wood shops, binderies, etc. The G-E water jacketed type is recommended where glue is used intermittently, as it permits the use of a high starting heat to melt the glue quickly. The jacketless type for continuous service automatically maintains the correct working temperature and operates on about one-half the current required for the average jacketed pot. Bulletin 69100.



WATER JACKETED
ELECTRIC GLUE
POT

Industrial Kettles—The GENERAL ELECTRIC COMPANY is prepared to furnish heating equipment for kettles and tanks for heating various substances such as oil, paraffin, solutions, compounds, etc., where the purchaser provides the tank and foundation and installs the heating equipment. When requesting prices submit complete requirements.

Electric Lead Burners—The G-E "Pyrotip" electric lead burner is designed to be connected to the ordi-

nary 110-volt A.C. circuit. It is used for burning terminals in place on storage batteries, removing old connections, cutting off or building up of posts and in fact most any kind of soldering work. The current required is about the same as that drawn by a flat iron. Several points of advantage are given in Booklet 3586.



SHOWING USE OF "PYROTIP" ELECTRIC BURNER IN
REPAIRING STORAGE BATTERY

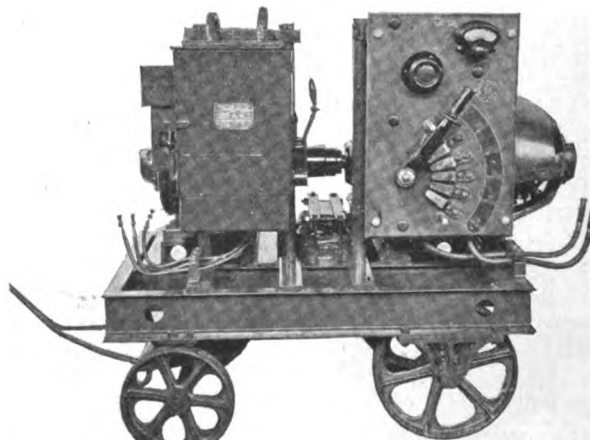
Electric Pipe Thawers—The G-E Wayne pipe thawer is essentially a transformer which reduces voltage of the lighting circuit and draws sufficient current to thaw small pipes. For use on 110 to 125 volts A.C., 50 to 60 cycles. It eliminates fire hazard incident to the use of a blow torch inside of buildings.

Electric Arc Welding Apparatus.

The use of welding apparatus in foundries, steel mills, shipyards and repair shops, is rapidly increasing, due to the economies effected. The principal advantages of the electric arc welding process is that large amounts of energy are transformed into heat in a very small space, which reduces materially the expansion and contraction troubles and at the same time results in a high heat efficiency. The resulting extremely high temperature is sufficient to fuse the metal and it is not necessary in starting a weld to preheat or to bring the metal to the fusing temperature.

The GENERAL ELECTRIC COMPANY has developed the following 4 principal types of arc welding equipment designed to meet almost every condition where it is possible to join metals by means of the electric arc. These equipments are described more fully in Bulletin 48932A.

Constant Energy Sets—Primarily single operator units. The generator, which may be driven by any standard form of power, is designed for metallic electrode welding only, but may be used intermittently for



CONSTANT ENERGY ARC WELDING SET

carbon electrode welding provided the arc voltage does not exceed 35 volts and the current does not exceed approximately 50% of rating. The generator is so designed that it gives a no-load or "striking" voltage of 60, which, when the arc is established, automatically decreases to the required arc voltage—normally 18 to 20 volts. This characteristic entails a great saving in energy and materially assists the operator in making a successful weld.

Balancer sets of the constant energy type are designed with the same characteristics. These are suitable for operation only when direct current at a potential of 110 to 125 volts is available.

Constant Potential Sets—With these units, more than one welding circuit may be operated simultaneously without interference with each other. These generators, built in ampere capacities of 400, 500 and 600 at 60 volts, and 800, 1000 and 1250 amps. at 75 volts, can be furnished for drive by any suitable electric motor, engine or belt. They deliver a constant potential over the entire range of no-load to full-load. One or more operator panels may be supplied with each equipment to meet the service requirements.



PORTABLE CONSTANT POTENTIAL ARC WELDING SET

Automatic Arc Welders—This is a mechanical device to feed automatically a metallic electrode to the work and maintain a constant arc length and constant welding temperature. It is for use on direct current circuits only, and may be operated from any of the constant energy or constant potential generators above mentioned or from any constant potential direct current source of power. Booklet B-3575.

Resistor Type of Welding Equipment—These sets consist primarily of a resistance with suitable voltage and current taps, so that it may be connected directly to any direct-current circuit of a potential of 600 volts or less and deliver the proper welding voltage. The largest size is readily portable by 2 men; the smaller sizes by one man. It is designed primarily for use on electric railway lines where it is not practicable to operate the more efficient welding generators.

Accessories—Electrode holders for both metallic and carbon electrodes, extra flexible cable for attaching to electrode holders, face masks and head shields may also be supplied on short notice.

Electrical Precipitation Equipment.

The GENERAL ELECTRIC COMPANY is prepared to furnish all of the electrical equipment for the Cottrell electrical precipitation process.

This equipment, which includes transformers, motor generator sets, synchronous motors, switchboards and rectifying apparatus, is of a very special type. This company has co-operated from the beginning with the owners of the Cottrell process and thoroughly understands the requirements. Bulletin 49137, giving further information on the electrical equipment furnished for this service, will be sent on request.

Electric Rock Drills.

Fort Wayne electric rock drills are extensively used in tunneling and mining operations. They are of the rotary hammer type, operated by a fully enclosed, splashproof electric motor, direct current or alternating current, single phase excepted. The motors are interchangeable on the drill body.

The power consumption of these drills is only $1\frac{1}{2}$ to 2½ h.p. as compared to 12 to 18 h.p. for air drills of equal capacity.

These drills strike 1700 blows per minute, each blow having a maximum cutting effect. The drill steel is rotated as it receives the hammer blows but the rotating gears and motor are protected by a slip-friction device so that they receive no undue strain in case the rotation of the drill steel is suddenly checked.

The Fort Wayne drill will drill holes up to 12 ft. in depth, finishing at 1½ in. diameter. The drill steel can be changed without the use of wrenches or other tools. Drills can be mounted on tripod, mining column, shaft bar, gadder post or quarry bar and can be handled by two men. Bulletin 48902 gives other points of advantage.

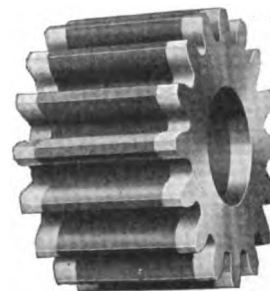


FORT WAYNE ROCK DRILL IN OPERATION

Fabroil Gears.

Fabroil gears are superior to other non-metallic gears by virtue of a measure of elasticity which allows meshing teeth to come to a good bearing across the full width of face and absorbs shock of rapid variation of torque.

Because of their noiseless operation, long life and high tooth strength, Fabroil gears are applicable to lathes, planers, traveling cranes, drill presses, shears, punches, etc.; shafts of back-gear motors which drive machine tools; drive of spinning frames in silk, worsted, carpet and similar mills; heavy machinery of paper and



FINISHED FABROIL GEAR

pulp mills; intricate mechanism of printing plants; automobile and other gas engine ignition drives; timing gear-trains. While in some instances they run with success at 4000 ft. per minute, maximum speed should be kept at 2000 ft. per minute, for all general applications.

Other advantages are: Strong as the best cast iron; unaffected by atmospheric changes and neither shrink nor swell in extreme dryness or dampness; run equally well against cast iron, steel or bronze; can be run in cold or hot oil baths; absolutely vermin-proof.

Further details are given in Bulletin 48703A.

Insulating Materials.

Insulating materials manufactured by the GENERAL ELECTRIC COMPANY are developed from careful research, and made primarily to meet the requirements of its own products. They represent 20 years' experience in the manufacture of insulating fabrics and compounds. These same materials are offered to others for general electrical repair work.

G-E insulating compounds include varnishes, japans, oils, sealing compounds and paints. These are described fully in Bulletin 48704. The fabrics, including fibers and papers treated with varnishes, oils and japans, also asbestos tape and treated cloths, are described in Bulletin 48715, which will be mailed on request.

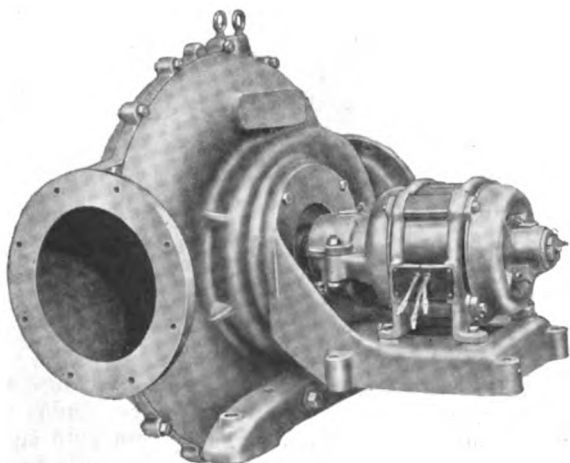
Centrifugal Blowers.

G-E centrifugal blowers or compressors are designed for large volumes and low pressures such as are required for the following classes of service: Oil and gas burning furnaces, foundry cupola blowing, pneumatic mail and cash conveying systems, agitation of liquids, sewage treating plants, blowing water gas generators, etc.

These blowers are similar in design to the well-known centrifugal pump. They may be driven by direct current motors with auxiliary apparatus for starting and controlling speeds, 60-cycle induction motors for constant speed service, or by Curtis steam turbines. Blower and driver are direct connected, the complete unit requiring at most 3 bearings and usually only 2 bearings.

The G-E centrifugal blower differs from the ordinary fan blower in that it is provided with discharge or diffusion vanes which convert the otherwise lost energy of velocity into pressure energy, resulting in high over all efficiency. It delivers practically constant pressure over a wide range of loads. The internal clearance is very large, thus there is no rubbing and no internal lubrication is required.

Made in single-stage and multistage types in various sizes. For general description send for Bulletin 48609. Foundry applications described in Bulletin 42800; gas plants, Bulletin 48600; blast furnace work, Bulletin 48601.

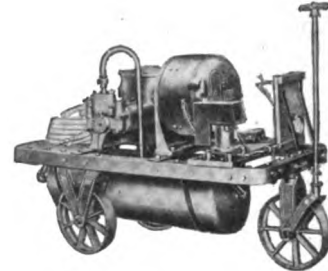


STANDARD SINGLE-STAGE CENTRIFUGAL BLOWER DRIVEN BY DIRECT CONNECTED INDUCTION MOTOR

SWEET'S CATALOGUE

Electrically Driven Air Compressors.

The small G-E reciprocating compressors such as are used to supply air brakes on electric railway cars, are particularly applicable for cleaning inaccessible parts of machinery in industrial plants, operating pneumatic tools, sand blasting, etc. These compressors are built in a combined unit with either induction motors or direct current motors of any commercial frequency or voltage. They are furnished either portable or stationary, complete with automatic pressure governor, reservoir, line switch, fuses and pressure gage. More detailed data given in Bulletin 48610.



PORTABLE AIR COMPRESSOR

Motor Driven Exhaust Fans.

G-E exhaust fan outfits are self-contained units, adapted for ventilating shops, factories, office buildings, etc. or for use in dye houses, laundries, paper mills and other industrial establishments where it is desirable to remove steam, moist air, dust, smoke and odors, or to exhaust noxious gases and fumes which attend certain processes of manufacturing. These outfits may also be usefully employed to dry cloth, paper, wool, tobacco, asbestos, bricks, clay and many other articles of merchandise.

Made in disk and propeller types for both alternating and direct current standard voltages, ranging in diameter from 12½ to 48 in.; capacities from 750 to 25,900 cu. ft. of air per minute. Bulletin 41801.



PROPELLER FAN



VENTURA DISK FAN

G-E Reliable Wiring Devices.

It is manifestly impossible to list more than a few of the 3000 wiring devices made by the GENERAL ELECTRIC COMPANY. Some of those having especially industrial uses are shown here and for information on the complete line, send for G-E Specialties Catalogue Y1270.

Locking Sockets and Receptacles—Locking sockets afford a positive protection to lamps installed in public or semipublic places. They also prevent the theft of current through the surreptitious use of high wattage lamps and current consuming devices. When the key is removed, the screw shell of the socket swivels freely, preventing injury either to the lamp base or socket if an attempt be made to remove the lamp without the use of the key. G-E locking sockets can be furnished in the following types: Key, keyless and pull,

Continued on next page

metal shell and porcelain, with all the usual styles of caps and bases.

Locking receptacles are made in several types, moulding, cleat, conduit box, etc., porcelain or with metal shells.



KEY SOCKET, PEN-
DENT CAP



FLUTED CATCH KEY
RECEPTACLE FOR
CLEAT WIRING



SHELL OF
THREADED
CATCH SOCKET

Threaded Catch Sockets—The G-E threaded catch socket can not pull apart under many times the strain to which it will be subjected in service.

Its strength and rigidity are unequalled by any other design of metal lamp socket.

Lugs on the cap fit into the body of the shell, preventing twisting, and a threaded ring holds the 2 parts of the shell firmly together.

This improved design costs no more than the ordinary types. It is made in key, keyless and pull styles, also in the locking type, both key and keyless. It is not designed for use in fixture husks.

Weatherproof Sockets—For outdoor installations or where sockets are exposed to unusual dampness or other corrosive influence, G-E weatherproof sockets should be used. Made N.E.C. standard and will take standard weatherproof shade holders. Made in 660 watts, 250 volts.



Porcelain Socket



Socket with Wires In-
side of Pipe



Pendent Socket

WEATHERPROOF SOCKETS

Porcelain Moulding and Conduit Box Receptacles—A sturdy, neat-appearing porcelain receptacle, designed for National metal moulding, with 1-way or 2-way bases.

Made in key, and keyless types.

The conduit box receptacles are made to fit 3¼-in. and 4-in. conduit boxes.

Key, 250 watts, 250 volts.

Keyless, 660 watts, 250 volts.



KEY MOULDING
RECEPTACLE,
REMOVABLE
BASE

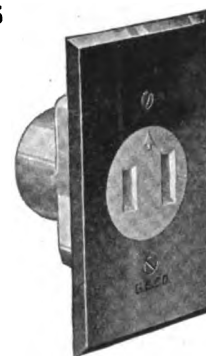
Heavy Duty Receptacles, 25

Amperes—An extra heavy duty receptacle for use on heating circuits, etc.

Dimensions of porcelain, center to center of supporting screw holes:



PLUG



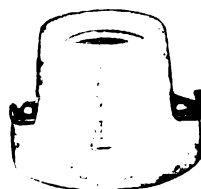
FLUSH RECEPTA-
CLE AND PLATE,
25 AMPERES

Length	Width	Depth
2½ in.	1½ in.	1½ in.

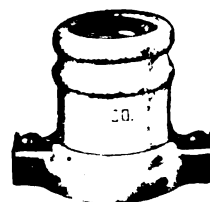
Outside
3 in.

Inside
2½ in.

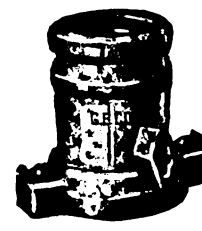
Porcelain Cleat Receptacles—For good appearance, utility and dependability, these receptacles are unique. The mechanism is protected from dampness and dust. Made N. E. C. standard in key, and keyless type, solid and removable base.



Cleat Receptacle



Keyless Cleat Recep-
tacle, Removable Base

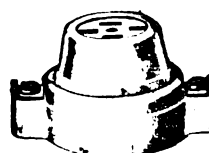


Key Cleat Receptacle,
Removable Base

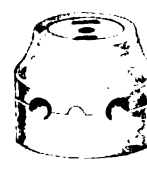
PORCELAIN CLEAT RECEPTACLES

"Standard" Separable Receptacles—The G-E line includes this convenient type of receptacle, for use with portable electrical conveniences now so increasingly popular in household, commercial and industrial installations.

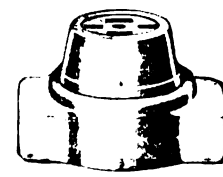
Made for long wear. Adaptable to cleat, moulding and conduit work.



Cleat Receptacle



Receptacle for
Conduit Boxes



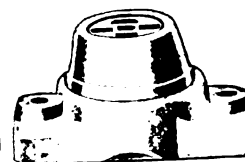
Receptacle with Base for
"Paiste" Taplets



Receptacle with
Base for Conduit



Receptacle for
Concealed Work



Receptacle for Mould-
ing Work

STANDARD SEPARABLE RECEPTACLES

Ceiling Receptacles

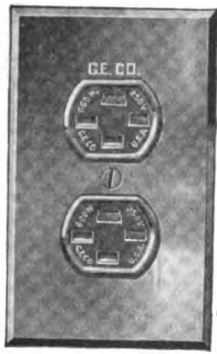
Like all other G-E fittings, these receptacles are substantially built and electrically perfect.

Made N. E. C. standard, in keyless and pull chain types.



KEYLESS METAL SHELL
CEILING RECEPTACLE
For use with 3¼- and 4-inch
Outlet Boxes

Continued on next page



"STANDARD" FLUSH
RECEPTACLE,
DOUBLE OUTLET

Flush Receptacles—"Standard" receptacles recommended for general use. Made in single and double outlet types. These receptacles take the same outlet boxes as flush push button switches. Provided with "standard" plugs, also heavy duty receptacles, 25 amps., for use on heating circuits, etc.

Snap Switches—Admirably adapted for open wiring in attics, garages, cellars, barns, storehouses and in all installations demanding a low cost, yet thoroughly dependable switch.

Made with porcelain base and some types in all porcelain.

Made in all standard ratings, in a great variety of types and sizes and may be had in indicating or non-indicating forms. Porcelain switches are recommended for use in places subject to moisture, acid fumes or other corroding influences. Made for cleat, moulding and conduit work. Furnished single, 2-, 3-, and 4-way.



Single Pole, Porcelain Switch



Ceiling Snap Switch, Concealed Base.



Single Pole Snap Switch for Condulets



Pony Type Tumbler Switch



Pony Type Snap Switch, Indicating

SNAP SWITCHES

Pull Switches—A necessary convenience where lights are inaccessible or remote from point of control. Ruggedly built and electrically perfect. Made for cleat, moulding and conduit work, and furnished with 1- or 2-way bases, with short chain and 10 ft. of cord.



Pull Switch Rosette, Conduit Base



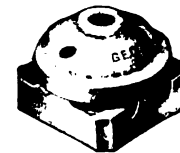
Pull Switch Rosette, Side Outlet, Large Concealed Base, Porcelain Flange

PULL SWITCHES

Ceiling Rosettes—On open wire installations and concealed work the ceiling rosette is the important connecting device between pendent lamps and the circuit. G-E ceiling rosettes are made in all types and sizes. Furnished with or without fuses.



Geco Rosette, Cleat



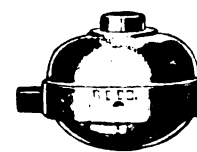
Geco Rosette, Moulding



Standard Rosette, Concealed Work

PORCELAIN CEILING ROSETTES

Pendent Switches—The advantages of this type switch are obvious. They permit the convenient control of lights without running wires along the ceiling or down the side walls.



Pendent Switch, 1/8-inch Cap



Pendent Cap, Pendent Switch



Porcelain Pendent Switch

PENDENT SWITCHES

Plug Cut-outs—Made with porcelain base, single, double and triple pole, two or three wire. Furnished in 30- and 60-ampere capacities.



Plug Cut-out Single-pole



Plug Cut-out Double-pole

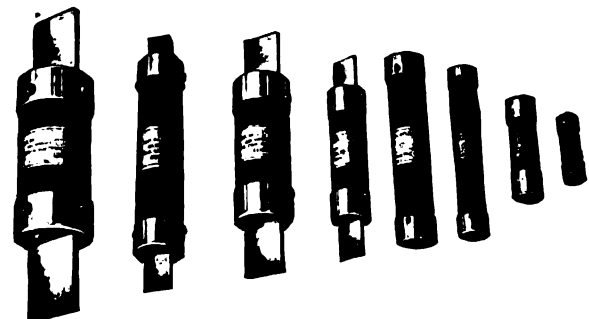
PLUG CUT-OUTS

Fuses—Where maximum protection under all operating conditions is desired, the use of N. E. C. S. fuses is strongly recommended.

Where it is considered desirable on account of frequent blow-outs to use fuses of the renewable type—G-E renewable enclosed fuses are offered with the assurance that they embody all the best features of this type of fuse.



FUSE PLUG
New type



ENCLOSED FUSES

National Electrical Code Standard

Floodlighting Projectors.

G-E floodlighting projectors have been successfully used in lighting arsenals, building fronts, chimneys, docks, freight unloading, grain elevators, manufacturing plant exteriors, patrol duty, quarries, water tanks, theater fronts, railroad yards, etc. Bulletin 43850B.

Form L-1—For lighting an object at 150 ft. or more; beam divergence 8° to 14° ; with medium angle reflector, beam divergence 12° to 20° , suitable for objects at 75 to 200 ft.

Form L-3—Beam divergence 50° , for objects at 25 to 75 ft. or more; similar to L-1 but provided with special silvered and copper backed heat resisting reflector.

Form L-11—Meets the demand for a small floodlighting unit mounted close to object.

Form L-15—Designed for large areas, lighting shipyards, construction work, etc. Beam divergence 20° to 30° . This projector is equipped with focusing mechanism to regulate divergence of beam.



FLOODLIGHTING PROJECTOR



CONSTRUCTION WORK ILLUMINATED BY FLOOD LIGHTING PROJECTORS

Electric Headlights.

G-E headlights can be furnished for electric railways, both traction service and mining or other industrial locomotives, also for steam roads. The arc type is described in Bulletin A4061; incandescent type in Bulletin 43800.



ELECTRICALLY CONTROLLED SEARCHLIGHT

Electric Searchlights.

Searchlights are suitable for night work in mines, railroad yards, marine and construction work.

The GENERAL ELECTRIC COMPANY makes 2 types: an 18-in. incandescent lamp, 1000-watt, 110-volt searchlight and the arc lamp type in sizes 9, 13, 18 and 24 in. Larger projectors of 30, 36 and 60 in. in diameter are manufactured and can be supplied.

Projectors arranged for hand and pilot house control are regularly kept in stock for immediate shipment. Units for shaft, rope, and electrical control can be provided when desired. Bulletin 43856A.

Blue Printing Lamps.

Economical blue printing and photographic work requires an intense light containing an excess of violet, ultraviolet or actinic rays.

The GENERAL ELECTRIC COMPANY manufactures a special enclosed carbon arc lamp meeting these requirements. These are adjusted for 20 amps. at 110 volts A.C., 15 amps. at 220 volts A.C. and 10 amps. at 220 volts D.C. All are equipped with heat resisting globes.

Direct Current Lamps—Form 12, 10 amps., 1100 watts; Form 6, 6 amps., 1320 watts; Form 20, 15 amps., 1650 watts; Form 14, 10 amps., 220 watts.

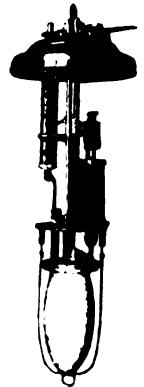
Alternating Current Lamps—Form 6, 10 amps., 770 watts; Form 6, 6 amps., 950 watts; Form 14, 20 amps., 1600 watts; Form 14, 15 amps., 2300 watts. It is desirable to use an arc lamp having a high current adjustment. Bulletin B-3293.

Novalux Units.

Novalux pendent and ornamental units are designed for use with the efficient Mazda "C" lamp. The pendent type is particularly suited for the economical illumination of streets, large interiors and exteriors, and the different light directing equipments produce such a variety of illuminating characteristics that a selection can be made to meet any individual requirement.

The ornamental units, in addition to lighting the streets and sidewalks, are designed to throw considerable light upward to illuminate the building fronts. By combining illuminating efficiency with a dignified and distinctive appearance, they beautify their surroundings and are an asset by day as well as by night.

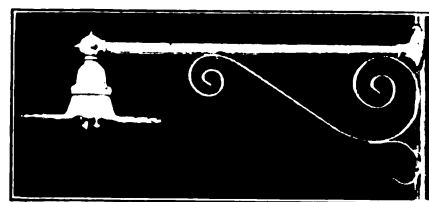
The Novalux ornamental units are made for all standard lighting circuits and for all candlepowers. Bulletin 43503.



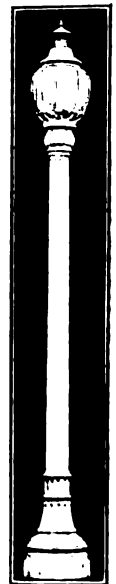
BLUE PRINTING LAMP



PENDENT UNIT



INCANDESCENT BRACKET, CONCEALED WIRING

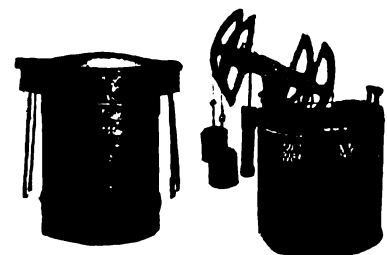


ORNAMENTAL UNIT

Constant Current Transformers.

The GENERAL ELECTRIC COMPANY builds a complete line of constant current transformers in capacities from 1 to 80 kw. inclusive, which may be supplied for any commercial voltage, frequency and current. Bulletins 65109 and 65110.

This Company also manufactures series luminous rectifier outfits for operating series magnetite arc lamps. These are described in Bulletins 43253 and 43900.



OUTDOOR TYPE AND STATION TYPE CONSTANT CURRENT TRANSFORMERS

WESTINGHOUSE ELECTRIC & MFG. CO.

Manufacturers of Apparatus for the Generation, Application, and Control of
Electric Power

EAST PITTSBURGH, PA.

DISTRICT OFFICES

ATLANTA, GA., Candler Building, 127 Peachtree Street
BALTIMORE, MD., Westinghouse Building, 121 East Baltimore Street
BIRMINGHAM, ALA., Brown-Marx Building, First Avenue and Twentieth Street
BLUEFIELD, W. VA., Law and Commerce Building
BOSTON, MASS., Rice Building, 10 High Street
BUFFALO, N. Y., Ellicott Square Building, Ellicott Square
BUTTE, MONT., Montana Electric Co. Building, 52 East Broadway
CHARLESTON, W. VA., Kanawha National Bank Building
CHARLOTTE, N. C., Commercial Bank Building
CHATTANOOGA, TENN., Hamilton National Bank Building
CHICAGO, ILL., Conway Building, 111 West Washington Street
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CLEVELAND, OHIO, Swetland Building, 1010 Euclid Avenue
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DALLAS, TEX., Exchange Building, Akard and Wood Streets
DAYTON, OHIO, Riebold Building, South Main Street
DENVER, COLO., Gas and Electric Building, 910 Fifteenth Street
DES MOINES, IOWA, 608 Securities Building
DETROIT, MICH., Dime Savings Bank Building, Fort and Griswold Streets
DULUTH, MINN., Alworth Building
EL PASO, TEX., Mills Building, Oregon and Mills Streets
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JOPLIN, MO., Miners Bank Building
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LOS ANGELES, CAL., I. N. Van Nuys Building, Seventh and Spring Streets
MEMPHIS, TENN., Exchange Building, 6 North Second Street
MILWAUKEE, WIS., First National Bank Building, 425 East Water Street
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PHILADELPHIA, PA., Widener Building, 1325-1329 Chestnut Street
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ROCHESTER, N. Y., Chamber of Commerce Building, 119 East Main Street
ST. LOUIS, MO., 300 North Broadway
SALT LAKE CITY, UTAH, Walker Bank Building, Second Street, South and Main Streets
SAN FRANCISCO, CAL., First National Bank Building, 1 Montgomery Street
SEATTLE, WASH., Alaska Building, Second and Cherry Streets
SYRACUSE, N. Y., University Building
TUCSON, ARIZ., Immigration Building
TOLEDO, OHIO, Ohio Building, Madison Avenue and Superior Street
WASHINGTON, D. C., *Hibbs Building, 723 Fifteenth Street, N. W.
WILKES-BARRE, PA., Miner's Bank Building
HONOLULU, T. H., The Hawaiian Electric Company, Ltd., Agent

*Government business exclusively.

CANADA: CANADIAN WESTINGHOUSE CO., LTD., HAMILTON, ONT.

WESTINGHOUSE ELECTRIC INTERNATIONAL COMPANY

NEW YORK OFFICE: 165 Broadway

LONDON OFFICE: No. 2 Norfolk Street, Strand

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Cia. Westinghouse Electric Internacional, Maipu 73, Buenos Aires

BRAZIL (Central and Northern)

Walter & Company, Rua General Camara 65, Rio de Janeiro

BRAZIL (Southern)

Byington & Co., Caixa do Correio P. Sao Paulo

BRANCH OFFICES: Santos, Curitiba, Campinas, Porto Alegre, Rio Grande do Sul, and Paranagua

NEW YORK, 141 Broadway

CHILE

Erazuriz, Simpson & Co., Casilla 715, Santiago

BRANCH OFFICE: Prat esq. Washington, Antofagasta

NEW YORK, Spruille Braden, Associate, 141 Broadway

CHINA

Gaston, Williams & Wigmore Elec. Eng. Corp., Union Building, Bund and Canton Road, Shanghai, China

BRANCH OFFICE: Tientsin

NEW YORK, 39 Broadway

COSTA RICA

H. T. Purdy, San Jose

NEW YORK, Wonham, Bates & Goode Trading Corp., 17 Battery Place

FRANCE, her Colonies and Dependencies

Compagnie Electro-Mecanique, 12 Rue Portalis, Paris

GREAT BRITAIN, her Colonies, Dependencies, and Protectorates other than in North America

Metropolitan Vickers Electrical Export Co., Ltd., 4 Central Buildings, Westminster, SW1, London

SALVADOR

Wm. C. McEntee, Santa Ana

SPAIN

Societe Espanola de Construccion Naval, Lealtad 8, Madrid

MAIN WORKS: EAST PITTSBURGH, PA.

CUBA OFFICE: Royal Bank of Canada Building, Havana

COLOMBIA

Vicente B. Villa & Co., 178 Palace, Medellin

NEW YORK, 165 Broadway

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Emilio Selle, 10 Calle Oriente Numero 2, Guatemala City

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JAPAN

Takata & Co., No. 2 Yeiraku-cho-Nichome, Tokio

BRANCH OFFICES: Osaka, Kure, Nagoya, Yokohama, Kobe, Moji, Yokosuka, Maizuru, Saseho, Nagaoka, Hakodate, Nagasaki, Taipeh, Seoul, Dalny

NEW YORK, 50 Church Street

MEXICO

G. Amsinck & Co. of Mexico, Inc., 3a de la Palma, No. 34, Mexico D. F.

BRANCH OFFICES: Edificio Elizondo No. 6, Monterey; Av. Colon Y.P. Sanchez, Apartado 11 Bis, Guadalajara

NEW YORK, 90-96 Wall Street

NORWAY

Vickers Norsk Aktieselskap, 20 Rosenkrantzgaten, Christiania

PERU

Emilio Wagner y Cia., Lima

PHILIPPINE ISLANDS

Catton-Neil Engineering & Machinery Co., 25 Santa Cruz Bridge, Manila

NEW YORK, Alexander & Baldwin, Ltd., 82 Wall Street

PORTO RICO

Porto Rico Railway, Light & Power Co., San Juan

NEW YORK, 90 West Street

Continued on next page

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General.

The products of the WESTINGHOUSE ELECTRIC & MFG. Co. comprise almost every kind of apparatus and machinery used in the generation, distribution and utilization of electric energy, as well as stokers and other mechanical equipment.

It is obviously impossible to display all Westinghouse products; however, typical apparatus is described and illustrated in these pages with such suggestions as are calculated to aid the reader in reaching a concrete decision on the products tabulated.

Service.

Only a few of the largest industrial plants in the country maintain an electrical engineering department. It is therefore our purpose to point out to the engineer of the average industrial plant how the WESTINGHOUSE ELECTRIC & MFG. Co. will co-operate with him by furnishing both engineering service and equipment.

Westinghouse engineers, through many years of practical experience in handling a great variety of problems, are able and willing to render the advice and assistance you need. The plant, laboratory and equipment of the WESTINGHOUSE ELECTRIC & MFG. Co. is at their disposal to aid them in serving you.

Every Westinghouse district office has a specialist to advise and furnish catalogues, booklets, prices and any other information you desire on our products.



TRADE-MARK

Underfeed Stokers—The Westinghouse underfeed stoker is of the multiple retort type designed and constructed to serve plants that require a wide range of economical operation or where peak loads and sudden increases in steam demands must be met.

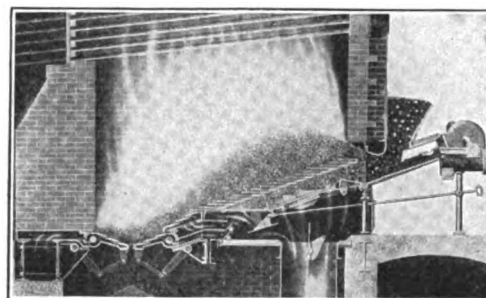
It has a reserve capacity of 250%, 300% or 400% of boiler rating when required.

It should be provided with ample combustion space, proper settings, large ash pits and underground air ducts. Forced draft is required for this type of stoker. The dampers may be quickly set, a long range of adjustment provided for, the usual air dilution is cut one-half and a high percentage of CO₂ is obtained in the flue gases.

Patented tuyeres insure proper admission and distribution of air to the underfeed section and corrugated overlapping and changeable grates provide proper admission of air to the overfeed section.

There is no waste, no idle equipment and no boilers held in readiness for peaks in plants equipped with the Westinghouse underfeed stoker.

For full information, write for circular 1615.



WESTINGHOUSE UNDERFEED STOKER IN ACTION

Stokers.

It is generally conceded that the days of hand firing are numbered. The great variety of mechanical stokers put on the market in the last few years has enabled the combustion engineer to successfully burn almost any kind of coal under any size and number of boilers.

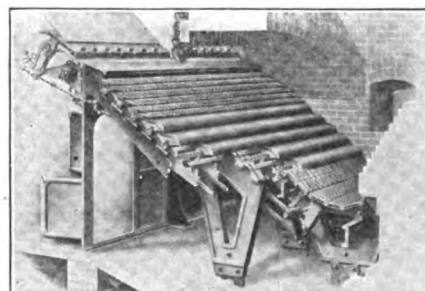
Under ordinary hand fired conditions, approximately 40% of the heat value of fuel is lost. With suitable stokers accurately designed and constructed, a fuel loss of 10% to 12% is rarely exceeded. The replacement of labor that this equipment effects adds to its economical and time saving advantage.

The economy of stoker operation therefore becomes at once apparent.

Although the stoker, furnace, boiler and stack may be of excellent design, they may not be of proper relative size or suited to each other or to the coal used and will therefore operate unsatisfactorily.

Westinghouse expert combustion engineers assist purchasers in designing their furnaces and boiler settings and instruct the operators in obtaining the highest economical results.

Overfeed Stokers—Conditions frequently exist in power plant design and operation that do not demand



WESTINGHOUSE-RONEY OVERFEED STOKER

the high overload capacity nor the extreme flexibility that the Westinghouse underfeed stoker possesses.

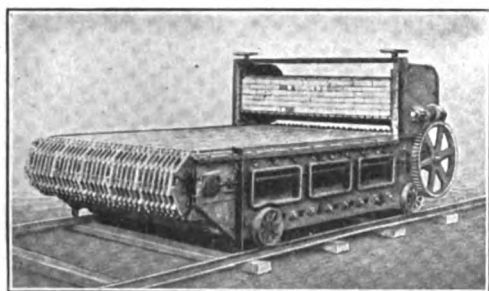
The Westinghouse-Roney stoker very satisfactorily burns the high volatile coals found in the Middle West as well as the low ash coals used so largely in the East.

Ashes can be removed to the boiler room floor, eliminating the necessity for expensive basements and ash pits.

When maximum reserve capacity is not over 200% rating, this type of stoker is widely used. It is particularly adapted to tubular boiler applications and to boilers generally found in moderate sized plants.

Full information is given in circular 1616.

Chain Grate Stokers—The Westinghouse chain grate stoker is of the traveling grate, standard link type and is limited in its application. It is particularly adapted to coals found in Illinois and the West.



WESTINGHOUSE CHAIN GRATE STOKER

Steam Turbines.

Electric power must first be cheaply generated and second, be absolutely dependable. Breakdowns during working hours cripple production and increase costs.

The turbine of today has ceased to be a machine of too high a speed for general application. It may be designed for its best speed and gear connected to the driven machine for performing all classes of work.

The advantages of steam turbine units are: Compactness, simplicity of construction, lower maintenance cost, high efficiency and little attention required.

Turbines for Mechanical Drive—This is the ideal turbine for driving centrifugal boiler feed pumps, circulating pumps, blowers and other mechanical apparatus.

These turbines are designed for reliability and simplicity and can be arranged either for driving by direct connection or through the medium of Westinghouse reduction gears. Capacities, 5 to 500 h.p.

Important features of design of Westinghouse turbines are: A heavily reinforced steel forging for turbine rotor containing a single row of blades; bronze nozzle and brass reversing chamber; electric furnace,

nickel-steel blades; powerful centrifugal type speed-regulating governor; water-sealed glands; balanced bronze inlet valve.

In capacities of 50 h.p. and upwards, the turbine casings are supported from the center instead of the usual turbine feet in order to insure perfect alignment of shaft under high temperatures.

Reduction Gear.

A dependable, efficient and noiseless method of speed reduction on moderate capacities which can be used with any type of turbine or motor, for speed increase or decrease, is obtained by the Westinghouse reduction gear. With this type of gear, the highest efficiency of the turbine and operated machines may be obtained.

For further information, write for leaflet 3907A.

Condensers.

The highest efficiency in the operation of the steam turbine is obtained by allowing the exhaust steam to pass into a condenser. The governing points entering into a true operating cost may be summed up as (1) power required to operate pumps and the efficiency of turbine or motor driving them; (2) ability of the condenser to maintain a high vacuum continuously; (3) cost of keeping the condenser in operative condition.

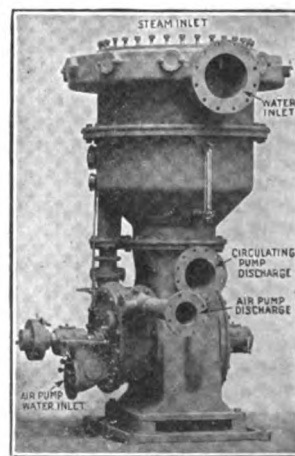
Jet Condensers—The Westinghouse-Leblanc jet condenser is capable of maintaining a high vacuum at low operating costs and is simple and compact. Its distinguishing feature is the absence of reciprocating parts and the fact that it has only 2 pumps, circulating and vacuum (both centrifugal), driven from the same shaft and adapted for low speeds.

For further information, write for leaflet 3899.

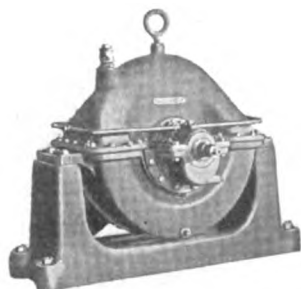
Surface Condensers—

The Westinghouse-Leblanc surface condenser is particularly designed so that the circulating water travels positively and rapidly past every square inch of the cooling surface, and is so constructed as to eliminate air and steam pockets, thus making for long life of the condenser.

It is also capable of maintaining a high vacuum and is known as the high vacuum condenser. In general, the apparatus consists of the condenser, a centrifugal pump and a Leblanc air



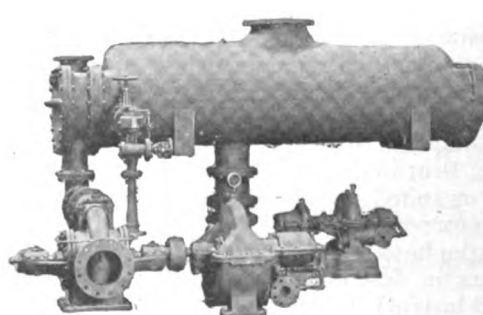
WESTINGHOUSE-LEBLANC JET CONDENSER



WESTINGHOUSE TURBINE FOR MECHANICAL DRIVE



WESTINGHOUSE REDUCTION GEAR FOR MODERATE CAPACITIES



WESTINGHOUSE-LEBLANC SURFACE CONDENSER

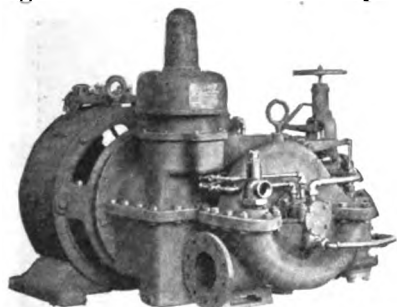
pump. They are installed in plants all over the world and are built to serve turbines up to 100,000 h.p.

For further information, write for leaflet 3894.

Direct Current Generators.

Westinghouse manufactures direct current generators in capacities from a fraction of a horsepower to 1000 h.p. in standard voltages for direct connection, turbine or belt drive. Some of the more important types of these are described as follows:

Small Geared Turbine Generator Units—This small Westinghouse turbine comprises every refinement of design for safety and successful operation contained in a large turbine or reciprocating engine. It is designed for steam at boiler pressures ranging from

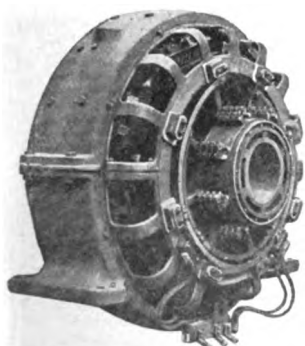


WESTINGHOUSE GEARED TURBINE GENERATOR UNIT

75 to 250 lbs. for condensing and non-condensing service. It is used with Westinghouse standard direct current generators in sizes from 15 to 50 kw. and for alternating current from 30 to 50 kw.

Write for leaflet L2021.

Type Q Engine Driven Direct Current Commutating-Pole Generators—Cool operation, high overload capacity, sparkless commutation under all



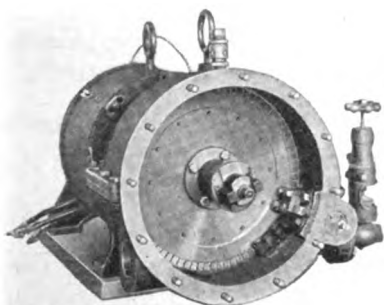
REAR VIEW OF TYPE Q ENGINE DRIVEN DIRECT CURRENT COMMUTATING POLE GENERATOR

loads and fixed brush position characterize this type. Each armature is arranged for mounting on a prime mover shaft, which is furnished together with the bearings by the builder of the engine. For capacities up to 250 kw., the standard voltages are 125 and 250; from 100 to 400 kw., 275 and 600 volts; from 250 to 1000 kw., 250 volts. Any type Q machine can, at increased price, be arranged for 3-wire service.

Ventilation exceptionally effective.

For all particulars, send for leaflet 2371-A.

Direct-Connected Turbine Generator Units—Built in capacities of 5, 7½, 10 and 15 kw. Especially developed to meet the demand for a small direct current, non-condensing turbine generator set for lighting and power work.



WESTINGHOUSE DIRECT-CONNECTED TURBINE GENERATOR UNIT

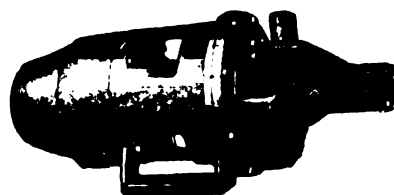
Designed to serve as 125-volt exciters for alternating current generators for lighting small industrial plants, coal mines, construction operations and for furnishing current (250 volts) for locomotive crane magnets.

See leaflet L-2000-A.

Locomotive Headlight Turbine Generator Units

—Capacity, 500 watts at 33 volts, direct current. Especially developed to meet the requirements and recommendations of steam railroad motive power engineers. Can also be used for lighting service in small isolated steam plants, pumping stations, shovel excavation work, oil derricks, etc. The unit is small, light, compact, requires no foundations and is very desirable in portable applications. It is totally enclosed, weather-proof and dustproof and can be used indoors or outdoors.

See leaflet 3485.



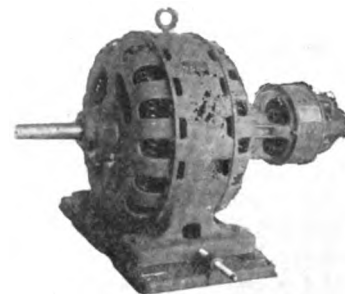
LOCOMOTIVE HEADLIGHT UNIT COMPLETE

Alternating Current Generators.

Type G Belt Driven Alternating Current Generators—Capacities, 25 to 312 kv-a. Small industrial plants requiring belt driven alternators find the type G line of 60-cycle generators well adapted for this service. Generators up to 125 kv-a. have bracket type supports for shaft and bearings. Larger generators have pedestal type bearings. Furnished for belted exciter or direct connected exciter.

These generators are highly efficient at all loads; well ventilated; simple in electrical and mechanical construction; made of high grade material; economical to operate and maintain; carefully inspected and tested before shipment.

For further information, see leaflet 2389.



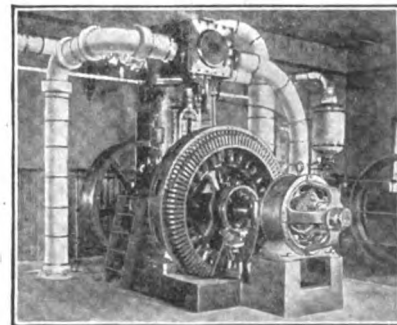
TYPE G 75 KV-A. BRACKET TYPE GENERATOR WITH DIRECT CURRENT EXCITER

Type E Engine Driven Alternating Current Generators

—Capacities, 62½ to 1750 kv-a. The practical experience of the WESTINGHOUSE ELECTRIC & MFG. CO. in the design and construction of various types of alternators has been embodied in type E generators, which constitute a standard line of 60-cycle alternators and which are applicable to all prime movers. They are suitable for direct connection to steam, gas or oil engines and slow speed horizontal water wheels.

They are efficient at all loads; rugged and long lasting; economical to operate and maintain; carefully inspected and tested before shipment.

See leaflet 2390.



250 KV-A. STEAM ENGINE DRIVEN UNIT WITH DIRECT-CONNECTED EXCITER

Type EA—A modification of the type E generators, all iron covers and guards not absolutely necessary being removed. The cost of this type is therefore materially less than that of type E.

See leaflet 2040.

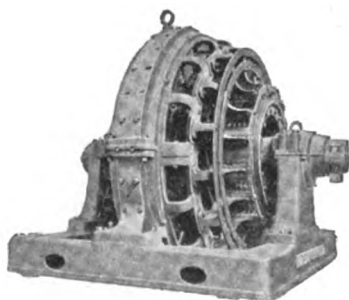
Commutating-pole Synchronous Converters.

The great number of Westinghouse synchronous converters ranging from 100 to 4000 kw. in successful operation on widely varying conditions demonstrate that these machines are unequalled for simplicity, strength, ruggedness, compactness and exceptionally large capacity.

As compared to converters of ordinary design, they possess better inherent commutating characteristics, commutating poles, composition leaf brushes, well distributed welded-damper windings and increased ventilation of windings.

Adapted to railway and industrial service not requiring direct current voltage adjustment, in all capacities and voltages. Arranged for alternating current or direct current, self-starting or both.

See leaflet 3823-C.



2000-KW., 600-VOLT, 60-CYCLE
COMMUTATING-POLE SYN-
CHRONOUS CONVERTER

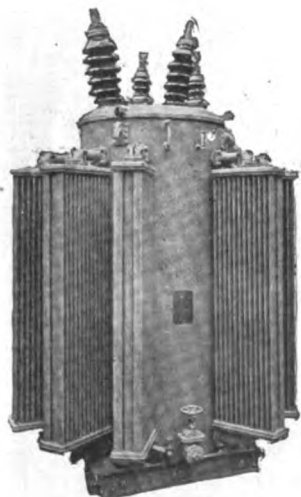
Transformers.

Many years of development and steadily effected improvements have brought Westinghouse transformers to a high degree of perfection. Improvements have been made in the materials used, in their design and construction, and incorporated with all modern developments of good electrical engineering application. Westinghouse transformers are made in 2 general types, one for station or substation use, the other for distribution work.

Type OISC Transformers—In many substations and some generating stations, where auxiliary equipment and required attendance must be reduced to a minimum, or where an abundant supply of cooling water of proper character is not available, transformers of the self-cooling type must be installed. Westinghouse OISC oil-immersed self-cooling transformers of the radiator type are designed to meet these requirements. The fact that no piping, pumps or blowers are required makes the self-cooling type particularly applicable for general service of all kinds.

OISC transformers are made for all capacities and voltages. They are wound for single- and 3-phase service and can be supplied for any frequency.

For full particulars, see leaflet 3560-A.



LARGE SIZE OISC TRANS-
FORMER, RADIATOR TYPE

Type OIWC Transformers—There is an increasing demand for transformers of greater capacity and for higher voltages. Beyond a certain size, it is too costly to build the self-cooling type.

Westinghouse oil-immersed water-cooled, OIWC, transformers embody fundamentally correct principles of design, and the factors of construction are carefully balanced, thus guaranteeing long life, efficient performance and security against breakdown.

They are immersed in oil, contained in heavy boiler-iron tanks of welded seams; are moistureproof and dust-proof; have automatic thermometer alarm; have reliable cooling system; shell or core form wound; built for any capacity above 200 kv-a.; shipped complete in tanks with oil.

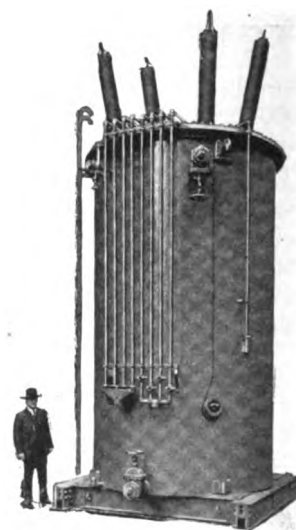
See leaflet 3566.

Steel Clad Type S Distribution Transformers—

Range in capacity from 1 to 200 kv-a., and are listed for voltages from 460 to 34,500 in both 25 and 60 cycles. As no one form of construction is best adapted for this wide range of capacity and voltage, Westinghouse distribution transformers are made in 4 different types of construction: (1) Distributed shell, single-phase. (2) Rectangular core, single- and 3-phase. (3) Crucible core, single-phase for 34,500 volts. (4) Simple shell, large capacity.

These distribution transformers are furnished for pole, platform or manhole mounting.

The reduction in weight which has resulted from the substitution of sheet metal for cast iron is the outstanding feature of Westinghouse distribution transformers, and an improvement on the older well-known type S transformers which have proved so successful.



ONE OF SIX 150,000-VOLT
TRANSFORMERS BUILT
FOR THE SOUTHERN
SIERRAS POWER CO.



GROUP OF STEEL CLAD
TYPE S TRANSFORMERS

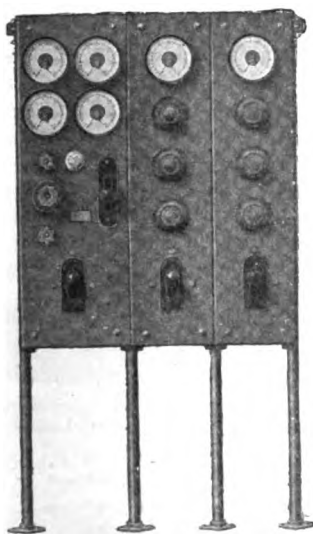
Outdoor Substations.

Westinghouse is prepared to furnish many different types of substations and steel towers. These substations can be used for any voltage up to 36,000. They are equipped with 3-pole type B horn gap switch, single-pole type R combined horn gap, lightning arresters, choke coils and fuses.

Switchboards.

Westinghouse manufactures a full line of switchboards for all systems of electrical distribution.

Westinghouse switchboards, by the use of 7-in. meters and remote control oil breakers, require a minimum amount of floor space. The front of the board is entirely symmetrical and all indicating meters match



TYPE JB AC SWITCHBOARD PANEL

perfectly in appearance. A complete line of standard panels is listed for prompt shipment. The type JB switchboard (shown in illustration) is particularly adapted to the control of single or parallel operated alternators in small industrial plants and central stations.

Switchboard Instruments.

Westinghouse offers a full line of indicating recording and integrating instruments. This line includes voltmeters, ammeters, wattmeters, etc.; frequency meters, synchronoscopes, etc.

Westinghouse instruments comprise the only complete line of 7-in. alternating current instruments with 14¼-in. scales on the market and have full, open glass fronts. Corresponding direct current instruments have scales that are equal to any 9-in. instruments previously used. Three of these 7-in. instruments can be mounted horizontally on a 24-in. panel and two on a 16-in. panel.

Among the many applications of the type M portable graphic wattmeter are the analysis of motor



TYPE SM 7-IN. ALTERNATING CURRENT AMMETER



POLYPHASE WATTHOUR METER



TYPE M PORTABLE GRAPHIC WATTMETER

operation, charting of the typical consumption curves of large industrial plants and obtaining records of power distribution.

The polyphase wattmeter, when properly connected, indicates the true power in a 2-phase, 3- or 4-wire or a 3-phase, 3-wire circuit regardless of the power factor or the degree of unbalance between phases.

Circuit-breakers.

Westinghouse offers many types of carbon and oil circuit-breakers which give satisfactory service in all kinds of railway, industrial and building service. They successfully meet such conditions as overload or short circuit, underload, undervoltage, overvoltage, reverse current or unbalanced voltage in 3-wire systems.

Type CA Carbon Circuit-breakers—Particularly

designed for the severe current carrying and interrupting conditions found in operating low voltage direct and alternating current systems.

When conditions make it desirable to operate circuit-breakers from a distance, the electrically operated form, or the manually operated remote control within its limited application, is furnished.

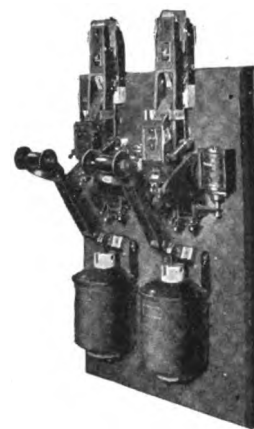
Type CD Carbon Circuit-breakers—May be used for motor starting control of industrial circuits and for control of feeder circuits. They are supplied for voltages up to 750 and for capacities up to 300 amps.

Type F Oil Circuit-breakers—Manually and electrically operated, non-automatic and automatic, single or double throw for indoor or outdoor service. Built for capacities up to 3000 amps. at 13,200 volts A.C.; interrupting capacities at rated voltage, 1000 to 15,000 amps.

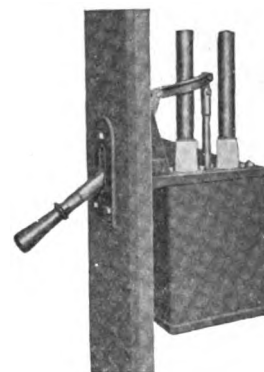
Type F oil circuit-breakers comprise a complete line of moderate capacity, non-automatic and automatic, manually and electrically operated breakers. For indoor service, the breakers are made in the panel mounting and remote control wall or pipe mounting forms and for outdoor service in pole or subway mounting forms.

Large Oil Circuit-breakers—In addition to the moderate capacity circuit-breakers described above, Westinghouse offers a complete line of large capacity and higher voltage oil circuit-breakers.

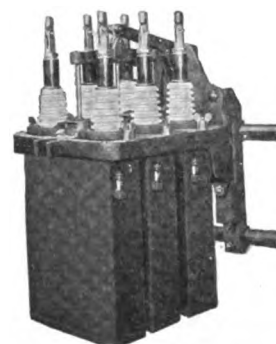
They are manually or electrically operated, automatic or non-automatic, and are arranged for panel, wall, pipe or cell mounting. In the latter case, the breaker may be mounted in fireproof compartments of brick, asbestos or concrete structures and placed in individual or common cells, de-



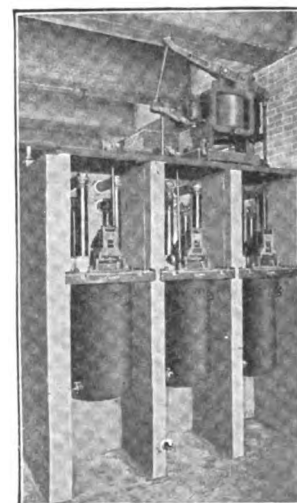
ELECTRICALLY OPERATED TYPE CA CARBON CIRCUIT-BREAKER



INDOOR MANUALLY OPERATED TYPE F OIL CIRCUIT BREAKER



TYPE B-13 SINGLE-THROW CIRCUIT-BREAKER WITH TANK REMOVED



TYPE O-2 OIL CIRCUIT-BREAKER

pending on the capacities and voltages to be handled and the degree of isolation required.

Designed for capacities up to 400 amps., 60 cycles and alternating current voltages up to 25,000.

Generator Voltage Regulators.

The problem of voltage regulation on constant potential circuits is of great importance. The operating company is no longer a purely lighting company, but largely a power supply center as well, and hence the regulation of generator voltage has become more difficult.

Alternating current regulators are used to maintain constant voltage at regulator or bus at the end of transmission lines for controlling boosters, converters and condensers and for the maintenance of constant current instead of constant voltage.



TYPE AB-4 GENERATOR VOLTAGE REGULATORS

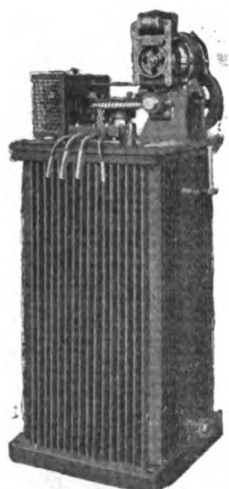
Direct current regulators are used for the maintenance of constant voltage on direct current generators where current is used for power only and to the maintenance of constant current.

Westinghouse manufactures a full line of direct current and alternating current regulators for these purposes. They are usually mounted on panels for switch-board work.

Feeder Voltage Regulators.

These regulators permit maintenance of uniform voltage at center of distribution of each feeder of an alternating current transmission system by independently compensating the voltage drop. In the induction type, practically an infinite number of steps of regulation are offered. Maintenance expense is low.

Made for all classes of service and for circuits of any commercial size, voltage or frequency. For automatic motor operation, the regulator is operated by a motor and electric brake controlled through a set of relays and a line drop compensator.



INDUCTION FEEDER REGULATOR

Krantz Safety Enclosed Auto-Lock Switches.

Desirable in steel mills, factories, mines and similar places employing men having practically no knowledge of electricity and its attendant risks and where switches in exposed locations are subject to damage from loaded trucks or the handling of heavy material.

Construction—They are equipped with double-break brush-type movable blades which can not weld shut from slow closing by careless operators (a decided improvement over ordinary knife switch construction), because the brushes have arcing tips that protect the brush leaves. Contacts are easily replaced.

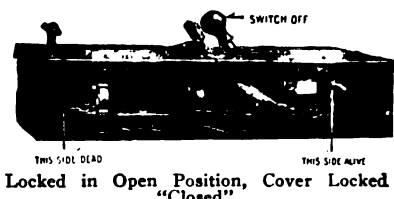
Switch is enclosed in a sheet metal box made of No. 12-gage steel. Stationary contacts are of hard

drawn copper, and, with the fuse clips and terminals, are mounted on slate bases. Moving contacts are laminated spring-copper brushes double-ended with auxiliary arcing at each end. All fuse connections are provided for the use of N.E.C. enclosed fuses up to 400 amps., inclusive. Covers are easily removable for inspection; brushes are insulated from cross bar; housing is waterproof and acidproof.

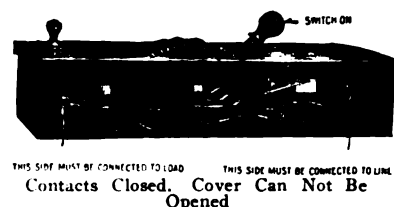
Operation—

Switches with other than standard size or arrangement of conduit holes will be supplied on special order without extra charge.

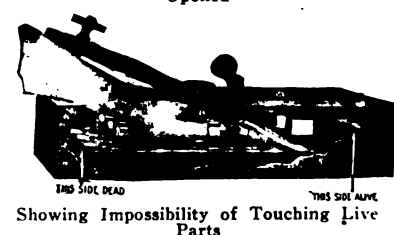
The door over the fuses is automatically locked when switch is in "closed" position. When switch is in "open" position, door can be opened. With door open, switch can not be closed. When switch is in "open" position, brushes completely obstruct the passage between fuse chamber and live contact chamber, making it impossible to reach the hand in far enough to touch the live stationary contacts. Switches are all made with fuse holders at the bottom, which is the outgoing end, so that the fuse holders are always "dead" when switch door is opened, thus fuses can be replaced in perfect safety. Box can be padlocked in the "on" and "off" positions.



Locked in Open Position, Cover Locked "Closed"



Contacts Closed, Cover Can Not Be Opened

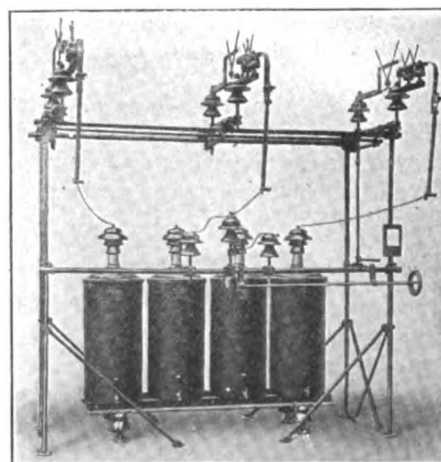


Showing Impossibility of Touching Live Parts
KRANTZ AUTO-LOCK SWITCH

Types and Voltages—Made in 1-, 2-, 3- and 4-pole types; 250 volts A.C. or D.C., 30 to 1000 amps., fused; 500-600 volts A.C., 30 to 600 amps., fused; 250 volts D.C. and 600 volts A.C., 30 to 1000 amps., unfused.

Lightning Arresters.

Westinghouse electrolytic arresters have been developed for maximum results and have the greatest freedom



ELECTROLYTIC LIGHTNING ARRESTER

of discharge and protective effect possible in the present state of the art. The Westinghouse impulse gap, when used with electrolytic arresters in place of the plain sphere gap, selects high frequency or steep wave front static impulses and discharges them at a much higher voltage than the normal frequency discharge voltage of the gap, thus adding greatly to the protective value of this form of arrester.

A complete line of arresters and choke coils for all classes of service is provided.

Westinghouse Electric Motors.

Westinghouse electric motors can be supplied for every service and for operation on every commercial circuit. Some of the different types are listed below. Complete information on motors for any service in any industry can be obtained on request at our nearest office.

MOTOR APPLICATIONS

INDUSTRY	TYPE	LEAFLETS
Brick and clay plants	CS, CW	CS3072
Cement plants	CS, CW	3860, 3553, CS3073
Chemical plants	CS, CW	3860, 3553, 1890, 1891, 1892
Coal mines	CS, SK	2359, 1902, 3655
Contractors	CS, SK, CI, CW	2359, 3860, 1241, 1240, 1242
Electric shovels	CS, CW, SK	3860, 2359, 3710
Electrochemical	CS, CW, SK	1160, 3820, 2359-A
Flour mills	CS, CW	3860, 4287
Hoists	CW, CI, K	3860, 1395, 3655
Industrial locomotives		1764, 1760, 1766, 1880, 1881, 1885
Laundries	CS	3725
Leather	CS, CW	3860
Metal mines	CS, SK	2359
Metal working	SK, CS	2359, 2321, CS3042, 1826A
Paper mills	CS, CW, SK	2359, 3505, 3506, 3500, 3507, 3508, 1933, 3500
Printing plants	SK, CW	2359, 3792, CS3185, 3544A, 3698, 3707
Pumping plants	CS, CW, SK	2321, 3860, 2359, CS3082
Refrigerating	E, G	1150, 2409-A
Rubber	CS, CW, SK	3860, 3693
Smelters	MC, MA, CS, CW	1101, 2383, 3860
Steam railroads	CS, SK	2359, 3668, CS3042
Steel mills	MC, CS, CW, SK	2361, 2383, 3860, 2359, 3810, 1103A, 1101B
Woodworking	CS, CW	3860, 3953

Type HK Direct Current Motors for Cranes, Hoists and Similar Service—Are designed for severe, intermittent, varying speed service where high starting torque is required and where load consists of series of starts, stops, and reversals and short periods of idleness. Capacities, 2 to 25 h.p., 230 volts. See leaflet 1123.

Type SK Direct Current Motors for General Application; Constant and Adjustable Speed—Type SK motors are for general service in all industrial applica-

tions using direct current and are supplied for either constant or adjustable speed service. They are especially adapted for driving machine tools. They are supplied open, semi-enclosed, splashproof or totally enclosed, according to the conditions under which they must operate. Capacities, 1½ to 250 h.p.; 115, 230 and 550 volts. Horizontal motors may be furnished for belted, geared or coupled service.

This type can also be supplied for vertical drive, such as for operating sump pumps, etc.

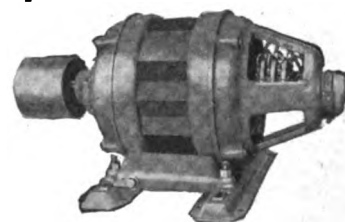
See leaflet 2359.

Type CI Wound Rotor Motors for Hoists and Similar Intermittent Service—These are of the alternating current wound rotor type for polyphase circuits for varying speed service where starting conditions are severe.

Capacities from ½ to 300 h.p. See leaflet 1242.

Type CW Motors (Wound Rotor Alternating Current)—Type CW motors range in capacities from ½ to 650 h.p. and are adapted for all commercial circuits. They are built for varying speed, have high starting torque, are designed for continuous duty and are arranged for belted, geared or coupled service.

The starting current is low.



TYPE CW MOTOR

Mill Motors (Types MC and MA)—For steel mills and other severe services where varying speed is required, the type MC motor for direct current and the type MA for alternating current are applicable. They have steel frames, massive shafts, very large bearings, fireproof insulation and other features that insure reliability. Commutating-poles in type MC motors insure sparkless commutation.

Capacities, type MC motors, 5 to 250 h.p.; type MA motors, 5 to 162 h.p. for 25 cycles. They are completely and fully housed, rendering them dustproof.

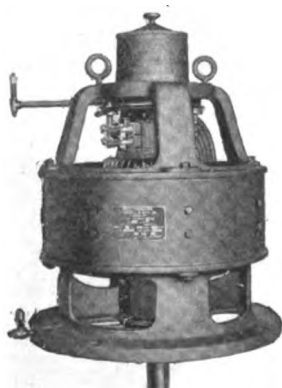


MILL MOTOR

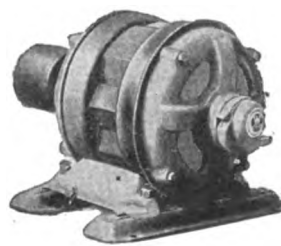
Type CS Motors (Squirrel Cage Alternating Current) for General Industrial Service—Are applicable wherever industrial machinery requires constant speed drive. These motors are made in all standard sizes of 2 h.p. and larger for all commercial voltages and frequencies.



TYPE SK MOTOR ARRANGED FOR BELTED SERVICE



TYPE SK VERTICAL MOTOR



TYPE CS BUILT-UP HORIZONTAL TYPE MOTOR

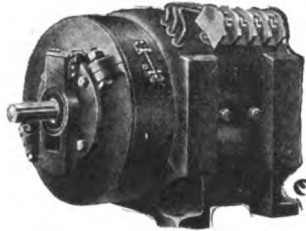


TYPE CS VERTICAL MOTOR

The horizontal motors are furnished for belted, geared and coupled service and in some cases are back geared for special services. They are wound with a specially prepared impregnated winding, thus insuring them from deterioration when exposed to ordinary conditions of moisture as encountered in mines and pump pits.

A specially constructed rotor with brazed windings which insure continuity of service. All mechanical parts such as shaft and bearings are very rugged.

For further details, see leaflet 1160A.



TYPE K CRANE MOTOR

Type K Crane and Hoist Motors—Type K motors, direct current, 2 to 52 h.p., are adapted for severe intermittent service where high starting torque is required. They are totally enclosed.

Type CA Motors for Advertising Devices, Small Blowers, etc.—Westinghouse type CA motors are split-phase induction motors which can be operated from a single-phase lighting circuit, or from any phase of a polyphase power circuit to drive many small machines, such as advertising devices, office devices, small blowers, etc. They are capable of innumerable starts and give years of service with very little attention except occasional oiling. They are interchangeable with type CD motors of the same rating.

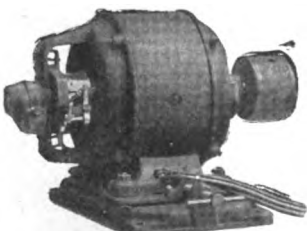
Type CAH Alternating Current Splashproof Motors for Washing Machines, Pumps, etc.—Single-phase, splashproof, clutchless and with clutch. Capacities $\frac{1}{8}$ to $\frac{1}{4}$ h.p. Many small motor applications such as washing machines, water pumps, etc., require compact splashproof motors with high starting and breakdown torques. Type CAH motors possess not only these desirable characteristics but many others and



TYPE CAH MOTOR

can be operated from single-phase commercial lighting circuits. Have ample ventilation through the peculiar ducts in the end brackets, thus making them suitable for a wide range of application. They are interchangeable with type CDH motors of the same rating.

Type CD Motors for General Applications—Shunt wound, $\frac{1}{20}$ h.p. to 3 h.p.; compound wound, $\frac{1}{2}$ h.p. to 3 h.p. The smaller sizes are suitable for advertising devices, office devices, etc., and the larger



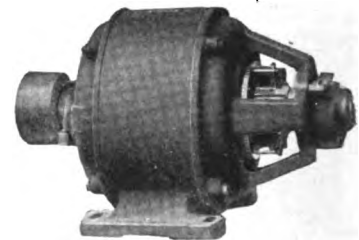
TYPE CD MOTOR WITH SLIDING BASE

sizes for general applications, such as drill presses, vacuum pumps, etc. They are well designed for strength and compactness, and will operate successfully with hard usage and unskilled handling, to which they are often subjected. These motors are interchangeable with type CA motors of the same rating.

Type CDH Direct Current Splashproof Motors for Washing Machines, Pumps, etc.—Continuous service capacity, $\frac{1}{8}$ to $\frac{1}{4}$ h.p. This type is also designed for use with pumps and other equipment requiring motors practically enclosed. Carefully designed ventilating

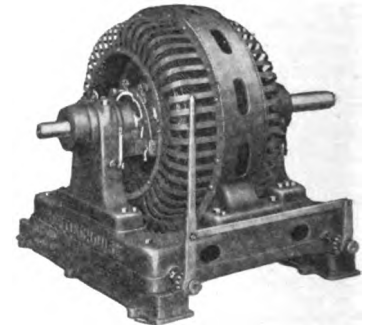
ducts maintain unusually low temperatures. Designed for durability. Can be arranged for either wall or ceiling mounting by changing detachable end brackets. Furnished for floor mounting unless otherwise specified. Sliding base furnished if desired. They are interchangeable with type CAH motors of the same rating.

Type AR Motors for Compressors, etc. (Automatic Starting)—Alternating current, single-phase, constant speed, $\frac{1}{2}$ to 10 h.p., repulsion and induction types. Fulfill the demand for simple, reliable, single-phase motors having high starting torque with low starting current for such applications as pumps, rotary blowers, compressors, etc. They are self-starting and require only a double-pole switch or circuit-breaker. A starting rheostat can be supplied, however, where especially low starting is desired. The temperature rise operating 100% load under specified conditions will not exceed 40° C.



TYPE AR MOTOR

Synchronous Motors—Westinghouse synchronous motors are furnished either belted, coupled or engine type for compressor drive. Their application gives a means of improving the power factor of industrial loads, resulting in better voltage regulation, improved line conditions and higher operating efficiency of the distributing system.



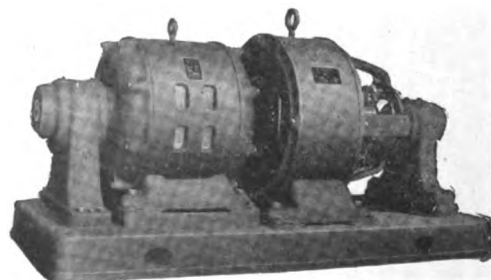
TYPE G SYNCHRONOUS MOTOR WITH PEDESTAL BEARINGS

Motor-Generators for Industrial Service—Where only available circuits are alternating current, a most satisfactory method of obtaining direct current for such applications is by using a Westinghouse motor-generator. A complete line of motor-generators has been designed, providing machines for every class of service.

Standard Westinghouse motor-generators will supply direct current of 125 to 250 volts for elevator service, machinshops, crane and mill work, and mines. The latter sets are of type SK generators driven by type CS or synchronous motors.

For charging vehicle storage batteries, type SK generators will be shut wound with voltage adjustment from 125 to 60 volts.

For application in motion picture theaters, Westinghouse motor-generators are furnished with 75-volt flat compound-wound generators in sizes of $2\frac{3}{4}$ to $8\frac{1}{4}$ kw. The motors for running these sets are available for all commercial circuits.



WESTINGHOUSE MOTOR-GENERATOR SET

Arc Welding Equipment.

The Westinghouse single operator equipment is designed to supply welding power for one operator only. It is a most efficient equipment because the generator operates at arc voltage and no resistance is used in circuit with the arc. The generator is designed to inherently stabilize the arc, thereby eliminating the necessity for providing automatic moving devices such as relays, solenoid control resistors, etc., which not only increase the cost of investment and maintenance but may not be quick enough in action to follow the instantaneous changes of the arc circuit.

The generator of the set has a rate capacity of 175 amps., is of Westinghouse standard design and construction, provided with commutating-poles.

The design of the control is such that very close adjustment of current may be easily and quickly made, and once made the amount of current at the weld will remain fixed within close limits until changed by the operator. There are 21 steps provided from 50 to 225 amps. This gives a current regulation of less than 9 amps. per step which makes it much easier for a welder to do vertical or overhead work often encountered in railroad shops and ship construction.

Due to the special design of the generator and its exciter it is unusually easy for the operator to strike and maintain the arc. Although the generator is strictly a short arc machine the arc produced is very tenacious and causes the deposited metal to penetrate deeply into the work. These features are extremely desirable as they make it easier for a new operator to learn to do welding work and enable experienced welders to accomplish more in a working day.

The generator is mounted on common shaft and bedplate with the motor. A pedestal bearing is supplied on the commutator end which carries a bracket for supporting the exciter which is coupled to the common shaft of the set by means of a special coupling. Motors can be supplied for either direct or alternating current circuits. Where an alternating-current motor is used leads are brought outside the motor frame for connecting either 220- or 440-volt circuits. An electrician can change these connections in a few minutes time. This feature is particularly desirable on portable outfits which may be moved from one shop to another having a supply circuit of different voltages.

Ball bearings are used on the single operator motor generator set. This type of bearing is particularly adaptable to this class of service, especially on portable equipments.

Where the equipment is required for portable service, the motor generator set with the control panel is mounted on a fabricated steel truck, equipped with roller bearing wheels. The portable equipment can be easily hauled about the shop or yards by one man. The suitable plugs and receptacles for 3-phase, 3-wire, or 2-phase, 4-wire, alternating current motors allow the set to be quickly and conveniently connected to the supply circuit at any desirable point. Only one plug is required for the motor but the number of receptacles required depends upon the number of points at which it is desired to do welding work.

Controllers.

It is impossible to describe all types and modifications of Westinghouse motor starters and controllers. It will suffice to say that the WESTINGHOUSE ELECTRIC & MFG. Co. manufactures a full line of this equipment in the field of electrical engineering at the present time. A

few of the more important types are outlined briefly as follows:

Type D Motor Starting

Rheostats—Type D starting rheostats are used for starting shunt, compound and series wound direct current motors. These starters are characterized by strong, compact, fireproof construction and have the approval of the National Board of Fire Underwriters. They are self-contained, consisting of a face plate with renewable segments, low voltage release mechanism and self-contained resistance.



TYPE D MOTOR
STARTING RHEO-
STAT

Type DM Motor Starting Rheostats—For use in mines and other places where the apparatus is exposed to moisture and acid fumes. They are practically the same in construction as type D except that they are made impervious to moisture and fumes.

Type S Drum Contractor Control-

lers—Maximum ratings, 37, 75 and 125 h.p. at 115, 230 and 550 volts. For shunt, series and compound wound direct current motors, by adjusting resistance in series and parallel with the motor armature. They are applicable to cranes, hoists, crushers, bridges, roll and transfer tables, punches and practically all applications employing this system of control. These controllers are noted for their low maintenance, long life of contacts and general accessibility.

See leaflet 1742.

Machine Tool Drum Controllers

—The type V-5, 245, 246 and V-4 controllers range from 1 to 50 h.p. at 110 to 550 volts and are used with shunt and compound wound direct current motors in machine tool operation where reversing and speed adjustment by field control is required.

These controllers have been designed with special reference to ease and accuracy of operation. They may be started, stopped, reversed and brought to desired running speed by means of a single handle.

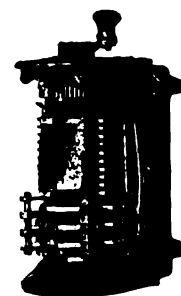
See leaflet 1443.

Type C Automatic Direct Current Starters and Controllers—For constant and adjustable speed motors, reversing and non-reversing service.

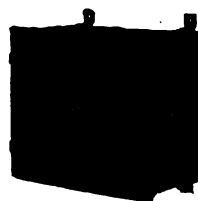
The Westinghouse automatic starter is operated by simply pressing a button or pulling a master switch, the motor thereafter accelerating with scientific exactness, preventing excessive starting current. The personal



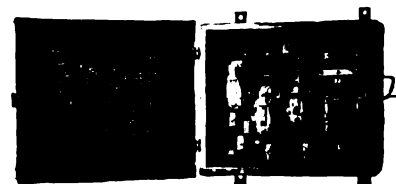
TYPE S
CONTROLLER
WITH VERTI-
CAL HANDLE



TYPE V CONTROL-
LER WITH COVER
REMOVED



Door Closed and
Locked



Door Open

TYPE C AUTOMATIC STARTERS AND CONTROLLERS

factor is eliminated and in certain applications such as compressors and pumps where predetermined pressures on fluid levels are to be maintained, no attendant is required. Automatic devices, such as float switches and pressure regulators, are used to start or stop these starters and automatically maintain the proper liquid level or pressure.

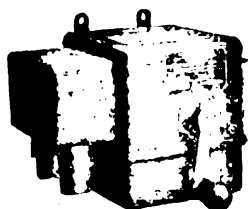
These starters are small and compact and in practically all cases (50 h.p. and below) may be mounted directly on machine, wall or other convenient place. They may be furnished with or without enclosing cover.

There are many forms and modifications of this type giving a remarkably flexible control service of every kind of electrical equipment. They are roughly divided into 4 classes: (1) For constant speed motors, non-reversing. (2) For constant speed motors, reversing. (3) For adjustable speed motors, reversing. (4) For adjustable speed motors, non-reversing.

They are supplied for 2 general classes of service: Low voltage release and low voltage protection, and are equipped with an overload relay.

General capacities, $1\frac{1}{2}$ to 200 h.p.; 115, 230 and 550 volts.

Quick-make and Quick-break Starting Switches, Types 815 and 816—For squirrel cage induction motors, 25 h.p. and below, 2- and 3-phase, 25, 40, 50 and 60 cycles and 110, 220, 440 and 550 volts. They connect the motor directly to the line; provide overload and low voltage protection; may be operated by hand or shipper rod.



STARTING SWITCH COMPLETE WITH OVERLOAD AND LOW VOLTAGE PROTECTION

Have the following advantages: protect operator from shocks and burns; protect both man and equipment against unexpected or accidental starting of motor; protect motor against burnouts without the use of fuses; can not be held closed on overload; foolproof; reduce shutdowns; long life under severe operating conditions; easy to install.

Type A Auto-starters—For squirrel cage induction motors; 5 to 200 h.p.; 2- and 3-phase; 25, 40, 50 and 60 cycles; 220, 440, 550 and 2200 volts.

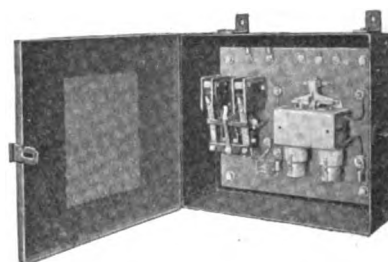


TYPE A AUTO-STARTER

Type A auto-starters consist of an auto-transformer unit together with the switching mechanism, low voltage and overload relays all mounted in a dustproof case, arranged for open or conduit wiring. A compact, self-contained unit easy to handle and install. Especially desirable for mounting on driven machine or other places where space is limited.

Type F Automatic Starter for Alternating Current Squirrel Cage Motors—Westinghouse type F line voltage automatic starters connect the motor directly to the line, and combine the advantages of push button, remote control with safety and convenience to the operator and full protection to the motor itself.

The outstanding features are: remote control, automatic operation, complete enclosure, low voltage release, overload protection, single-phase protection, compactness and knockouts for conduit windings.



TYPE F AUTOMATIC STARTER

Maximum horsepower, 25; 2- and 3-phase; 110, 220, 440 and 550 volts; 25 to 60 cycles. See leaflet 1667.

Type F automatic starters employing resistance or transformer for motors of 5 to 400 h.p. are described in leaflet 1660.

Drum Controllers for Alternating Current Wound Rotor Motors, Reversing or Non-reversing—Types FA and RF are used for starting, stopping, varying the speed and reversing alternating current wound rotor induction motors, 200 h.p. and below. Simple in construction and reliable in operation.

Type F automatic starters for wound rotor motors, reversing and non-reversing, for 600 h.p. and below are described in leaflet 1661.



TYPE RF DRUM CONTROLLER

Magnet Operated Brakes for Alternating and Direct Current Motors—Westinghouse brakes, Types A and B, are used for stopping direct current motors quickly without jar or shock and for holding their connected loads. They are designed for use where frequent stops and reversals are made. The brake is simple and rugged and consists essentially of a frame supporting a clapper type magnet, strong compression springs, levers, brake shoes and wheel.

The clapper type magnet has several advantages over the solenoid type. There are no moving parts within the coil; when the power is off, powerful compression springs force the brake shoes against the brake wheel; when the power is on, the clapper type magnet compresses the springs and releases the brake wheel.



TYPE A MAGNET OPERATED BRAKE

Smooth retardation; equal retarding torque in both directions; no slipping of load; applicable to any horizontal motor in range; furnished with either series or shunt operating coils.

See descriptive leaflet 1751-B.

Industrial Lighting Reflectors and Fixtures.

Good illumination on an average saves 30 minutes of each man's time per day, representing an amount more than 10 times sufficient to pay for the installation. It gives increased production for the same labor costs and overhead, reduces the amount of spoilage and seconds, decreases eye strain and creates better sanitary and more cheerful conditions for employees.

The engineering department will assist in making plans and estimates. When submitting sketches, give class of work to be performed, dimensions of rooms,

height of ceiling, location of work benches, color of walls and whether conduit or open wiring is to be used.

Type RLM Standard Dome Type Reflector—The latest and most efficient design available for general illumination in factories. Where high mounting is possible, bowl type reflectors are used; for low ceilings, the RLM type. Both direct and reflected glare may be reduced by the use of opal glass bowls with RLM standard dome reflectors. For localized lighting, the bowl type is most satisfactory.

Holder-Socket-Reflectors—Easy to wire. Guaranteed weatherproof. Holder-socket-reflectors are combinations of "Cutter easy-to-wire" holder sockets and the standard types of high efficiency one-piece enameled steel reflectors—dome, bowl and angle.

Holder socket saves 75% of time ordinarily required to install lighting fixtures of these types and is interchangeable. Reflectors of different types may be substituted at any time.

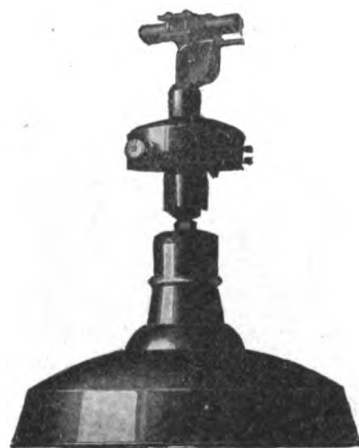
Holder-socket-reflectors may be used in any type of installation and for either interior or exterior purposes. They may be suspended on a 1/2- or 3/4-in. conduit directly from outlet box, on chain or cord by means of suspension eyes, and on reinforced drop cord by using porcelain bushings.



ONE-PIECE ANGLE TYPE REFLECTOR



STANDARD BOWL TYPE STANDARD HEEL REFLECTOR



CUTTER AUTOMATIC CUT-OUT HANGER WITH HOLDER-SOCKET-REFLECTOR (RLM Standard Dome Type)



HOLDER-SOCKET WITH PORCELAIN BUSHING FOR REINFORCED DROP CORD SUSPENSION

"Cutter" Holder-Sockets—Combination holders for standard heel reflectors, and sockets for Westinghouse Mazda lamps. Approved by National Board of Fire Underwriters. They permit of the greatest flexibility in light distribution.

Holder-sockets are made with cap for attachment on conduit stems, to boxes, and with drop cord as above.

Holders are made for both 2 1/4- and 3 1/4-in. standard heel reflectors.

Standard Heel Reflectors—Different types of reflectors with same size heel may be used with same holder, permitting change in light distribution without disturbing the wiring. Reflectors easily removed for cleaning. The 2 1/2-in. heel supplied on reflectors for 200-watt lamps and smaller; 3 1/4-in. heel on reflectors for 300-watt lamps and larger. Standard heel reflectors

used with holder-sockets recommended for outlet box, conduit and reinforced drop cord installations.

Sol-lux Vaporproof Fixtures—"Safety first" units of highest class designed for plants where explosive gases and dust accumulating in the standard types of industrial lighting fixtures would cause explosions and fires, and where moisture and smoke fumes would hasten corrosion of exposed metal parts.

Each fixture uses a Cutter holder-socket. Special gaskets are used in all joints to make the fixtures tight. Write for price list.



SOL-LUX VAPOR-PROOF FIXTURES WITH PEAR SHAPE GLOBE AND GUARD

Automatic Cut-out Hanger for Multiple Circuits—Cutter automatic cut-out hangers facilitate cleaning reflectors without use of ladders, thus saving much time and expense with absolute protection against accidental short circuits.

This hanger may be used with angle type reflectors and other fixtures requiring a fixed location. The position of the lower switch is always the same with respect to the upper part of the pulley.

Universal suspension clamp furnished with this device may be used for fastening the hanger to ceiling, cable or pipe bracket of 3/4- to 1 1/4-in. bore. With this hanger, use Cutter Midget changeable pulley and weatherproof cord of galvanized ebony wire rope.

Luxsolite Fixtures—Types CI and SP cast iron Luxsolite fixtures are used with Westinghouse Mazda C lamps in the same manner as former types of Luxsolite fixtures for lighting of residential streets, parks, industrial plants, etc. Their rugged construction makes them especially useful for hard service and their weight has been kept well under that of standard enclosed lamps formerly used.

Made of cast iron, galvanized and finished in asphaltum paint, they suffer no deterioration in any climate. Casings are convenient to disassemble.

Luxsolite fixtures are made in 2 types, namely, CI and SP. Type CI is furnished with a special auto-transformer to increase the efficiency of the ordinary commercial circuit and is provided with film cut-outs or multiple sockets. Divided into 2 chambers, the upper (containing the transformer) being ventilated, while the lower containing socket and lamp is sealed against insects and dust.

Type SP is of the same construction as type CI except that it is built in one body piece and the transformer is omitted. Also dustproof and bugproof.

For full particulars, write for bulletin "Luxsolite."



TYPE SP LUXSOLITE FIXTURE WITH REFLECTOR AND LUXSOLITE GLOBE



TYPE CI LUXSOLITE FIXTURE WITH REFLECTOR AND SOL-LUX DIFFUSER

MARQUETTE ELECTRIC ENGINEERING CO.

Engineers and Manufacturers

TELEPHONE:
FRANKLIN 3942
(Private Exchange)

212-222 West Austin Avenue
CHICAGO, ILL.

Products and Services.

MOTOR DEPARTMENT: REPAIRING and REWINDING of

A. C. Motors and Generators
D. C. Motors and Generators
Commutators and Compensators
Motor Starters and Controllers
Transformers and Auto Starters
Armatures and Armature Coils
Brushholders and Regulators
Magnet and Controller Coils
Field and Brake Coils
Stators and Rotors

New A. C. and D. C. Motors, Used Generators and Motors.

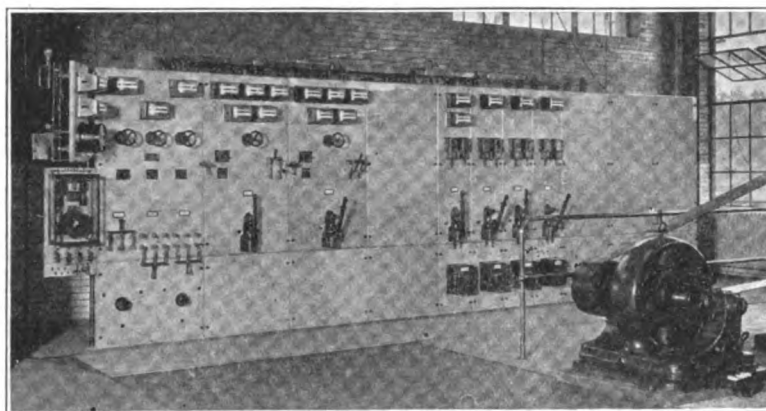
This company rewinds all sizes and types of motors and generators, refills and reinsulates commutators, and repairs all kinds of electric machinery. Old machines rebuilt and remodeled for new use.

All repair work is guaranteed equal in workmanship and service to the original equipment.

SWITCHBOARD DEPARTMENT: SWITCHBOARDS for power and lighting comprising

Generator Panels
Feeder Panels
Service Panels
Distributing Centers
Series Lighting Boards
Test Boards
Terminal Boards
Disconnecting Switches
Special Switches
Fuse Bases
Busbar Supports
Switchboard Fittings

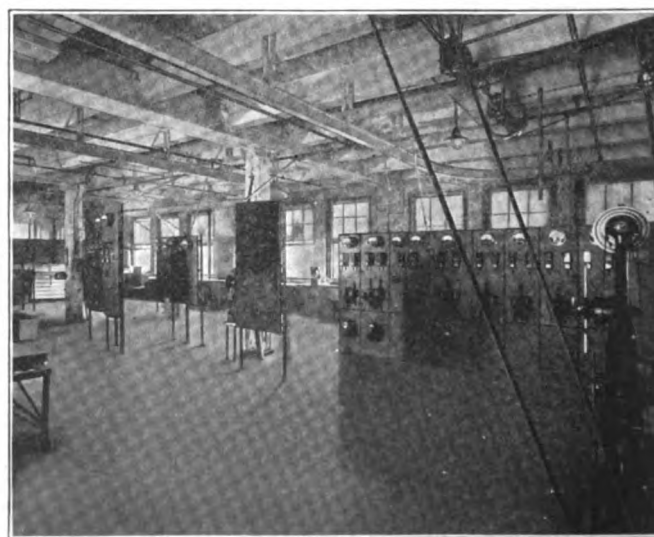
The MARQUETTE ELECTRIC ENGINEERING CO. is equipped to manufacture A. C. and D. C. Switchboards. Also to make additions to all makes of switchboards. Special controlling apparatus and interlocking devices designed and built. A large stock of switchboard material is carried, insuring prompt delivery.



SWITCHBOARD MANUFACTURED BY MARQUETTE ELECTRIC ENGINEERING CO.



MOTOR DEPARTMENT



SWITCHBOARD DEPARTMENT

FAIRBANKS, MORSE & CO.

Manufacturers of Electric Motors

CHICAGO, ILL.

Products.

ELECTRIC MOTORS, A. C. and D. C.

Also manufacturers of Electric Generators, A. C. and D. C.; Starters; Lighting Plants for Homes or Cities.

For Oil Engines, see page 852; for Centrifugal Steam, and Power Pumps, see page 889.



TRADE-MARK

Solid Metal Rotor Cage Winding.

Used on all Fairbanks-Morse squirrel cage motors over 3 h.p. One piece of solid metal without joints, eliminating repairs occasioned by loose screws and rivets or resoldering joints. This is the original, jointless rotor winding, and insures maximum conductivity.

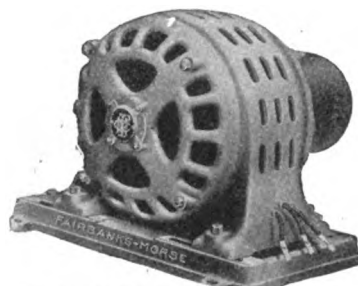


SOLID METAL ROTOR CAGE

"H" Squirrel Cage Ball Bearing Induction Motor.

For alternating current. Ball bearings mean less friction, higher efficiency, proved reliability. "H" motors have grease lubrication, bearings are dustproof; no oil slop.

Bulletin 210.



"H" SQUIRREL CAGE BALL BEARING MOTOR

"B" Squirrel Cage Induction Motor.

For alternating current. Big sturdy ring oiling bearings with interchangeable phosphor bronze sleeves.

Bulletin 202.



"B" SQUIRREL CAGE INDUCTION MOTOR

"KPV" Internal Starter Motor.

For alternating current. Especially adapted for remote control. Close a switch to start, open to stop. Switch may be located anywhere. Takes little starting current. May be used where squirrel cage motors would impair the lighting service.

Bulletin 210.

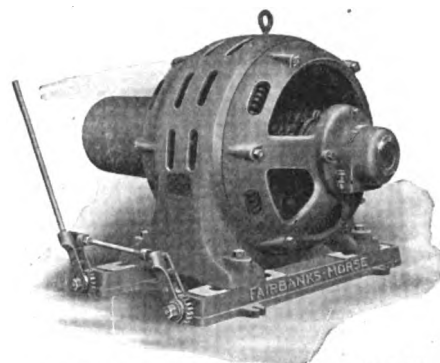


"KPV" INTERNAL STARTER MOTOR

"BV" Slip Ring or Wound Rotor Motor.

For use where speed control is desired, or high starting torque with small starting current. For alternating current.

Bulletin 29.

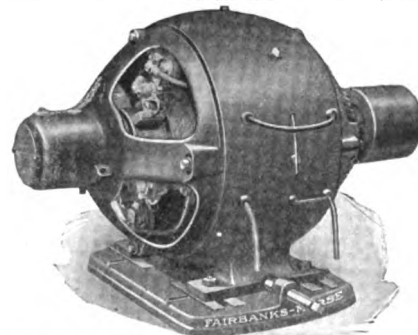


"BV" SLIP RING OR WOUND ROTOR MOTOR

"CP" Ring Oiling Sleeve Bearing Motor.

For direct current. Commutating pole or interpole type. Either constant speed or adjustable speed for machine tools.

Bulletin 27.

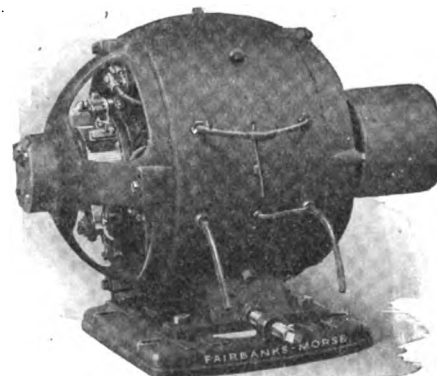


"CP" RING OILING SLEEVE BEARING MOTOR

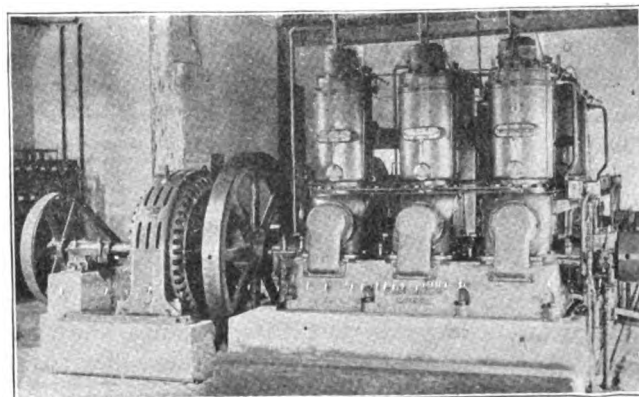
"CPB" Ball Bearing Motor.

For direct current. Similar to the "CP" motor except that it has ball bearings. The grease packed ball bearings require little attention.

Bulletin 31.



"CPB" BALL BEARING MOTOR



MUNICIPAL PLANT INSTALLATION OF "Y" OIL ENGINES

Furnished with either alternators or generators these engines make most economical power plants for small cities or towns.

ALLIS-CHALMERS MANUFACTURING COMPANY

Power and Electrical Equipment
MILWAUKEE, WIS.

DISTRICT OFFICES

ATLANTA
BIRMINGHAM
BOSTON
BUFFALO

CHICAGO
CINCINNATI
CLEVELAND
DALLAS

DENVER
DETROIT
DULUTH
KANSAS CITY

LOS ANGELES
MILWAUKEE
MINNEAPOLIS
NEW ORLEANS
TOLEDO

NEW YORK
PHILADELPHIA
PITTSBURGH
PORTLAND

ST. LOUIS
SALT LAKE CITY
SAN FRANCISCO
SEATTLE

FOREIGN DISTRICT OFFICES: LONDON, PARIS and SANTIAGO, CHILE
CANADIAN REPRESENTATIVES: CANADIAN ALLIS-CHALMERS, LTD., TORONTO

Products.

ELECTRICAL EQUIPMENT: Motors for all purposes. Alternating Current and Direct Current Generators, Motor Generator and Turbo Generator Sets, Transformers, Synchronous Converters, Frequency Changers, Balancers, Boosters, Synchronous Condensers, Switchboards.

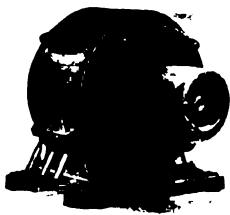
PRIME MOVERS: Steam Turbines; Steam, Gas and Oil Engines; Hydraulic Turbines.

INDUSTRIAL MACHINERY: Portable and Stationary Air Compressors, Crushing and Cement Machinery, Mining Machinery, Power Transmission Machinery, Flour Mill Machinery, Saw Mill Machinery, Rolling Mill Machinery, Timber Treating and Preserving Machinery, Sugar Machinery, Agricultural Machinery, Pumping Engines, Hydraulic Machinery, Steam and Electric Hoists, etc.

For Centrifugal Pumps, see pages 862-863.

Squirrel Cage Induction Motors.

Type "AN" are standard polyphase alternating current motors for constant speed service. They are of very rugged construction and therefore adapted to severe service conditions. The field frames are of the substantial box type, the shafts large and rigid, while the bearings, which are of liberal size, are provided with dust guards. Moisture-proof coils are used. Standard ratings are $\frac{1}{2}$ h. p. and larger.



SQUIRREL CAGE
INDUCTION MOTOR

Slip Ring Induction Motors.

Type "ANY" are polyphase alternating current motors for use where the starting conditions are severe, where the starting current must be kept low, and for varying speed requirements. Standard ratings, 5 h. p. and larger.

Alternating Current Synchronous Motors and Condensers.

Synchronous motors are especially suited for driving generators, large air compressors, pumps, line shafts and other constant speed apparatus where the starting conditions are not severe.

The corrective effect which they exert on the power system makes them particularly desirable for alternating

systems where the power factor is low. Built for ratings of 50 h. p. and larger.



TRADE-MARK

Direct Current Motors.

The new type "E" motors incorporate the latest and best features of direct current engineering practice; among which are the following:

Ratings and speeds corresponding to those of induction motors, a complete line of constant and adjustable speed ratings, rugged cast steel yokes, commutating poles, insuring sparkless commutation, dustproof bearings, windings treated to resist oil and moisture, thorough ventilation, conduit terminal boxes on all motors, standard enclosing covers, all parts easily accessible.

For ratings of 150 h. p. and larger, Type "HC" motors are built for constant or adjustable speed service. Having commutating poles and with pedestal bearings mounted on a substantial base, they are particularly rugged and adapted for heavy duty.



DIRECT CURRENT MOTOR,
TYPE "E"

Alternating and Direct Current Generators.

Allis-Chalmers generators are built in a number of forms and for ratings and speeds adapted to the various types of prime movers.

For belting or coupling, the smaller generators are of the self-contained bracket bearing type; while larger machines have pedestal bearings. Other complete lines are those for reciprocating engines, vertical and horizontal machines for hydraulic turbines and high speed steam turbine units.

Allis-Chalmers generating units can be furnished complete with any type of prime mover. This gives the purchaser the important advantage of a complete installation with undivided responsibility.

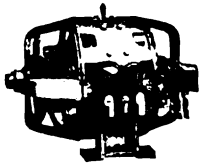


2000 KW. DIRECT
CURRENT ENGINE
DRIVEN UNIT

Synchronous or Rotary Converters.

Standard synchronous converters or "rotaries" for industrial or mining service deliver 250 or 275 volts direct current when operating from the alternating current supply system. They are built for ratings of 100 kw. and larger, in the commutating pole type, and for 60-cycle and 25-cycle systems.

Railway "rotaries" are supplied for voltages up to 1500 volts direct current.



200 KW. INDUSTRIAL SYNCHRONOUS CONVERTER

Motor Generator Sets.

For transforming from alternating to direct current, standard sets are built for ratings of 2 kw. and larger. Ratings of 50 kw. and larger may be provided with synchronous motors suitable not only for driving the direct current generator, but for correcting the power factor of the alternating current system.

Sets operating from direct to alternating current, frequency changing sets, balancers, boosters and many other sets are built for particular service conditions.

Some of the largest sets in service are those built by the ALLIS-CHALMERS MANUFACTURING COMPANY.

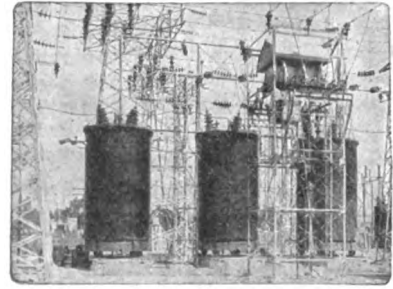


1500 KW. MOTOR GENERATOR SET

Transformers.

Distributing transformers are built for high and low tension power or lighting distribution. Standard ratings, up to 200 kv-a. are furnished in all commercial voltages.

Allis-Chalmers power transformers are built for voltages up to the highest in transmission service, and are used on many of the largest transmission and distributing systems of the country. Information furnished on application.



THREE 4000 KV-A, 150,000-VOLT TRANSFORMERS, OUTDOOR INSTALLATION

Stationary and Portable Air Compressors.

These compressors are extensively used for garage or industrial purposes. They are entirely automatic in operation, maintaining the air pressure practically constant at all times. Portable or stationary equipment are built in capacities from 11 to 150 cu. ft. for belt drive or in the motor driven type.



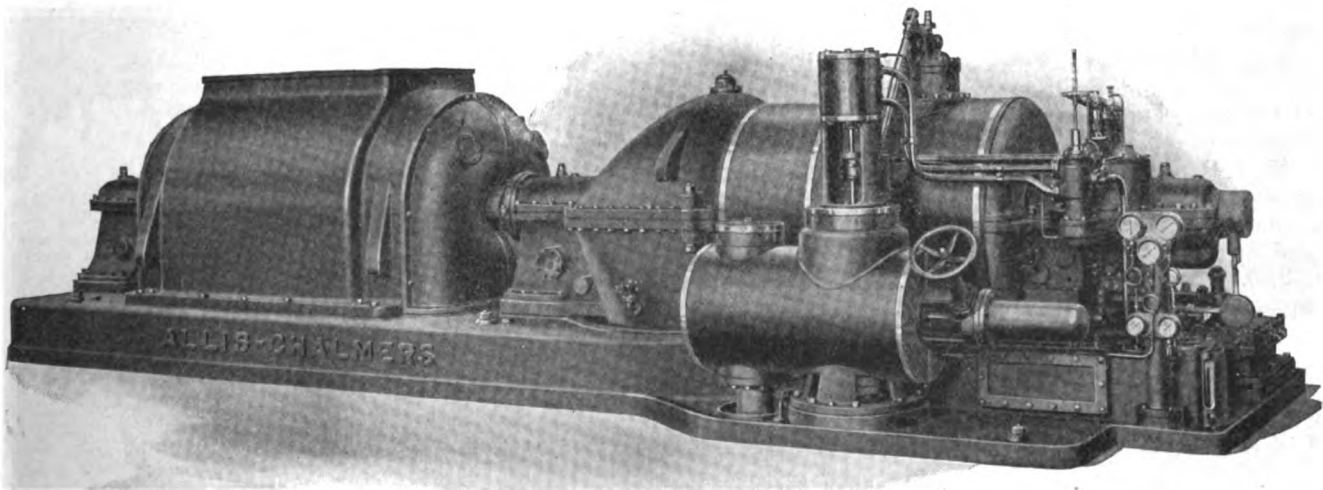
PORTABLE AIR COMPRESSOR

Steam Turbines.

Allis-Chalmers steam turbine and alternator units, condensing, non-condensing, mixed pressure and low pressure types, built in sizes from 200 kw. up.

Allis-Chalmers steam turbines are of the horizontal reaction type, highly efficient, simple in design, accessible for inspection and built for continuous service.

Full information will be furnished on application to the nearest district office.



STANDARD 4000 KW. MAXIMUM, 80 PER CENT. P.F., 3600 R.P.M., HIGH PRESSURE CONDENSING STEAM TURBINE AND ALTERNATOR UNIT

THE MECHANICAL APPLIANCE CO.

Manufacturers of Electric Motors and Generators

133 Stewart Street
MILWAUKEE, WIS.

DISTRICT OFFICES

BUFFALO, N. Y., 318 Prudential Building
CHICAGO, ILL., Steger Building, 28 E. Jackson Boulevard
CINCINNATI, OHIO, 605 Mercantile Library Building
CLEVELAND, OHIO, 5716 Euclid Avenue
DETROIT, MICH., 4815 Woodward Avenue

MINNEAPOLIS, MINN., 1123 Metropolitan Life Building
NEW YORK, N. Y., 409 Broadway
PHILADELPHIA, PA., 889 Drexel Building
BOSTON, MASS., NEW ENGLAND APPLIANCE Co., 514 Atlantic Avenue
PITTSBURGH, PA., 1213 Bessemer Building

Products.

WATSON MOTORS, 40° RATING for DIRECT and ALTERNATING CURRENT; BALL BEARING EQUIPPED MOTORS, MULTISPEED MOTORS, INTERPOLE MOTORS.

Also manufacturers of Generators, Direct and Alternating Current; Motor Generator Sets; Rotary Converters, Frequency Changers; Direct Connected Ventilating and Exhaust Fans; Buffing and Grinding Motors; Special Motors for all drives.

Sales Engineering Service.

The many designs of Watson motors make possible selection of equipment to meet the requirements for any service. Special apparatus can be designed and built for any type of drive, to meet individual requirements. Our various district offices have complete data on many special motors, and the sales engineers will be pleased to give the benefit of their experience to all who have motor application problems.

Alternating Current Motors, Ratings and Types.

Ratings—Built for 2- and 3-phase, 60, 50, 40, 30 and 25 cycles and for all standard voltages from 110 to 600 volts. Standard ratings from $\frac{1}{4}$ to 60 h.p. The great flexibility of frame sizes and windings makes it possible to design a Watson motor to meet any service requirement.

Squirrel Cage Motors—Have characteristics similar to shunt wound direct current motors and should be used for applications requiring constant speed for continuous service.

High Resistance Squirrel Cage Motors—Combine high starting torque with comparative low inrush current and should be used where maximum power is required for short time ratings.

Slip Ring Motors—Adaptable for both constant and variable speed service. As constant speed motors they offer the advantages of high torque, low starting current and regulated acceleration. As variable speed motors they permit 50% speed reduction, adjustable by means of a resistance type controller.

Multispeed Motors—Have the same advantages in the alternating current field that speed variation by field control has demonstrated for direct current. Both



types of control give positive speeds regardless of the load. In construction these motors are similar to the squirrel cage type, but are provided with 2, 3 or 4 windings, each giving a different constant speed. Each winding is independent and speed changes are made by a drum switch. The ratings at the different speeds can be chosen for constant torque, constant horsepower or any combination of the two.

Direct Current Motors, Ratings and Types.

Ratings—Watson direct current motors are built in 13 frame sizes for all standard voltages up to 600 volts. Shunt, series, compound, and compensated windings can be furnished at all standard speeds and many special ones. Range from $\frac{1}{4}$ to 15 h.p.

Shunt Motors—Designed for constant speed and constant load conditions.

Compensated Motors—Designed for adjustable speed service. By means of resistance type controller in shunt field circuit, the motor speed may be increased to 6 times normal. These motors also recommended for high speed ratings and for service where motor is subjected to wide fluctuations in voltage, sudden changes in load, severe momentary overloads, quick reversing duty, or other extreme conditions. Interpole windings insure sparkless commutation.

Series and Compound Wound Motors—Motors can be furnished with special windings for any type of drive.

Vertical Ball Bearing Motors—Both alternating current and direct current Watson vertical motors are equipped with ball bearings. The bearings selected are exceptionally large and oil lubricated. The bearing chambers are dustproof and waterproof.

Horizontal Ball Bearing Motors—Alternating current or direct current types can be supplied in all standard ratings. Extra large bearings, grease lubrication, dustproof, gritproof, and waterproof construction.



DIRECT CURRENT MOTOR



HORIZONTAL MOTOR
Squirrel cage type



A.C. VERTICAL MOTOR
Tripod base and mushroom cover



SLIP RING MOTOR
Ball bearing equipped, fully enclosed



ENCLOSED A.C. MOTOR
Solid housing and end brackets, gritproof and dustproof ball bearings

ANACONDA COPPER MINING CO.

ROLLING MILLS DEPARTMENT

Manufacturers of Copper Wires, Cables and Rods

TELEPHONE:
FRANKLIN 5200

GENERAL OFFICES
539 Conway Building
CHICAGO, ILL.
MILLS: GREAT FALLS, MONT.

Products.

BARE COPPER WIRES and CABLES for Telephone, Telegraph, Street Railway, Long Distance Power Transmission and all industrial uses.

Also manufacturers of COPPER RODS, hot rolled.

"From Ore to Finished Product."

In 1918 the mills of the ANACONDA COPPER MINING Co., at Great Falls, Mont., were completed for the manufacture of copper rods, wires and cables, so that the consumer is now served direct. The products of the rolling mills are the first of their kind to be manufactured west of the Mississippi River.

Facilities.

Cooperating with the most up-to-date machinery obtainable, there is a well equipped laboratory, wherein the chemical, physical and electrical properties of all wires are carefully studied and developed.

Copies of inspection reports will be furnished customers on request.

Copper.

All our products are made from pure electrolytic copper, mined at Butte, smelted at Anaconda and electrolytically refined at Great Falls.

The following is an average analysis of this copper:

	99.96	per cent.
Copper		
Oxygen	.03	"
Silver	.0022	"
Arsenic	.0017	"
Antimony	.0016	"
Nickel and cobalt	.0006	"
Bismuth	.0004	"
Iron	.0006	"
Selenium	.0009	"
Sulphur	.0020	"
	100.0000	"

It is of interest to note that the total metallic impurity content is less than 1/100 of 1%.

The average conductivity of this copper is 100.75%, Mathiessen's Standard.

Bare Copper Wires.

For telephone and telegraph line wires, and transmission lines. Furnished in all sizes and degrees of temper.



BARE COPPER WIRE

Stranded Copper Cables.

Made in all capacities and degrees of temper.



STRANDED COPPER CABLES

DATA, STRANDED COPPER CABLES

CONCENTRIC STRANDS				VARIOUS METHODS OF STRANDING								
Capacity circular mils	Weight, lbs.		Approx. diameter in mils	Diameter in mils when composed of								
	per 1000 ft.	per mile		3 wires	7 wires	12 wires	19 wires	27 wires	37 wires	61 wires	91 wires	
1,000,000	3057	16142	1152		378	239	229	192	164	128	105	
750,000	2293	12107	998		327	250	199	167	143	111	91	
500,000	1529	8070	813		267	204	162	136	116	91	74	
250,000	764	4036	575		189	144	115	96	82	64	52.4	
4/0 B & S	647	3416	528	265.6	174	133	106	86	76	58.9	48.2	
3/0 "	513	2708	470	236.7	155	118	94	79	67	52.5	43.0	
2/0 "	407	2148	419	210.7	138	105	84	70	60	46.7	38.3	
1/0 "	323	1704	373	187.7	123	94	75	62.6	53.4	41.6	34.1	
1 "	256	1351	332	166.9	109	83	66	55.6	47.5	37.0	30.8	
2 "	203	1071	296	149	97	75	59.2	49.7	42.4	33.0	27.1	
3 "	161	810	260	132.2	87	66	52.5	44.1	37.7	29.3	24.0	
4 "	127	674	232	117.5	77	59	46.8	39.3	33.5	26.1	21.4	
6 "	80	424	184	93.5	61.2	46.8	37.2	31.2	26.6	20.7	17.0	
8 "	51	267	146	73.9	47.1	37.0	29.4	24.6	21.1	16.4	13.4	

Trolley Wires.

Round, grooved and figure 8, for electric railways, coal mines, etc.



ROUND TROLLEY WIRE



GROOVED TROLLEY WIRE

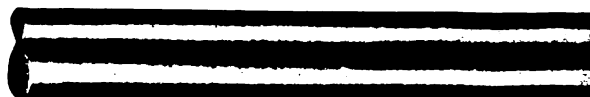


FIGURE 8 TROLLEY WIRE

AMERICAN STEEL & WIRE COMPANY

Manufacturers of Electrical Wires and Cables

SALES OFFICES

CHICAGO, 208 South La Salle Street
 NEW YORK, 30 Church Street
 WORCESTER, 94 Grove Street
 BOSTON, 120 Franklin Street
 PHILADELPHIA, Widener Building
 PITTSBURGH, Frick Building
 BUFFALO, 337 Washington Street
 DETROIT, Foot of First Street
 CINCINNATI, Union Trust Building

ST. PAUL-MINNEAPOLIS, Pioneer Building, St. Paul

CLEVELAND, Western Reserve Building
 BALTIMORE, 32 South Charles Street
 WILKES-BARRE, PA., Miners Bank Building
 ST. LOUIS, Third National Bank Building
 MONTREAL, CAN., Bank of Ottawa Building
 SALT LAKE CITY, Walker Bank Building
 OKLAHOMA CITY, State National Bank Building
 BIRMINGHAM, ALA., Brown-Marx Building
 DENVER, First National Bank Building

EXPORT REPRESENTATIVES, UNITED STATES STEEL PRODUCTS Co., 30 Church Street, New York
 PACIFIC COAST REPRESENTATIVES, UNITED STATES STEEL PRODUCTS Co., San Francisco, Los Angeles, Portland, Seattle

Products.

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RESISTANCE WIRE.....	596
ARMATURE BINDING WIRE.....	596
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Facilities.

Reinforcing the extensive factory equipment, there are well equipped chemical, physical and electrical laboratories, wherein the problems incident to the solution of every difficulty encountered are handled by thoroughly reliable experts and up-to-date methods. All steel and copper used are rolled and drawn in our mills and under our supervision throughout every operation.

All raw materials are tested and inspected before being used, the manufacturing processes are constantly checked, and finally the finished material is subjected to an exhaustive series of tests that determine beyond

question whether or not it is of proper quality. With such facilities we are enabled to manufacture electrical conductors of all kinds to the severest specifications, and to give to the users of our product a standard of quality that is unexcelled.

General Specifications.

General specifications for Industrial Plants are given on pages 604-606.

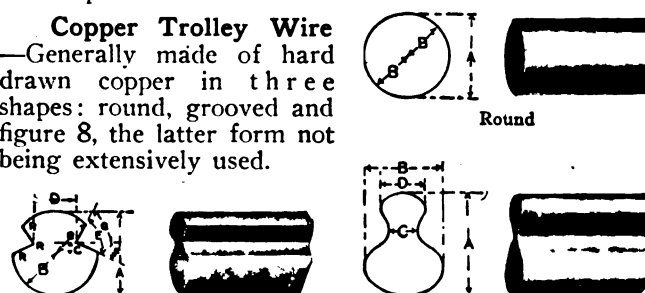
Bare Wires and Cables—Copper, Iron and Steel.

Copper wire for all purposes in any required shape or size; for telephone and telegraph, high voltage long distance transmission, and industrial purposes in general. Copper cables of all capacities and degrees of flexibility, hard drawn or annealed, bare or insulated.

Galvanized iron and steel wire is also made in all shapes and sizes, bare or insulated, and for all purposes; telephone and telegraph wires, armor wires, strand and wire rope of all kinds.

Copper Trolley Wire

—Generally made of hard drawn copper in three shapes: round, grooved and figure 8, the latter form not being extensively used.



Grooved

Figure 8

TROLLEY WIRE, THREE SHAPES

DATA, HARD DRAWN COPPER TROLLEY WIRE

Section of trolley wire	Size, B. & S.	Sectional area in cir. mils.	Weight, lbs. per 1,000 ft.	Tensile strgth, lbs.	Dimensions									
					A	B	C	D	E	F	G	H	I	J
Round	0	105,600	319	4,522	325	1625	...	...	...	...	...	...	...	...
	00	133,200	404	5,550	365	1825	...	...	...	...	...	...	...	...
	000	168,100	509	6,735	410	2045	...	...	...	...	...	...	...	...
	0000	211,600	641	8,140	460	230	...	...	...	...	...	...	...	...
Grooved "American Standard"	00	133,200	404	...	392	196	☆	20	78°	27°	51°	.015	...	...
	000	168,100	509	...	430	215	☆	22	78°	27°	51°	.015	...	...
	0000	211,600	641	...	482	241	☆	25	78°	27°	51°	.015	...	...
	00	133,200	404	...	480	352	108	196	...	...	...	...	...	...
Figure 8	000	168,100	509	...	540	400	130	222	...	...	...	...	...	...
	0000	211,600	641	...	600	450	150	250	...	...	...	...	...	...

DATA, HARD DRAWN COPPER TELEGRAPH AND TELEPHONE WIRE

Size, B. & S.	Diam., in.	Weight per mile in lbs.	Size, B. & S.	Diam., in.	Weight per mile in lbs.
8	.1285	264	12	.0808	104
9	.1144	209	14	.0641	66
10	.1019	166			

Extra Flexible Cables—Made up of a large number of small copper wires, and are for flexible connectors, commutator brushes, third rail shoes and similar purposes.

Made both concentric and rope lay.

Rail Bonds—Made of any desired type, capacity or length to meet any requirements. All standard types of terminal stud bonds are made, from which any particular style of bond can be selected for any given set of track conditions. These bonds are distinguished by accurate workmanship, superior grade of material and simplicity of design, insuring lasting and economical service.

PROPERTIES OF HARD DRAWN COPPER WIRE
(Adopted by the A. S. T. M.)

Size, B. & S.	Diam., in.	Area, cir. mils.	Tensile strength, lbs. per sq. in.	Per cent elongation in 10 in.	Size, B. & S.	Diam., in.	Area, cir. mils.	Tensile strength, lbs. per sq. in.	Per cent elongation in 10 in.
0000	0.460	211,600	49,000	3.75	8	0.128	16,380	63,400	1.4
000	0.410	168,100	51,000	3.20	9	0.114	12,996	64,200	1.3
00	0.365	133,200	52,800	2.70	10	0.102	10,404	64,800	1.2
0	0.325	105,600	54,500	2.4	11	0.091	8,281	65,400	1.1
1	0.289	83,520	56,000	2.1	12	0.081	6,561	65,700	1.0
2	0.258	66,560	57,500	2.0	13	0.072	5,184	66,000	0.9
3	0.229	52,440	58,500	1.9	14	0.064	4,096	66,200	0.9
4	0.204	41,620	59,500	1.8	15	0.057	3,249	66,400	0.8
5	0.182	33,120	60,500	1.7	16	0.051	2,601	66,600	0.8
6	0.162	26,240	61,500	1.6	17	0.045	2,025	66,800	0.7
7	0.144	20,740	62,500	1.5	18	0.040	1,600	67,000	0.7

Extra Galvanized W. & M. Telephone and Telegraph Wire—There are three standard grades, all made from the very best materials by improved processes: "extra best best" (E. B. B.), "best best" (B. B.), and "steel."

While these grades differ in physical characteristics, there is no difference in the standard as regards galvanizing.

PROPERTIES OF GALVANIZED TELEPHONE AND TELEGRAPH WIRES
Based on Standard Specifications

Size, B. W. G.	Diam. in. mils. = d	Area in cir. mils. = d ²	Weight, lbs.		Breaking strain, lbs.			Resistance per mile (International Ohms) at 68° F. or 20° C.		
			Per 1000 ft.	Per mile	Ex. B. B.	B. B.	Steel	Ex. B. B.	B. B.	Steel
0	340	115,600	313	1,655	4,138	4,634	4,965	2.84	3.38	3.93
1	300	90,000	244	1,289	3,223	3,609	3,867	3.65	4.34	5.04
2	284	80,656	218	1,155	2,888	3,234	3,465	4.07	4.85	5.63
3	259	67,081	182	960	2,400	2,688	2,880	4.90	5.83	6.77
4	238	56,644	153	811	2,028	2,271	2,433	5.80	6.91	8.01
5	220	48,400	131	693	1,732	1,940	2,079	6.78	8.08	9.38
6	203	41,209	112	590	1,475	1,652	1,770	7.97	9.49	11.02
7	180	32,400	87	463	1,158	1,296	1,389	10.15	12.10	14.04
8	165	27,225	74	390	975	1,092	1,170	12.05	14.36	16.71
9	148	21,904	60	314	785	879	942	14.97	17.84	20.70
10	134	17,956	49	258	645	722	774	18.22	21.71	25.29
11	120	14,400	39	206	515	577	618	22.82	27.19	31.55
12	109	11,881	32	170	425	476	510	27.65	32.94	38.23
13	95	9,025	25	129	310	347	372	37.90	45.16	52.41
14	83	6,889	19	99	247	277	297	47.48	56.56	65.66
15	72	5,184	14	74	185	207	222	63.52	75.68	87.84
16	65	4,225	11	61	152	171	183	77.05	91.80	106.55

DATA, W. & M. TELEPHONE WIRE

Size, B. W. G.	Diam., in.	Bdls. per mile	Weight per 1000 ft., lbs.	Size, B. W. G.	Diam., in.	Bdls. per mile	Weight per 1000 ft., lbs.
4	0.238	4	153	10	0.134	2	49
6	0.203	3	112	11	0.120	2	39
8	0.165	2	74	12	0.109	2	32
9	0.148	2	60	14	0.083	2	19

Extra Galvanized Bond Wire—For signal bonding on steam roads. Extra B. B. extra galvanized telephone wire is nearly always used for this purpose. Cut and straightened to lengths at small extra charge. Usually 3 to 5 ft. long, of any gage number desired.

Extra Galvanized Steel Signal Wire—Used as

connection from lever or other pulling device to semaphore signal operated mechanically. The two sizes in common use are Nos. 8 and 9 B. W. G., with breaking strength of 2350 lbs. and 1900 lbs. respectively.

Standard Steel Strand—Galvanized or extra galvanized. Used chiefly for guying poles and smokestacks, supporting trolley wire, and operating railroad signals.

For fuller data, see our Wire Rope Catalogue in this volume.



7 steel wires twisted into single strand
STANDARD STEEL STRAND
Galvanized or extra galvanized

Diam., in.	Weight per 1000 ft., lbs.	Strength, lbs.	Diam., in.	Weight per 1000 ft., lbs.	Strength, lbs.
7 STEEL WIRES TWISTED INTO SINGLE STRAND					
3/4	1,200	18,000	1/2	125	2,300
5/8	800	14,000	3/4	95	1,800
3/8	650	11,000	1/4	75	1,400
1/2	510	8,500	3/8	55	900
3/4	415	6,500	1/2	40	700
5/8	295	5,000	3/4	32	500
3/8	210	3,800	1/4	20	400
1/2	160	2,800			
19 STEEL WIRES TWISTED INTO SINGLE STRAND					
1	2,100	32,000	5/8	800	14,000
3/4	1,610	24,000	3/4	650	11,000
5/8	1,200	18,000	1/2	510	8,500

Extra Galvanized Special Strands—Three special grades which meet all requirements for durability, strength, toughness and light weight; extra galvanized Siemens-Martin strand, extra galvanized high strength (crucible steel) strand, and extra galvanized extra high strength (plow steel) strand. All three grades are composed of 7 wires each, and have very heavy coating of galvanizing, insuring long life.

Besides these three standard grades, we are in position to make strands to the most exacting specifications.

For fuller data, see our Wire Rope Catalogue in this volume.



EXTRA GALVANIZED SPECIAL STRAND

EXTRA GALVANIZED SIEMENS-MARTIN STRAND				EXTRA GALVANIZED HIGH STRENGTH STRAND				EXTRA GALVANIZED EXTRA HIGH STRENGTH STRAND			
Diam., in.	Actual breaking strength, lbs.	Elastic limit, per cent	Per cent elongation in 24 in.	Diam., in.	Actual breaking strength, lbs.	Elastic limit, per cent	Per cent elongation in 24 in.	Diam., in.	Actual breaking strength, lbs.	Elastic limit, per cent	Per cent elongation in 24 in.
3/4	19,000	50	10	5/8	25,000	55	6	3/4	42,500	60	4
1/2	11,000	50	10	1/2	18,000	55	6	1/2	27,000	60	4
3/8	9,000	50	10	3/4	15,000	55	6	3/8	22,500	60	4
1/4	6,800	50	10	1/4	11,500	55	6	1/4	17,250	60	4
3/8	4,860	50	10	3/8	8,100	55	6	3/8	12,100	60	4
1/2	4,380	50	10	1/2	7,300	55	6	1/2	10,900	60	4
3/4	3,060	50	10	3/4	5,100	55	6	3/4	7,600	60	4
1/2	2,000	50	10	1/2	3,300	55	6	1/2	4,900	60	4
3/8	900	50	10	3/8	1,500	55	6	3/8	2,250	60	4

CATENARY METHOD OF SUPPORTING TROLLEY WIRE—These three special grades of extra galvanized special strands are also used in the catenary method of supporting trolley wire.

LONG SPANS IN HIGH TENSION CURRENT TRANSMISSION LINE—Where necessary to cross over rivers, lakes and bays with power transmission lines, the current may be conducted through an extra galvanized strand of one of the three special grades of steel previously described, of such size and strength as will show a safety factor of at least 5.

An entire power transmission line of very high potential could be economically constructed with extra galvanized Siemens-Martin strand, reducing the number of supporting towers which are often the cause of energy loss and trouble.

PROPERTIES OF SPECIAL GRADES EXTRA GALVANIZED SPECIAL STRANDS

Diam. strand, in.	Number of wires in strand	Strength S. M. strand, tons	Strength crucible strand, tons	Strength plow strand, tons	Weight per ft., lbs.
1½	61	55	91.5	121	4.75
1½	61	45.5	76	100	3.95
1½	37	38	63.5	85	3.30
1½	37	32.5	54	72	2.62
1	37	25.5	43.7	60	2.25
¾	19	19	32	45	1.70
¾	19	14.2	23.7	35	1.25
¾	19	10	16.5	23.5	.81

Tico Resistance Wire—A high grade nickel steel wire for purposes where a high specific and uniform resistance is required.

Used in some constant potential devices, such as electric heaters and rheostats for the purpose of transforming electrical energy into heat.

DATA, TICO RESISTANCE WIRE

Size, B. & S.	Diam. in. mils.	Area, cir. mils.	Area, sq. in.	Weight, lbs. per 1000 ft.	Ft. per lb.	Resistance			
						Ohms per ft.	Ohms per lb.	Ft. per ohm	Lbs. per ohm
4	204.31	41743	.032784	110.5	9.05	.0124	.112	80.9	8.94
5	181.94	33102	.025999	87.7	11.40	.0156	.178	64.2	6.63
6	162.02	26250	.020618	69.54	14.4	.0197	.283	50.8	3.53
7	144.29	20820	.016351	55.14	18.1	.0248	.450	40.3	2.22
8	128.49	16510	.012967	43.73	22.9	.0313	.715	32.0	1.40
9	114.42	13092	.010283	34.68	28.8	.0394	1.14	25.4	.879
10	101.90	10384	.008155	27.50	36.4	.0497	1.81	20.1	.553
11	90.74	8234	.006467	21.81	45.8	.0627	2.88	16.0	.348
12	80.81	6530	.005129	17.70	57.8	.0791	4.57	12.6	.219
13	71.96	5179	.004067	13.72	72.9	.0997	7.29	10.0	.137
14	64.08	4107	.003225	10.88	92	.1257	11.6	7.95	.0865
15	57.07	3257	.002558	8.625	116	.1585	18.4	6.31	.0544
16	50.82	2583	.002029	6.842	146	.2000	29.2	5.00	.0342
17	45.26	2048	.001609	5.425	184	.252	46.5	3.97	.0215
18	40.30	1624	.001276	4.302	232	.318	73.9	3.15	.0135
19	35.89	1288	.001012	3.411	293	.401	117	2.49	.00851
20	31.96	1022	.000823	2.707	369	.505	187	1.98	.00535
21	28.46	810.1	.0006363	2.146	466	.638	297	1.57	.00337
22	25.35	642.5	.0005046	1.702	588	.804	473	1.24	.00212

Armature Binding Wire—Tinned steel armature wire is manufactured in four grades: A, B, C1 and C2, which vary in tensile strength.

Grade A—Used to bind armatures of small motors and dynamos.

Grade B—Commercial grade. Used on motors and dynamos of ordinary commercial size and speed.

Grade C1—Made of high grade piano wire and used where great strength is required.

Grade C2—Used when very high tensile strength is required, as on motors and dynamos of unusual size and high speed.

Pole Steps.

For use of electric light, street railway and telephone companies. Have our regular spike and button heads, each step carefully threaded with screw thread. Special shapes or lengths to order.

DATA, POLE STEPS

Size, in.	Weight per 100 pole steps, lbs.		Size, in.	Weight per 100 pole steps, lbs.	
	Plain	Galvanized		Plain	Galvanized
8 x ¾	73	75	8½ x ¾	58	61
9 x ¾	78	81	9 x ¾	62	65
10 x ¾	85	88	10½ x ¾	71	74
10½ x ¾	89	93	9 x ¾	51	54

A keg of pole steps weighs about 200 lbs.

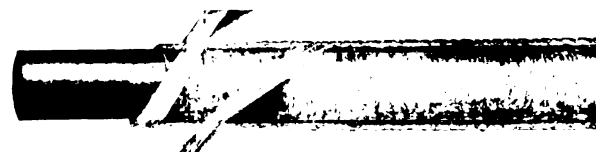
Magnet Wire.

All magnet wire is thoroughly annealed by processes which insure uniform and extreme softness, highest conductivity and ease of handling. Before cover is applied all wire is carefully inspected for size, uniformity of dimensions, freedom from scale and all surface imperfections.

Large quantities of the ordinary commercial sizes of cotton covered magnet wire are produced, as well as fine and special work, silk and cotton. Magnet wire is covered with single, double or triple cotton or silk, asbestos, cotton and paper.



SINGLE COTTON COVERED MAGNET WIRE



DOUBLE COTTON COVERED MAGNET WIRE

DATA, COARSE SIZES ROUND COTTON COVERED MAGNET WIRE

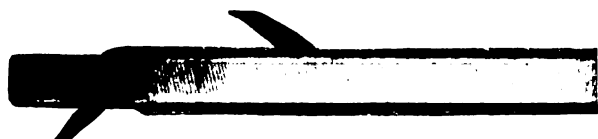
Size, B. & S.	Diam., in.	Allowable variation either way in per cent	Rated area in cir. mils.	SINGLE COTTON COVERED Approx. values		DOUBLE COTTON COVERED Approx. values	
				Outside diam., in.	Pt. per lb.	Outside diam., in.	Pt. per lb.
0	0.3249	½ of 1	105.625	.333	3.1	.339	3.1
1	.2893	½ of 1	83.694	.297	3.9	.303	3.9
2	.2576	½ of 1	66.358	.266	5	.272	4.9
3	.2294	¾ of 1	52.624	.237	6.2	.243	6.2
4	.2043	¾ of 1	41.738	.212	7.8	.218	7.8
5	.1819	¾ of 1	33.088	.190	9.9	.196	9.9
6	.1620	¾ of 1	26.244	.170	12.5	.176	12.4
7	.1443	¾ of 1	20.822	.152	15.7	.158	15.6
8	.1285	1	16.512	.136	19.8	.142	19.6
9	.1144	1	13.087	.121	24.9	.125	24.7
10	.1019	1	10.384	.108	31.4	.113	31.1
11	.0907	1	8.226	.097	39.5	.102	39.1
12	.0808	1½	6.528	.087	49.6	.092	49.2
13	.0720	1½	5.184	.078	62.5	.083	61.7
14	.0641	1½	4.108	.070	78.6	.075	77.5
15	.0571	1½	3.260	.063	98.9	.068	97
16	.0508	1½	2.580	.056	125	.060	122
17	.0453	1½	2.052	.050	157	.054	153
18	.0403	1½	1.624	.045	198	.050	192
19	.0359	1½	1.288	.041	248	.045	240

DATA, FINE SIZES SILK COVERED ROUND MAGNET WIRE

Size, B. & S.	Diam. in.	Area cir. mils.	SINGLE SILK			DOUBLE SILK		
			Max. outside diam., in.	Ft. per lb.	Lb. per 1000 ft.	Max. outside diam., in.	Ft. per lb.	Lb. per 1000 ft.
20	.0320	1.024	.0340	316	3.160	.0360	313	3.190
21	.0285	812.2	.0305	398	2.510	.0325	393	2.543
22	.0253	640.0	.0273	502	1.990	.0293	492	2.013
23	.0226	510.7	.0246	632	1.581	.0266	623	1.604
24	.0201	404	.0221	796	1.257	.0241	781	1.280
25	.0179	320.4	.0199	1000	1.000	.0219	977	1.023
26	.0159	252.8	.0179	1258	.794	.0199	1233	.811
27	.0142	201.6	.0162	1569	.637	.0182	1531	.653
28	.0126	158.7	.0146	1996	.501	.0166	1934	.517
29	.0113	127.6	.0133	2463	.406	.0153	2380	.420
30	.0100	100.0	.0120	3125	.320	.0140	3003	.333
31	.0089	79.70	.0109	3906	.256	.0129	3731	.268
32	.0080	63.20	.0100	4878	.205	.0120	4651	.215
33	.0071	50.13	.0091	6060	.165	.0111	5714	.175
34	.0063	39.69	.0083	7575	.132	.0103	7092	.141
35	.0056	31.47	.0076	9433	.106	.0096	8695	.115
36	.0050	25	.0070	11627	.086	.0090	10637	.094
37	.0045	19.80	.0065	14492	.069	.0085	12987	.077
38	.0040	15.68	.0060	17857	.056	.0080	15625	.064
39	.0035	12.46	.0055	22222	.045	.0075	18518	.054
40	.0031	9.860	.0051	27027	.037	.0071	22222	.045

ROUND ASBESTOS AND SINGLE COTTON COVERED
MAGNET WIRE

Size, B. & S.	List number, asbestos and single cotton covered	Lbs. per 1,000 ft.	Diam. over insulation, in.	Quantity on reels, lbs.	Shipped on reel number
0000	5440	656	.482	150	321
000	5430	522	.432	150	321
00	5420	415	.387	150	321
0	5400	325	.347	150	321
1	5401	258	.311	150	313
2	5402	205	.280	150	313
3	5403	163	.251	150	313
4	5404	130	.226	150	313
5	5405	103	.204	150	313
6	5406	82	.184	150	313
7	5407	66	.166	150	313
8	5408	52	.150	150	313
9	5409	42	.136	150	313

SQUARE MAGNET WIRE DOUBLE COTTON COVERED
Copper 98% conductivity and annealed extremely soft. Used largely
in street railway motors

Size, B. & S.	List number	Radius of corners, in.	Diam. over insulation, double cotton covered, in.	Quantity on reels, lbs.	Shipped on reel number
0000	5540	☆	.481	150	321
000	5530	☆	.431	150	321
00	5520	☆	.386	150	321
0	5500	☆	.346	150	321
1	5501	☆	.310	150	344
2	5502	☆	.279	150	344
3	5503	☆	.250	150	344
4	5504	☆	.225	150	344
5	5505	☆	.200	150	344
6	5506	☆	.180	150	344
7	5507	☆	.163	150	344
8	5508	☆	.146	150	344
9	5509	.02	.130	150	344
10	5510	.02	.117	150	344
11	5511	.02	.106	150	344
12	5512	.02	.096	150	344
13	5513	.02	.087	150	344

Paper Covered Magnet Wire—The space required by paper insulation is less than half that required for a double cotton covering, thus allowing more ampere turns in a given space. Very best grade of manila rope paper is used, containing no particles of iron or wood pulp and no trace of alkali or acid.



PAPER COVERED MAGNET WIRE

Enamel Magnet Wire—Consists of copper wire having a coat of enamel baked thereon, and is used for many purposes where cotton and silk covered magnet wire are undesirable. Made in sizes ranging from 16 to 36 in considerable quantities. Our equipment for making this product embodies the very latest design of apparatus used by the leading European insulated wire companies and the enamel used on the wire is imported direct.

Enameled wire is manufactured by passing soft copper wire through an enamel bath, then through a baking process and repeating both operations until the

desired thickness of enamel coating is obtained. The insulation thus secured is so flexible that the wire will permit winding around a mandrel not larger than twice its own diameter without cracking of insulation. The fine sizes may be wound around a mandrel of their own diameters without showing injurious effect. It will also permit wire being stretched longitudinally 10% of its original length without deleterious effects on the enamel coating.

Enamel and Single Cotton Covered Magnet Wire—Insulated as described above and covered with 1 wind of cotton. Makes a good substitute for double silk magnet wire, and is sometimes used in place of the impregnated single or double cotton covered magnet wire. Principally used in motor starting and lighting devices.

Special Magnet Wire—Special magnet wire made to specifications.

Annunciator and Office Wire.

Annunciator Wire—Commercially pure, soft copper wire from No. 14 to No. 22 B. & S. is used. This is insulated with specially prepared paraffin wax compound. The outside wrap is made of any color or combination of colors, the most common being bright and fast red or blue with white. Put up in spools weighing about 7 lbs. net.



ANNUNCIATOR WIRE

Size, B. & S.	List number	Length in 1 lb., ft.	Size, B. & S.	List number	Length in 1 lb., ft.
14	3114	67	20	3120	221
16	3116	101		3122	311
18	3118	155			

"BLACK CORE" OR "DAMPPROOF" ANNUNCIATOR WIRE—Finished in colors as above, shipped on spools of about 7 lbs. net. Made with the inside wind saturated with our weatherproof compound. This permits its use in damp places. Outside wind of cotton, which is made in colors, is saturated with special paraffin wax compound, and finished so as to present a smooth and highly polished surface that will not catch dust.

DATA, "BLACK CORE" OR "DAMPPROOF" ANNUNCIATOR WIRE

Size, B. & S.	List number	Length in 1 lb., ft.	Size, B. & S.	List number	Length in 1 lb., ft.
14	3214	60	20	3220	200
16	3216	90		3222	280
18	3218	130			

Office Wire—Standard grade consists of copper conductor from No. 14 to No. 20 B. & S., insulated with one wind and one braid of cotton, both applied tight and even and saturated with special paraffin wax compound. The outer braid is given high polish and is made in any color, or combination of colors, specified. Standard colors are red and white or blue and white. The wire is put up in coils of about 20 lbs.

Used largely by telephone and telegraph companies for inside wiring, extending from the instruments to the junction where they connect with outside wires and cables as they enter building. Also used as high grade bell and annunciator wire.



OFFICE WIRE

Size, B. & S.	List number	Length in 1 lb., ft.	Size, B. & S.	List number	Length in 1 lb., ft.
14	3314	56	18	3318	115
16	3316	80	20	3320	154

"BLACK CORE" OR "DAMPPROOF" OFFICE WIRE—Has 2 inside cotton winds applied in opposite directions which are thoroughly impregnated with black weatherproof compound. The outside braid is finished same as regular office wire. Used where higher grade of insulation is required. Packed same as regular office wire.



"BLACK CORE" OR "DAMPPROOF" OFFICE WIRE

Size, B. & S.	List number	Length in 1 lb., ft.	Size, B. & S.	List number	Length in 1 lb., ft.
14	3414	53	18	3418	98
16	3416	72	20	3420	135

Special Annunciator and Office Wire—Special kinds furnished as specified. Also conductors of other than standard sizes, either solid or stranded. Untinned copper wire is used in the regular product, but tinned wire will be furnished if required.

Multiple Conductors—Any of these insulated wires can be supplied, 2 in parallel or twisted in pairs, in 3-conductor cables or in cables having any number of conductors. Same can be covered with 1 or more braids or with tape and braid and finished in any manner specified.

Weatherproof and Slow Burning Wires and Cables.

These have moderate degree of insulation and are less expensive than rubber insulated conductors. Double and triple braid. Reliance weatherproof wire meets every requirement for outdoor service, while Reliance slow burning wire is superior for indoor uses.

Wires and cables are made in strict accordance with all requirements of the National Board of Fire Underwriters, sizes varying from No. 20 B. & S. to the largest feeder cables used. Sizes No. 4/0 B. & S. and smaller are usually made of solid wires, while larger sizes have stranded conductors.

Unless hard drawn copper be specified, wires of purest grade of annealed copper, uniform in softness and having minimum conductivity of 98% Matthiessen's standard, will be used.

Reliance Weatherproof Insulation—For use outdoors where moisture is certain and where fireproof qualities are not necessary; also where, on account of small separation, bare wires would be liable to swing into contact with each other or with other low tension cables.

The wires are first covered by two or three closely and evenly woven braids of strong fibrous material, which is then completely saturated with weatherproof insulating compound. After drying thoroughly, the wire receives dressing of mineral wax, when the surface is

thoroughly burnished and polished, reducing to a minimum trouble from sleet and ice.

The insulation will withstand all ordinary climatic conditions.



RELIANCE WEATHERPROOF WIRE

Solid copper wire, double braid, black finish

National Electrical Code Standard

Size, B. & S.	Diam., in., bare wire	Area, cir. mils.	List number	Weights		Standard packages, amounts, ft.	Shipped on reel number
				Lbs. per 1000ft.	Lbs. per mile		
0000	.4600	211600	2040	723	3,817	2,400	315
000	.4096	167772	2030	587	3,098	2,500	315
00	.3648	133079	2020	467	2,467	3,200	315
0	.3250	105625	2000	377	1,989	4,300	315
1	.2893	83694	2001	294	1,553	1,000	302
2	.2576	66358	2002	239	1,264	1,300	302
3	.2294	52624	2003	185	977	1,600	302
4	.2043	41738	2004	151	795	2,100	302
5	.1819	33088	2005	122	646	2,500	322
6	.1620	26244	2006	100	529	3,400	322
8	.1285	16512	2008	66	349	5,000	322
9	.1144	13087	2009	54	283	6,000	322
10	.1019	10384	2010	46	241	35 to 50	Coils
12	.0808	6528.6	2012	30	158	25 to 40	Coils
14	.0641	4108.8	2014	20	107	25 to 40	Coils
16	.0508	2580.6	2016	16	83	20 to 30	Coils
18	.0403	1624.1	2018	12	64	20 to 30	Coils



RELIANCE WEATHERPROOF WIRE

Solid copper wire, triple braid, black finish

National Electrical Code Wire

DATA, RELIANCE WEATHERPROOF WIRE
Solid Copper Wire, Triple Braid, Black Finish National Electrical Code Wire

Size, B. & S.	Minimum thickness of insulation, in.	List number	Weights		Standard packages, amounts, ft.	Shipped on reel number
			Lbs. per 1000 ft.	Lbs. per mile		
0000	.0781	2140	767	4,050	2,400	315
000	.0781	2130	629	3,320	2,500	315
00	.0781	2120	502	2,650	3,200	315
0	.0781	2100	407	2,150	4,300	315
1	.0781	2101	316	1,670	1,000	302
2	.0625	2102	260	1,370	1,300	302
3	.0625	2103	199	1,050	1,600	302
4	.0625	2104	164	865	2,100	302
5	.0625	2105	135	710	2,500	322
6	.0625	2106	112	590	3,400	322
8	.0469	2108	75	395	5,000	322
9	.0469	2109	62	325	6,000	322
10	.0469	2110	53	280	35 to 50	Coils
12	.0469	2112	35	185	25 to 40	Coils
14	.0469	2114	25	130	25 to 40	Coils
16	.0469	2116	20	105	20 to 30	Coils
18	.0469	2118	16	85	20 to 30	Coils

DATA, SOLID COPPER WEATHERPROOF COILS

Size, B. & S.	Weights per coil, lbs.		Outside diam. of coil, in.	Diam. of eye of coil, in.	Thickness of coil, in.	Covering of coil	How shipped
	2 braids	3 braids					
0000	360	383	30 to 34	19	7 1/4	Paper and burlap	Loose coils
000	352	377	30 to 34	19	7 1/4		
00	326	350	30 to 34	19	7 1/4		
0	301	325	30 to 34	19	7 1/4		
1	294	316	30 to 34	19	7 1/4		
2	310	338	30 to 34	19	7 1/4		
3	305	330	30 to 34	19	7 1/4		
4	317	344	30 to 34	19	7 1/4		
5	317	350	30 to 34	19	7 1/4		
6	320	180	30 to 34	19	6		
8	171	195	30 to 34	19	6	Paper	Coils packed in barrels
10	50	50	18 to 20	12	5		
12	40	40	18 to 20	12	5		
14	40	40	18 to 20	12	5		
16	30	30	18 to 20	12	5		
18	30	30	18 to 20	12	5		



RELIANCE WEATHERPROOF CABLE
Stranded copper conductors, double braid, black finish
National Electrical Code Standard

Size	No. and diam. of wires in strand, in.	Diam. bare strand, in.	List number	Weights	
				Lbs. per 1000 ft.	Lbs. per mile
2,000,000	91 x .1482	1.6302	2250	6690	35,323
1,750,000	91 x .1386	1.5246	2251	5894	31,119
1,500,000	91 x .1284	1.4124	2252	5098	26,915
1,250,000	91 x .1172	1.2892	2253	4264	22,516
1,000,000	61 x .1280	1.1520	2254	3456	18,246
900,000	61 x .1215	1.0935	2257	3137	16,513
800,000	61 x .1145	1.0305	2259	2799	14,779
750,000	61 x .1109	.9981	2260	2635	13,913
700,000	61 x .1071	.9639	2261	2471	13,046
600,000	61 x .0992	.8928	2263	2093	11,052
500,000	37 x .1162	.8134	2265	1765	9,318
450,000	37 x .1103	.7721	2267	1601	8,452
400,000	37 x .1040	.7280	2268	1436	7,584
350,000	37 x .0973	.6811	2269	1248	6,589
300,000	19 x .1257	.6285	2270	1083	5,721
250,000	19 x .1147	.5735	2271	907	4,788
0000	19 x .1055	.5275	2240	745	3,935
000	19 x .0940	.4700	2230	604	3,190
00	7 x .1378	.4134	2220	482	2,544
0	7 x .1228	.3684	2200	388	2,051
1	7 x .1093	.3279	2201	303	1,599
2	7 x .0973	.2919	2202	246	1,301
3	7 x .0867	.2601	2203	190	1,004
4	7 x .0772	.2316	2204	155	820
5	7 x .0687	.2061	2205	126	668
6	7 x .0612	.1836	2206	103	544
8	7 x .0485	.1455	2208	68	359



RELIANCE WEATHERPROOF CABLE
Stranded copper conductors, triple braid, black finish
National Electrical Code Wire

Size	Minimum thickness of insulation, in.	List number	Weights		Standard packages, amounts, ft.	Shipped on reel number
			Lbs. per 1000 ft.	Lbs. per mile		
2,000,000	.1250	2350	7008	37,000	600	324
1,750,000	.1250	2351	6193	32,700	700	324
1,500,000	.1250	2352	5380	28,400	850	324
1,250,000	.1250	2353	4508	23,800	1000	324
1,000,000	.1250	2354	3674	19,400	1320	324
900,000	.1094	2357	3332	17,600	1320	324
800,000	.1094	2359	2992	15,800	1320	324
750,000	.1094	2360	2822	14,900	1320	333
700,000	.1094	2361	2650	14,000	1320	333
600,000	.1094	2363	2235	11,800	1320	333
500,000	.1094	2365	1894	10,000	1320	333
450,000	.0938	2367	1724	9,100	1320	333
400,000	.0938	2368	1553	8,200	1320	333
350,000	.0938	2369	1345	7,100	2640	333
300,000	.0938	2370	1174	6,200	2640	333
250,000	.0938	2371	985	5,200	2640	333
0000	.0781	2340	800	4,220	2000	315
000	.0781	2330	653	3,450	2000	315
00	.0781	2320	522	2,760	2640	315
0	.0781	2300	424	2,240	2640	315
1	.0781	2301	328	1,735	1000	302
2	.0625	2302	270	1,425	1300	302
3	.0625	2303	206	1,090	1600	302
4	.0625	2304	170	900	2100	302
5	.0625	2305	140	740	3000	322
6	.0625	2306	115	610	3400	322
8	.0469	2308	78	410	4000	322



RELIANCE WEATHERPROOF IRON WIRE, DOUBLE BRAID

Size, B. W. G.	List numbers		Weights per mile, lbs.	Length of coil, ft.
	B. B. extra galvanized	Extra B. B. extra galvanized		
4	2704	2804	860	1320
6	2706	2806	665	1760
8	2708	2808	470	2640
9	2709	2809	400	2640
10	2710	2810	350	2640
12	2712	2812	225	2640
14	2714	2814	145	2640
16	2716	2816	100	5280
18	2718	2818	65	5280



RELIANCE WEATHERPROOF IRON WIRE, TRIPLE BRAID
For fire alarm, telephone, telegraph and burglar alarm construction where danger of short circuits with other wires or trees exists

Size, B. W. G.	List numbers		Weights per mile, lbs.	Length of coil, ft.
	B. B. extra galvanized	Extra B. B. extra galvanized		
4	2904	3004	940	1320
6	2906	3006	740	1760
8	2908	3008	525	2640
9	2909	3009	450	2640
10	2910	3010	400	2640
12	2912	3012	260	2640
14	2914	3014	175	2640
16	2916	3016	125	5280
18	2918	3018	85	5280

DATA, WEATHERPROOF IRON WIRE COILS

Size, B. W. G.	Weight per coil, lbs.		Outside diam. of coil, in.	Diam. of eye of coil, in.	Thickness of coil, in.		Covering of coil	How shipped	Approx. length of coil, ft.
	2 braids	3 braids			2 braids	3 braids			
6	222	247	30 to 34	19	6	7 1/2	Paper and bur-lap	Loose coils	1760
8	235	263	30 to 34	19	6	7 1/2			2640
9	200	225	30 to 34	19	6	7 1/2			2640
10	175	200	30 to 34	19	6	7 1/2			2640
12	113	130	30 to 34	19	6	7 1/2			2640
14	78	87	22 to 24	12	5	5			2640

Reliance Slow Burning Wires and Cables—
Have insulation that will not carry flame. Especially useful in hot, dry places, and where wires are brought together, as on the back of a large switchboard or in a wire tower. Each insulating braid completely saturated with white slow burning compound, and outside thoroughly slicked down and given a hard, smooth, white surface.



RELIANCE SLOW BURNING WIRE, NATIONAL CODE STANDARD

Solid conductor, 3 white braids

*Size	STRANDED		SOLID		Standard packages, amounts, ft.	Shipped on reel number
	List number	Weights	List number	Weights		
		Lbs. per 1000 ft.		Lbs. per 1000 ft.		
2,000,000	2400A	7540	39800	.....	600	.....
1,750,000	2401A	6700	35400	.....	700	.....
1,500,000	2402A	5830	30800	.....	850	.....
1,250,000	2403A	4940	26100	.....	1000	.....
1,000,000	2404A	3980	21000	.....	1320	.....
900,000	2406A	3640	19200	.....	1320	.....
800,000	2408A	3280	17300	.....	1320	.....
700,000	2410A	2920	15400	.....	1320	.....
600,000	2412A	2460	13000	.....	1320	.....
500,000	2414A	2080	11000	.....	1320	.....
450,000	2415A	1900	10000	.....	1320	.....
400,000	2416A	1700	9000	.....	1320	.....
350,000	2417A	1500	7900	.....	2640	.....
300,000	2418A	1310	6900	.....	2640	.....
250,000	2419A	1120	5900	.....	2640	.....
0000	2640	960	5070	2440	925	4890
000	2630	785	4150	2430	760	4020
00	2620	625	3300	2420	600	3170
0	2600	510	2700	2400	495	2610
1	2601	380	2000	2401	365	1930
2	2602	335	1770	2402	320	1690
3	2603	280	1480	2403	270	1425
4	2604	230	1220	2404	220	1160
5	2605	195	1030	2405	190	1000
6	2606	165	870	2406	160	845
8	2608	105	555	2408	100	530
10	.....	.....	.....	2410	80	420
12	.....	.....	.....	2412	55	290
14	.....	.....	.....	2414	40	210
16	.....	.....	.....	2416	30	160
18	.....	.....	.....	2418	24	130

*Size and number of wires in strands same as in weatherproof cables



RELiance SLOW BURNING CABLE
Stranded copper conductor, 3 white braids

Special Weatherproof and Slow Burning Wires—

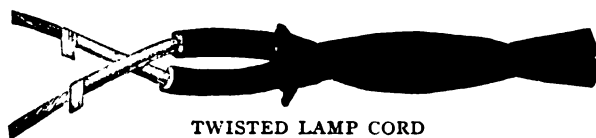
A combined insulation of black weatherproof and white slow burning coverings is often required. The wires may have a single coating of each kind of 3 coatings, 2 of slow burning and 1 of weatherproof, or conversely. When weatherproof covering is inside, the conductor is known as "white finish weatherproof," and when flame-proof covering is inside, it is called "black finish slow burning." Outside surfaces are finished smooth and hard. The white finish weatherproof wire only is approved by National Electrical Code.

Any of these wires furnished twisted into pairs, or formed into cables having any number of conductors, the conductors so formed being incased in 1 or more finished braids or with tape.

Americore Lamp and Portable Cord.

For exposed wiring to connect concealed wiring with drop lights, brackets, and portables. Also used for bell and annunciator wiring, and for other purposes where a short flexible connecting conductor is desired.

The conductor consists of a number of small untinned annealed copper wires each No. 30 American Wire gage (B. & S.), having a diameter of .01 in., twisted into a cable of the required carrying capacity. This conductor is then covered with a tight, close wind of fine cotton, after which it is insulated with seamless



TWISTED LAMP CORD

rubber and then covered with an ornamental braid of silk or cotton. Two of these are finished and braided all over with silk or cotton, in each case forming the two branches of a circuit.

All sizes put up in coils of 250 ft. each. Sizes Nos. 16 and 18 have the largest sale, and are put up in packages containing 1000 ft. and 3000 ft. each, as desired. Coils will be packed in specially prepared paper cartons on request.

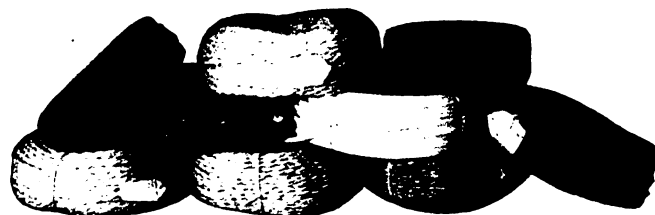
A combination of green and yellow is the color usually furnished for cotton covered lamp cords; portable cords generally furnished with dry black cotton braid.

Types—The following is an extract from the National Board of Underwriters' specifications dated 1911, and covers this company's Americore (new code) lamp cord and portable cord:

TYPE C, FOR PENDANT LAMPS—In this class is included all flexible cord, which, under usual conditions, hangs freely in the air and not likely to be moved sufficiently to come in contact with surrounding objects. Pendant lamps provided with long cords, so that they can be carried about or hung over nails or on machinery, etc., are not included in this class, even though they are usually allowed to hang freely. Each conductor must have an approved braided covering, so put on and sealed in place that when cut it will not fray out.

This type is insulated with $\frac{3}{4}$ -in. rubber on sizes 8 to 14 and $\frac{1}{2}$ -in. on 16 to 22.

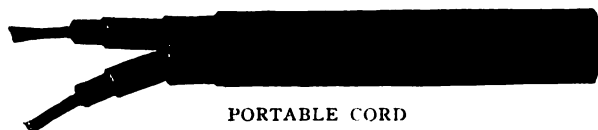
TYPE C. W. P. FOR PENDANT LAMPS—Same as above, except must have saturated braid and $\frac{3}{4}$ -in. rubber. For use in damp places.



LAMP CORD OF ALL KINDS AND SIZES

TYPE P. O., FOR PENDANT LAMPS—Parallel cord—each conductor type C, two such conductors laid parallel and covered with one silk or cotton braid.

TYPE P., FOR PORTABLES—Flexible cord for portable use, except in offices, dwellings or similar places where cord is not liable to rough usage and where good appearance is an essential feature, must meet all the requirements for flexible cord for pendants, and in addition must have a tough braided cover over the whole. There must also be an extra layer of rubber between the outer cover and the flexible cord. All sizes (except No. 14 and larger) are insulated with $\frac{3}{4}$ -in. rubber; No. 14 and larger have $\frac{1}{2}$ -in. rubber.



PORTABLE CORD

TYPE P. W. P., FOR PORTABLES IN DAMP PLACES—(Same as type P except must be furnished with a saturated braid.) For use in damp places, the insulation must be $\frac{3}{4}$ -in. thick on sizes No. 14 and larger, and $\frac{1}{2}$ -in. on sizes No. 16 and smaller, and the cord must have an outer covering saturated with a moistureproof preservative compound thoroughly slicked down, or must have a filler of approved material instead of an extra layer of rubber, and have two outer braids saturated with a moistureproof compound with an exterior surface thoroughly slicked down.

TYPE P. S., FOR PORTABLES IN DWELLINGS, OFFICES, ETC.—In offices, dwellings or similar places where cords are not liable to rough usage and where good appearance is essential, flexible cord for portable use must meet all of the requirements for flexible or for pendant lamps, both as to construction and thickness of insulation, and in addition must have a tough braided cover over the whole; or providing there is an extra layer of rubber between the flexible cord and the outer cover, the insulation proper on each stranded conductor of cord may be $\frac{1}{4}$ -in. in thickness instead of as required for pendant cords.

Note: The underwriters will no longer tag this material, now substituting type PD which is same as Type C with additional braid over twisted pair. This cord has only $\frac{1}{4}$ -in. rubber on each conductor, sizes 16 and 18, approved by underwriters. The supplementary insulation is same as on other portable cords.

DATA, AMERICORE LAMP CORD, TYPES C. AND P. O.

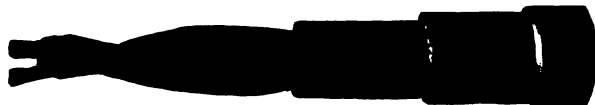
Size, AWG B. & S.	No. wires	Rubber, in.	TWISTED PAIR (TYPE C)				DUPLEX PARALLEL (TYPE P.O.)			
			Cotton covered		Silk covered		Cotton covered		Silk covered	
			List number	Weight per 1000 ft., lbs.	List number	Weight per 1000 ft., lbs.	List number	Weight per 1000 ft., lbs.	List number	Weight per 1000 ft., lbs.
10	104	3-64	1100	122.00	1120	116.71	1400	120.0	1420	117.0
12	65	3-64	1102	89.36	1122	84.77	1402	88.9	1422	86.1
14	41	3-64	1104	65.49	1124	61.53	1404	66.1	1424	63.6
16	26	1-32	1106	37.70	1126	34.61	1406	38.7	1426	36.8
18	16	1-32	1108	29.33	1128	26.47	1408	30.2	1428	28.5
20	10	1-32	1110	23.44	1130	20.83	1410	24.5	1430	22.9
22	6	1-32	1112	20.15	1132	17.50	1412	20.9	1432	19.3

DATA, REINFORCED PORTABLE CORD, TYPE P. S.

Size	No. wires	Rubber, in.	DRY COTTON BRAID (TYPE P. S.)		SILK BRAID (TYPE P. S.)	
			List number	Weight per 1000 ft., lbs.	List number	Weight per 1000 ft., lbs.
10	104	1-64x1-64	.....	142.4	.....	135.1
12	65	1-64x1-64	1142	104.2	1152	98.0
14	41	1-64x1-64	1144	75.3	1154	70.2
16	26	1-64x1-64	1146	56.0	1156	51.7
18	16	1-64x1-64	1148	46.0	1158	41.9
20	10	1-64x1-64	1150	38.2	1160	34.5
22	6	1-64x1-64	.....	33.8	.....	30.3

DATA, REINFORCED PORTABLE CORD, TYPES P. AND P. W. P.

Size	No. wires	Rubber, in.	DRY COTTON BRAID (TYPE P.)		SILK BRAID (TYPE P.)		SATURATED BRAID (TYPE P.W.P.)	
			List number	Weight per 1000 ft., lbs.	List number	Weight per 1000 ft., lbs.	List number	Weight per 1000 ft., lbs.
10	104	3-64x1-64	.....	214.7	.....	204.0	.....	222.4
12	65	3-64x1-64	1162	169.2	1172	159.8	1182	175.6
14	41	3-64x1-64	1164	131.2	1174	125.9	1184	135.9
16	26	1-32x1-64	1166	77.9	1176	73.9	1186	81.4
18	16	1-32x1-64	1168	67.4	1178	62.7	1188	69.9
20	10	1-32x1-64	1170	58.2	1180	53.3	1190	59.8
22	6	1-32x1-64	.....	53.2	.....	48.5	.....	54.3



AMERICAN (SPECIAL) BREWERY CORD

Size	No. wires	Rubber, in.	List number	Weight per 1000 ft., lbs.
12	65	3-64x1-64	.....	202.4
14	41	3-64x1-64	.....	161.0
16	26	1-32x1-64	.....	98.0
18	16	1-32x1-64	.....	86.8
20	10	1-32x1-64	.....	76.5

Construction of Cord for Portables—Made with regular National Electrical Code cotton covered lamp cord, over which is placed a supplementary insulation of vulcanized rubber. This is then covered with one strong braid of cotton, thoroughly saturated with a preservative compound, waxed and polished.

Reinforced portable cord is sometimes called for with the outside braid of dry, glazed cotton, either black or colored, and sometimes with a colored silk braid. Such cords take the same lists and are the same as our Reinforced portable cord.

Show window cord and cord for portables are the same as Reinforced portable cord. Orders should specify the kind of braid desired, i. e., whether weatherproof, dry cotton or silk, and the color.

1909 Code: This grade, also known as grade A, is insulated with $\frac{1}{32}$ -in. thickness of rubber, and was formerly the National Code Standard.

Commercial: Known as "old code," or grade C, is insulated with $\frac{1}{64}$ -in. thickness of rubber.

Both these grades are still in demand and can be furnished upon request in lamp cord or portable cord constructions.

The braiding can be either dry cotton or silk in any color or weatherproof saturated cotton.

Americore Brewery, Packing House and Canvasite Cords.

Brewery Cord (Type C. B., Class A)—Each conductor is lamp cord strand, cotton wound, insulated with Americore rubber and covered with a weatherproof braid; two such conductors twisted together (no braid over all).



BREWERY CORD

List number	Construction of conductor	Thickness of rubber insulation, in.	Size, B. & S. gage	Weight per 1000 ft., lbs.
8930L	104-30 B. & S. wires	3-64	10	125
8932L	65-30 " "	3-64	12	95
8934L	41-30 " "	3-64	14	70
8936L	26-30 " "	1-32	16	40
8938L	16-30 " "	1-32	18	32
8940L	10-30 " "	1-32	20	25

Canvasite Cord (Type C. C.)—Each conductor is lamp cord strand, cotton wound, insulated with Americore rubber and covered with a weatherproof braid; two such conductors twisted together with one weatherproof braid over all.

This is the same as brewery cord except that there is a weatherproof braid over both conductors.



CANVASITE CORD

List number	Construction of conductor	Thickness of rubber insulation, in.	Equal in capacity to	Weight per 1000 ft., lbs.
8910	104-30 B. & S. wires	3-64	10 B. & S.	140
8912	65-30 " "	3-64	12 " "	105
8914	41-30 " "	3-64	14 " "	85
8916	26-30 " "	1-32	16 " "	48
8918	16-30 " "	1-32	18 " "	39
8920	10-30 " "	1-32	20 " "	32

Packing House Cord (Type P. K. W. P.)—Each conductor is lamp cord strand, cotton wound, insulated with Americore rubber and covered with a dry braid; 2 such conductors twisted together, jute filled, and covered with 2 weatherproof braids.



PACKING HOUSE CORD

List number	Construction of conductor	Thickness of rubber insulation, in.	Size, B. & S. gage	Weight per 1000 ft., lbs.
8950L	104-30 B. & S. wires	3-64	10	142
8952L	65-30 " "	3-64	12	107
8954L	41-30 " "	3-64	14	84
8956L	26-30 " "	1-32	16	52
8958L	16-30 " "	1-32	18	41
8960L	10-30 " "	1-32	20	33

Americore Deck Cables, Theater or Stage Cable.

Deck Cables (Class A)—Each conductor is stranded, insulated with vulcanized rubber and braided; 2 such conductors twisted together with jute fillers, covered with a supplementary rubber insulation and 1 weatherproof braid.

DATA, DECK CABLES

Size, (B. & S.)	Number of wires in strand	Thickness of rubber insulation, in.	List number	Weight per 1000 ft., lbs.
10	7	3-64x1-32	9960	194
12	7	3-64x1-32	9962	158
14	7	3-64x1-32	9964	129
16	7	1-32x1-32	9966	82
18	7	1-32x1-32	9968	69

Theater or Stage Cable—Sizes 10 to 16, Type T: Each conductor regular lamp cord strand, cotton wrapped, insulated with code thickness of rubber and covered with single weatherproof braid; 2 or 3 such conductors twisted together with jute fillers and covered with two weatherproof braids.

Sizes 2 to 8, same as above, except have standard rubber covered tinned copper concentric strand and are not covered by type T.



THEATER OR STAGE CABLE

DATA, THEATER OR STAGE CABLE

Size, B. & S.	Number of wires in strand	Thickness of rubber insulation, in.	List number	Weight per 1000 ft., lbs.
2	210	4-64	8972	...
3	151	4-64	8973	...
4	133	4-64	8974	654
6	49	4-64	8976	468
8	49	3-64	8978	286
10	104	3-64	8980L	196
12	65	3-64	8982L	153
14	41	3-64	8984L	118
16	26	3-64	8986L	70

Border Light Cables (Type B)—Same construction as theater and stage cable, but have not jute fillers, and may have more than 3 conductors.

Elevator Lighting and Control Cable.

Type E construction, 2 or more conductors, no smaller than No. 14 B. & S. for lighting, nor No. 16 B. & S. for control cables, insulated with code thickness of rubber and covered with a dry soft cotton braid; conductors twisted together and covered with a supplementary belt of rubber and 1 weatherproof braid, or with no supplementary belt and 3 weatherproof braids.

Automobile Cables.

We are manufacturing a large number of different styles of lighting, ignition and starting cables in various sizes of conductors; insulated with rubber or cambric or a combination of both, braided or armored over all.

These cables can be furnished in single or multiple conductors.



B-5. BRAIDED PRIMARY SINGLE LIGHTING CABLE; ENLARGED



RS-2-W. DUPLEX PRIMARY AND LIGHTING CABLE

Rubber Covered Copper Telephone Wire.

Specifications—The following are considered standard by the larger telephone companies:

No. 14 B. & S. TWISTED PAIR "OUTSIDE DISTRIBUTION WIRE"—Each conductor hard drawn tinned copper wire, insulated to a diameter of $\frac{3}{32}$ in. over rubber and covered with cotton braid, saturated with black weatherproof compound, wax finish, one conductor having a raised tracer to distinguish it from the other.



NO. 14 B. & S. TWISTED PAIR "OUTSIDE DISTRIBUTION WIRE"

No. 18 B. & S. TWISTED PAIR "BRIDLE WIRE"—Each conductor soft drawn tinned copper wire, insulated to a diameter of $\frac{1}{16}$ in. over rubber and covered with cotton braid, saturated with black weatherproof compound, wax finish, 1 conductor having a raised tracer to distinguish it from the other.



NO. 18 B. & S. TWISTED PAIR "BRIDLE WIRE"

No. 19 B. & S. SINGLE CONDUCTOR TWISTED PAIR AND TRIPLE CONDUCTOR "INSIDE" OR "SUBSTATION" WIRE—Conductors soft drawn tinned copper insulated to a diameter of $\frac{3}{32}$ in. over rubber, covered with single hard glazed cotton braid. Single conductors are braided with plain colored cotton, while in the twisted pair 1 conductor contains a differently colored tracer thread, and in triple conductor 2 of the 3 wires contain different colors or different design of tracer threads, thus making no two of conductor braids alike. Sometimes a differently colored cotton braid is used, 1 for each conductor, for purposes of distinction.



NO. 19 B. & S. SINGLE CONDUCTOR TWISTED PAIR, AND TRIPLE CONDUCTOR "INSIDE" OR "SUBSTATION" WIRE

"POT HEAD" WIRES, PLAIN TELEPHONE CONDUCTORS—Furnished in the smaller sizes, Nos. 18, 19, 20 or 22 B. & S., either single conductor or twisted pair. Soft tinned copper conductors insulated to a diameter of $\frac{3}{32}$ in. over rubber without any outer braid or protection. In case of twisted pairs, 1 conductor is sometimes made of a differently colored rubber than the other to discriminate between them.



"POT HEAD" WIRE, PLAIN TELEPHONE CONDUCTOR

DATA, TELEPHONE WIRES, TWISTED PAIRS

Size, B. & S.	Finish	Diam. over rubber, in.	List numbers			Weight per 1000 ft., lbs.
			No test	100 megohms	Over 100 megohms	
14	Braided	11-64	9141	9040	9040A	75
14	Braided	5-32	9145	9045	9045A	68
16	Braided	5-32	9165	9065	9065A	72
16	Braided	9-64	9169	9069	9069A	55
16	Braided	4-32	9164	9064	9064A	40
18	Braided	4-32	9184	9084	9084A	35
18	Braided	7-64	9187	9087	9087A	32
19	Braided	7-64	9197	9097	9097A	30
19	Braided	3-32	9193	9093	9093A	28
20 or 22	Braided	3-32	{ 9120 9122	{ 9020 9022	{ 9020A 9022A	{ 26 20
19	Plain	3-32	{ 9193P 9120P	{ 9093P 9020P	{ 9093B 9020B	{ 20 24
20 or 22	Plain	3-32	{ 9122P 9022P	{ 9022P 9022P	{ 9022B 9022B	{ 24 24

Telephone Cables—Made to include any number of single conductors or twisted pairs of telephone wires either plain or braided, bunched together or laid up concentrically, with a tape or cotton braid or other fibrous covering over all. Frequently incased in lead sheath, or armored. These cables vary greatly in construction and are furnished to buyers' requirements and specifications.

Rubber Covered Iron Telephone Wire, Single Conductor—These conductors are generally No. 12 or 14 B. W. G. galvanized iron wire insulated with code thickness of vulcanized rubber, either single or double cotton braid, weatherproof, saturated and wax polished.



RUBBER COVERED IRON TELEPHONE WIRE, SINGLE CONDUCTOR

Size, B. W. G.	Thickness rubber, in.	SINGLE BRAID		DOUBLE BRAID	
		List number	Weight per 1000 ft., lbs.	List number	Weight per 1000 ft., lbs.
12	$\frac{1}{16}$	1512	100	1512A	140
14	$\frac{1}{8}$	1514	75	1514A	100

When furnished in twisted pairs, 1 conductor contains a raised tracer thread to distinguish it from the other conductor.

Other Styles of Telephone Wire—SPIDER WIRE—The accepted interpretation of this term is synonymous with "bridle wire," except that it is used singly instead of in pairs. Braids and finish are the same.

DROP WIRE—No. 14 B. & S. twisted pair, $\frac{5}{32}$ in. over insulation, with black saturated weatherproof braid, and raised marker in 1 conductor. Hard drawn copper. This service involves the drop from the pole terminal to the house bracket. No. 16 B. & S. insulated to $\frac{4}{32}$ in. is extensively used, but on account of the severe service to which this type of wire is put, necessitating great resistance to climatic conditions, No. 14 B. & S. is considered the standard, because of increased tensile strength.

JUMPER WIRE—This is often confused with spider and "bridle wire" in outside construction, but by the more general acceptance of the term, it applies to the wire used for cross connecting service on the main distributing frame. It is usually a No. 20 or No. 22 B. & S. wire insulated to $\frac{3}{32}$ in. with flameproof braids; if twisted pair, 1 is red and 1 is white.

Rubber Covered Wires and Cables.

Used for general interior light and power wiring.

The conductor consists of uniformly soft annealed commercially pure copper wire, insulated with code thickness of high grade vulcanized rubber protected with closely woven, strong, and elastic cotton braids saturated in waterproof compound.

All conductors are thoroughly and evenly coated with tin to protect the copper from any injurious effect from the sulphur in the rubber insulation.

Grades of Rubber Insulation—Three standard grades of rubber compound are made for rubber covered conductors. In addition, the company insulates wire to any specifications covering particular requirements, such as 20% or 40% rubber compounds.

AMERICORE RUBBER COVERED WIRE—This grade meets all requirements of the National Electrical Code. It is recommended for all service conditions in which the working pressure is 7000 volts or under.

AMPARAK RUBBER COVERED WIRE—This is an "intermediate" grade commonly known as *engineers'* wire. The insulation is of a high grade of compound made to suit the demand of engineers and architects desiring a better wire than Americore but not so high a quality as Amerite. This grade is recommended especially for open wiring (knob and tube system) in dwellings, industrial plants, etc.

AMERITE RUBBER COVERED WIRE—This is the highest grade of rubber covered wire. It answers all requirements of the 30% Para rubber grade. It is used for high voltage circuits. It has great strength and elasticity, high insulating qualities, and long life.

Identification—Every wire insulated with the company's standard compounds has a distinguishing woolen tracer thread placed lengthwise of the conductor between the rubber and the braid as follows: Americore, *uncolored* thread; Amparak, *dark green*; Amerite, *crimson*.

Americore Rubber Covered Wires and Cables.

This wire is made to comply with the National Electrical Code requirements and every coil is regularly examined and labeled under the supervision of the Underwriters' Laboratories, Inc. A strictly high grade wire for interior light and power wiring.



AMERICORE WIRE
Solid tinned copper conductor

DATA, AMERICORE WIRE
Solid tinned copper conductor

Gage (B. & S.)	Thickness of insulation in in., for					
	0 to 600 volts Type R. S.	600 to 1500 volts Type R. S.-15	1500 to 2500 volts Type R. S.-25	2500 to 3500 volts Type R. S.-35	3500 to 5000 volts Type R. S.-50	5000 to 7000 volts Type R. S.-70
14-8.....	3-64	1-16	3-32	4-32	6-32	8-32
7-2.....	1-16	5-64	3-32	4-32	6-32	8-32
1-0000.....	5-64	3-32	7-64	4-32	6-32	8-32
Cir. mils.						
225,000 to 500,000.....	3-32	7-64	1-8	9-64	6-32	8-32
525,000 to 1,000,000.....	7-64	1-8	9-64	10-64	6-32	8-32
Over 1,000,000.....	1-8	9-64	10-64	11-64	7-32	9-32

NOTE—Type R. S. as given above signifies single braid rubber covered wire. Double braid or tape and braid would be designated as Type R. D.



AMERICORE CABLE, STRANDED TINNED COPPER CONDUCTOR

DATA, AMERICORE RUBBER COVERED WIRES AND CABLES

Size, B. & S.	Thickness of rubber, in.	SOLID		STRANDED		Standard packages, amounts, ft.	
		List number	Weight per 1000 ft., lbs.	Number wires in strand	List number		Weight per 1000 ft., lbs.
SINGLE BRAID							
4/0	5-64	810C	784	19	557	832	1000 Reels
3/0	5-64	810B	633	19	558	678	1000 Reels
2/0	5-64	810A	517	19	559	550	1000 Reels
1/0	5-64	810	423	19	560	454	1000 Reels
1	5-64	811	348	19	561	372	1000 Reels
2	4-64	812	268	7	562	289	1000 Reels
3	4-64	813	221	7	563	237	1000 Reels
4	4-64	814	183	7	564	197	1000 Reels
5	4-64	815	152	7	.....	.....	1000 Reels
6	4-64	816	127	7	566	137	1000 Reels
8	3-64	818	80	7	568	86	500 Coils
10	3-64	820	57	7	570	61	500 Coils
12	3-64	822	42	7	572	45	500 Coils
14	3-64	824	32	7	574	34	500 Coils
16	2-64	826	19	.....	.....	.....	500 Coils
18	2-64	828	15	.....	.....	.....	500 Coils
DOUBLE BRAID							
4/0	5-64	850C	820	19	867	871	1000 Reels
3/0	5-64	850B	666	19	868A	715	1000 Reels
2/0	5-64	850A	547	19	869	583	1000 Reels
1/0	5-64	850	450	19	870	485	1000 Reels
1	5-64	851	374	19	871	400	1000 Reels
2	4-64	852	291	7	872	314	1000 Reels
3	4-64	853	242	7	873	260	1000 Reels
4	4-64	854	201	7	874	218	1000 Reels
5	4-64	855	169	7	.....	.....	1000 Reels
6	4-64	856	144	7	876	155	1000 Reels
8	3-64	858	94	7	878	101	500 Coils
10	3-64	860	69	7	880	74	500 Coils
12	3-64	862	53	7	882	57	500 Coils
14	3-64	864	42.2	7	884	44.8	500 Coils
16	2-64	866	25	.....	.....	.....	500 Coils
18	2-64	868	20	.....	.....	.....	500 Coils



AMERICORE FEEDER CABLE

Capacity in cir. mils.	Number and diam. of wires in strand, in.	Thick-ness of rubber, in.	Diam. over tape and braid, in.	List number single braid	Weight per 1000 ft., lbs.	Shipped on reel number
250,000	37x.0822	3-32	56-64	340	1018	1013
300,000	37x.0901	3-32	59-64	341	1194	1013
350,000	37x.0973	3-32	62-64	342	1368	1013
400,000	37x.1040	3-32	65-64	343	1541	1013
450,000	37x.1103	3-32	68-64	344	1714	1020
500,000	37x.1162	3-32	72-64	345	1894	1020
600,000	61x.0992	7-64	79-64	346	2282	1020
750,000	61x.1109	7-64	86-64	347	2795	1020
1,000,000	61x.1280	7-64	96-64	348	3640	1021
1,250,000	91x.1172	8-64	107-64	348A	4534	1021
1,500,000	91x.1284	8-64	115-64	349	5406	1015
2,000,000	127x.1255	8-64	129-64	349A	7062	.....

Shipped in reels containing 1000 ft. lengths.

AMERICORE LIGHT INSULATION FIXTURE WIRE

Solid tinned copper conductor, rubber insulation, single braid, black finish

Size, B. & S.	Thickness of rubber, in.	Diam. over braid, in.	List number	Standard coils, ft.
12	1-64	9-64	.....	500
14	1-64	8-64	8004	500
16	1-64	6-64	8006	1000
18	1-64	5-64	8008	1000
19	1-64	5-64	.....	1000
20	1-64	5-64	.....	1000

Americore Rubber Covered Switchboard Cables.

Specifications—Tinned annealed extra flexible strand of highest conductivity, insulated with code thickness of high grade vulcanized rubber, protected, with 1 or 2 smooth closely woven cotton braids, saturated in black weatherproof compound and smoothly finished. For switchboard, brush holder and similar connections where very flexible cables are required.

AMERICORE RUBBER COVERED SWITCHBOARD CABLE

National Electrical Code Standard; low potential, 0-600 volts; Class A

Size, B. & S.	Number of wires in strand, in.	Thick-ness of rubber, in.	Diam. over single braid, in.	Diam. over double braid, in.	List number		Weight per 1000 ft.		Standard pack-ages, amounts, ft.
					Single braid	Double braid	Single braid	Double braid	
1	259	5-64	37-64	40-64	221	271	376	406	1000
2	210	4-64	33-64	36-64	222	272	302	329	1000
3	151	4-64	30-64	33-64	223	273	231	255	1000
4	133	4-64	27-64	30-64	224	274	210	231	1000
6	82	4-64	23-64	26-64	226	276	144	163	1000
6	49	4-64	23-64	26-64	226A	276A	145	164	1000
8	49	3-64	19-64	22-64	228	278	87	101	500
9	40	3-64	18-64	21-64	229	279	73	87	500
10	19	3-64	17-64	20-64	230	280	61	74	500
12	19	3-64	15-64	18-64	232	282	45	57	500
14	19	3-64	14-64	17-64	234	284	34	45	500

Americore Twin Rubber Covered Wire and Cable.

Specifications—Tinned annealed copper wires or strands of highest conductivity, each conductor insulated with code thickness of high grade vulcanized rubber, protected by saturated braid; 2 such finished conductors laid parallel and covered with heavy cotton braid over all, saturated in black weatherproof compound. Special finish for conduit work.

AMERICORE TWIN RUBBER COVERED WIRE**AMERICORE TWIN RUBBER COVERED CABLE****DATA, AMERICORE TWIN RUBBER COVERED WIRES AND CABLES**

Size, B. & S.	Thickness of rubber, in.	SOLID CONDUCTOR		STRANDED CONDUCTOR			Shipped on reel number
		List number	Weight per 1000 ft., lbs.	Number wires	List number	Weight per 1000 ft., lbs.	
0000	5-64	917	1653	19	687	1762	1020
000	5-64	918	1328	19	688	1444	1013
00	5-64	919	1091	19	689	1176	1013
0	5-64	920	896	19	690	966	1013
1	5-64	921	743	19	691	796	1002
2	4-64	922	576	7	692	622	1002
3	4-64	923	479	7	693	513	1002
4	4-64	924	399	7	694	431	335
5	4-64	925	334	7	695	362	335
6	4-64	926	280	7	696	301	335
8	3-64	928	181	7	698	195	1004
10	3-64	930	123	7	700	141	Coils
12	3-64	932	92	7	702	107	Coils
14	3-64	934	71	7	704	83	Coils
16	2-64	936	.....	.....	.....	.....	Coils
18	2-64	938	.....	.....	.....	.....	Coils

Underwriters' rules permit use of above in sizes No. 14 and larger. No. 6 and larger shipped on reels containing 100-ft. lengths; smaller sizes shipped in coils containing 500-ft. lengths.

Industrial Plant Wiring.

While factory wiring does not often have to be concealed, nor to be so neatly installed as in a residence, its installation is not on this account as simple as it seems.

Two Requirements—The primary requirement of factory wiring is to serve as the reliable means of furnishing energy to motors, lamps, heating devices, etc. Power is one of the chief requisites in modern manufacturing; having provided a reliable source of electric power, the wiring for distributing it about the plant must be at least as dependable. The second requirement of the wiring is that it must be safe and free from fire or accident hazards because of the large number of employees that may be at work in the plant and of whom only very few know much about electricity and how to guard against shock or fire from its use. It is in order to provide safety from these hazards that the rules governing factory wiring in the national and local electrical codes have steadily been made more stringent.

Two Principal Systems—There are two principal wiring systems used in factory buildings: (1) open wiring, in which the insulated wires are supported on porcelain knobs or cleats and are not enclosed in any protection except where exposed to probable injury, and (2) conduit wiring in which the wires are run in metal ducts that are either exposed on ceilings, walls or columns, or concealed in walls and floors, or partly exposed and partly concealed. Conduit wiring is obviously more expensive, but much safer and more reliable because wires are completely protected from mechanical injury, from accumulations of dust, etc. Because of its superior safety, conduit wiring is insisted on for factory buildings in the largest cities and is coming more and more into use everywhere.

Selection of System—Selection of the wiring system depends on nature of the building construction and on character of the manufacturing process carried on. In general, it may be said that the less expensive open wiring system may be used in any factory building where no special effort at fireproofing has been made and in which no hazardous materials or processes are used and, further, where wires may be so arranged that they will not be readily disturbed. If building is of substantially fireproof construction, open wiring is entirely out of place because every feature of the wiring also should be practically fireproof. If so-called mill construction is used, open wiring may be used with slow burning insulation on wires. Conduit wiring may be used in almost any type of building; but is especially desirable in concrete or other fireproof buildings. In factories or mills where explosive or other hazardous materials are being handled conduit wiring is absolutely essential. Examples are flour mills, grain elevators, powder plants, certain chemical works, oil works, many textile mills, etc.

Economy Precautions—Several precautions should be observed in laying out the system in order to promote economy in first cost of installation and in making future additions; this is especially important in concealed conduit systems. Circuits should be run as direct and as free of bends as possible. All wires for a circuit should be run in the same conduit, especially if alternating current is used. Distribution, junction, cut-out and switch boxes or cabinets should be of ample size to accommodate additional feeders and branch circuits that it may be anticipated to add later, even if these are not installed for some time. This may be easily done by having these boxes of ample size, and provided with blank knockouts to permit ready addition of other

feeders or branches without interfering with existing service. If such provision is neglected, troublesome interference, delay and much extra expense may be involved when the additional circuits are needed. In the case of concealed conduit in a concrete building it pays to install ample conduit runs for any possible future demands because of the obvious cost and trouble to put in extra conduit unless the latter is exposed. Wire may be pulled into such extra conduit whenever needed.

Separate Feeders for Lighting and Power—Separate feeders should always be installed for lighting and power.

The first reason for this is that starting and stopping of motors causes serious fluctuation of the circuit voltage; large changes of load also produce such fluctuations, which are very noticeable in the light emitted by lamps. Flickering light is very annoying to the eye and may produce errors or accidents.

The second reason is that motor circuits are more often overloaded or short circuited, and therefore interrupted by blowing of fuses, than lighting circuits. Any combination of lighting and power circuits on the same feeder is therefore liable to cause troublesome cutting off of the light that might lead to confusion, accidents or even panic, if many, or if easily terrified women employees were involved in a large shop.

Illumination Requirements Must Be Determined—In laying out lighting circuits, the illumination requirements of different rooms must first be known. These depend on the kind of work done, size and light absorbing conditions of the room and on the nature of the lighting equipment selected. On account of these variables, power consumption for lighting ranges from 0.5 to 2.5 watts per sq. ft. in different departments of different plants.

For any chosen lighting intensity and related conditions it is possible to find the corresponding unit watt consumption. Assume it to be 1.2 watts per sq. ft.; the floor area in square feet multiplied by 1.2 will then give total wattage to be provided for the room in question. Not more than 660 watts is allowed on any ordinary lighting circuit. From these facts it is possible to lay out the requisite circuits, arrangement of which in a large room should usually permit switching on the lamps in rows parallel to the windows, so those farthest from the windows may be turned on first.

The table on following page shows capacity of different sizes of wires as lighting feeders.

The second column gives capacity of the wire in amperes, the third column gives it in watts based on 220 volts between the outer wires.

The last six columns give number of 25-, 40-, 50-, 60-, 75- and 100-watt lamps, respectively, that can be supplied by the particular size of wire. The neutral wire is not taken into account, serving chiefly as a means for overcoming unbalance.

These capacities have nothing to do with the branch circuits, which are normally limited to 660 watts.

Independent System for Emergency Lighting—Since failure of light at a critical time, as at the outbreak of a fire, might easily contribute to serious loss of life in a factory with many employees, because of the great difficulty in finding exits in a dark, smoke filled room, a number of communities require installation of an independent system for emergency lighting. This is an excellent provision in any medium size or large plant. Such a system should have separate circuits and be fed from a source separate from that normally supplying the lighting.

If the plant has its own powerhouse, emergency lighting should be fed from a central station or other external source. If the plant uses central station supply, a separate service should furnish emergency lighting. This lighting should include all exit and stairway lights and enough special lights on each large floor to permit finding the way to the nearest exit.

Laying Out Power Circuits—Laying out power circuits where there are many motors and of different sizes is often a difficult problem. Since the power load is almost invariably many times greater than the lighting load in a factory, even greater care in laying out the power feeders and branch circuits is necessary than for the layout of the lighting, because not only would there be a waste in first cost of unnecessary length of heavy cable or wire but also in needless power loss in overcoming resistance.

Rules for finding the size of wire to run to any motor are quite well known and many tables have been published both for direct current and alternating current motors. It is usual to allow not only for efficiency of motor, but also for at least 10% over full load current because the starting current, though usually of brief duration, is frequently three times the full load current. Obviously, if motor is started at short intervals, or if it is subjected to frequent overloads, wire size has to be larger, else overheating of conductors would ensue.

The kind of service motor is to render, type of motor and its rating must be taken into account in determining wire size.

There are conflicting rules and opinions about sizes of mains supplying more than one motor. Insurance inspectors are inclined to require a heavier size of main than many municipal or central station inspectors. Among the former a common rule is to have the main provide for 110% of full load for largest motor plus full load for the other motors of the group. Other inspectors are inclined to allow for the demand factor of motor group; this usually permits of smaller wire size and is legitimate, provided the prospective demand factor is definitely known and remains so after installation. On account of the uncertainty of this it is better to be on the safe side and provide mains of ample size to prevent overheating, which is not only dangerous, but represents needless power loss and reduced voltage and speed for the motors.

In some large plants motor mains are run on the ceiling to a junction box, from which branch circuits are dropped to individual motors. This is economical of wire, but requires fuses in the junction box, which is here located in a relatively inaccessible place, so that blowing of a fuse may represent much delay before motor can be put back in service. It is preferable to run the mains as risers to distributing boxes or panels on wall or columns where fuses may be quickly replaced.

Starting Device—For all but small motors over a minimum that depends on the type of motor, kind of service it performs and source of supply, it is necessary to provide a starting rheostat, compensator or other starting device to permit motor to come up to speed gradually without drawing an excessive starting current. This starter should be placed as convenient to the control point as possible; if it is at some distance from a large motor, an automatic remote control system may save considerable heavy wiring.

The starting device must have an automatic no-voltage release to prevent possible burnout of the motor if power is suddenly restored while motor switch and

CAPACITY OF WIRES FOR LIGHTING FEEDERS

Brown & Sharpe wire gage	Ampere capacity	3-Wire System, 220-110-220						
		Feeder wattage	Lamp Wattage					100
			25	40	50	60	75	
14	15	3,300	132	82	66	55	44	33
12	20	4,400	176	110	88	73	58	44
10	25	5,500	220	137	110	91	73	55
8	35	7,700	308	192	154	128	102	77
6	50	11,000	440	275	220	183	146	110
4	70	15,400	616	385	308	256	205	154
3	80	17,600	704	440	352	293	234	176
2	90	19,800	792	495	396	330	264	198
1	100	22,000	880	550	440	366	293	220
0	125	27,500	1,100	687	550	458	366	275
00	150	33,000	1,320	825	660	550	440	330
000	175	38,500	1,540	962	770	641	516	385
0000	225	49,500	1,980	1,237	990	825	660	495
250,000 C.M.	240	52,800	2,112	1,320	1,056	880	704	528
300,000	275	60,500	2,420	1,512	1,210	1,008	806	605
350,000	300	66,000	2,640	1,650	1,320	1,100	880	660
400,000	325	71,500	2,860	1,787	1,430	1,191	953	715
450,000	372	81,840	3,272	2,040	1,636	1,364	1,090	818
500,000	400	88,000	3,520	2,200	1,760	1,466	1,173	880
550,000	425	93,500	3,740	2,337	1,870	1,558	1,246	935
600,000	450	99,000	3,960	2,475	1,980	1,650	1,320	990
650,000	475	104,500	4,180	2,612	2,090	1,741	1,393	1,045
700,000	500	110,000	4,400	2,750	2,200	1,833	1,466	1,100
750,000	525	115,500	4,620	2,887	2,310	1,925	1,540	1,155
800,000	550	121,000	4,840	3,025	2,420	2,016	1,613	1,210
900,000	600	132,000	5,280	3,300	2,640	2,200	1,760	1,320
1,000,000	650	143,000	5,720	3,575	2,960	2,383	1,906	1,430
1,250,000	750	165,000	6,600	4,125	3,300	2,750	2,200	1,650

circuit is closed. Stopping of motor should preferably be by opening the main switch, which may be done by remote control from several stations about the driven machine.

Installation of Open Wiring System—Installation of an open wiring system is relatively simple. The wires must have either a rubber, slow burning, or slow burning weatherproof insulation; rubber covered wires smaller than No. 6 may have a single outer braid, but No. 6 or larger must have a double braid. In very moist rooms rubber insulation is required. In places where there are corrosive vapors, insulation may be either rubber or weatherproof; in the latter case a coating of shellac or varnish is sometimes applied over the wires after they have been put up.

In all cases, wires must be properly supported and spaced. Where exposed to mechanical injury they must be protected by conduit, running boards of guard strips.

Installation of Conduit Wiring System—Installation of conduit wiring is not very difficult when done by a skilled wireman. Rubber covered wiring is used almost exclusively, unless temperature of room is quite high when slow burning insulation is required. In places where there is liability for condensation inside the conduits due to changes of temperature, as in cold storage or refrigerating rooms, conduit must be well drained or open wiring with suitable guard strips where necessary must be used.

The growing use of conduit systems in industrial plants is causing electricians quite generally to gain the requisite experience and skill needed for its proper installation. Its almost universal use in the future is therefore to be expected.

Americore Car Cables.

This cable is used for both power and light circuits in electric cars and motor lead cables. It differs from the other rubber insulated conductors already described, in having a layer of fine cotton or paper wound on the conductor underneath the rubber which is easily removed and which leaves the conductor clean for jointing.

Specifications—Consist of tinned annealed copper strand of highest conductivity, over which is placed a wind of fine cotton or paper and a code thickness of vulcanized rubber insulation. This is protected by a closely woven cotton braid, thoroughly saturated with black weatherproof compound and finished smooth.



AMERICORE CAR CABLE

National Electrical Code Standard

Stranded tinned conductor, rubber insulation, single braid, black finish. For low potential 0-600 volts

Size, B. & S.	Number and diam. of wires in strand, in.	Thickness of rubber, in.	Diam. over braid, in.	List number	Standard packages, amounts, ft.	Shipped on
2	19 x .0592	4-64	31-64	2502	1000	Reels
3	19 x .0526	4-64	29-64	2503	1000	Reels
4	49 x .0292	4-64	29-64	2504	1000	Reels
4	7 x .0772	4-64	27-64	2504A	1000	Reels
6	49 x .023	4-64	25-64	2506	1000	Reels
6	7 x .0612	4-64	24-64	2506A	1000	Reels
8	7 x .0485	3-64	20-64	2508	500	Coils
10	7 x .0385	3-64	18-64	2510	500	Coils
12	7 x .0306	3-64	17-64	2512	500	Coils
14	7 x .0243	3-64	16-64	2514	500	Coils

Americore Fireproof Cables.

This wire is placed before the public at the suggestion of many superintendents of electric light companies who are using it for wiring their stations. It is fireproof in the sense that the braid will not ignite or carry flame.

Specifications—Tinned annealed copper strand of highest conductivity, insulated with required thickness of high grade vulcanized rubber, protected with 2 smooth, closely woven strong heavy cotton braids, each of which is thoroughly saturated in white flameproof compound, smoothly finished.



AMERICORE FIREPROOF CABLE

Stranded tinned copper conductor, double braid, white finish. For high potential, exposed arc lighting and station wiring

Size, B. & S.	Number and diam. of wires in strand, in.	For 1/2 in. rubber		For 3/4 in. rubber		Shipped on
		Approx. diam. over braid, in.	List number	Approx. diam. over braid, in.	List number	
0000	37 x .0756	59-64	887	63-64	987	Reels
000	19 x .0940	55-64	888	59-64	988	Reels
00	19 x .0836	52-64	889	56-64	989	Reels
0	19 x .0746	49-64	890	53-64	990	Reels
1	19 x .0663	46-64	891	50-64	991	Reels
2	19 x .0592	42-64	892	47-64	992	Reels
4	7 x .0772	39-64	894	43-64	994	Reels
6	7 x .0612	35-64	896	39-64	996	Reels
8	7 x .0485	33-64	898	37-64	998	Reels

Flat Steel Taped Park or Suburban Cables.

These are either rubber, cambric or paper insulated. This type of cable is becoming standard for lighting purposes in parks and boulevards, suburban ornamental lighting, private estates, service laterals and pole connections, and in places where installation is difficult or impossible owing to the absence of ducts. It is installed by being laid in trenches 15 to 30 in. deep (depending on locations), and sufficient in width to permit cables being laid at this depth. This style of cable is not only economical and easy to install, but really makes a safe and reliable substitute for the more expensive conduit system.

Steel taped cables carry their own protection. Being lead covered, they are waterproof. A serving of saturated jute is placed over the lead covering and two steel tapes of suitable width are laid spirally in the same direction with an additional serving of saturated 2-ply jute on the outside. The cable is then drawn through a bath of hot preservative compound and compressed, giving it a smooth and hard finish. Note illustrations:



Single Conductor



Twin Conductors



Three Conductors

FLAT STEEL TAPED PARK OR SUBURBAN CABLES
Rubber, cambric, or paper insulated

The jute and steel armoring protect the cable against mechanical injury and thus permit of its being laid in the trenches, which are afterwards filled with sand and gravel. However, it is desirable to give such cables an additional protection, by putting a layer of sand beneath and over the cable as it is laid in the trench, tamping the sand tightly around the cable, and putting in place a covering of brick or plank before the trench is filled up with gravel. Such extra precaution protects the cable from damage from picks, etc., in case of future excavations.

These cables are usually shipped from the factory in long lengths on reels which, when received at destination, are mounted on a shaft with 2 wheels or on a truck alongside of trench and, as the reel is being pulled forward, the cable is unwound and laid into the open trench, thus avoiding the necessity of making many joints. Where joints are required, the same method is followed as in all other lead covered cables and, in addition to this, a split cast iron joint box (straightaway or branch—details covering jointing material on application) is put over the lead sleeve and protects it against injury.

Cables of this kind can be constructed with any desired number or size of conductors. Each conductor

is insulated with a suitable thickness of rubber, cambric, or paper, to meet any standard commercial working voltage.

The standard requirements for single-conductor are in sizes No. 8 B. & S. gage up to 1,000,000 circular mils. Twin-conductor in sizes from No. 8 B. & S. gage up to 500,000 circular mils. Three-conductor in sizes from No. 8 B. & S. gage up to 4/0 B. & S. gage.

If the number of joints and other details are stated, a sufficient amount of jointing material—such as tinned copper jointing sleeves, insulation, filling compound and cast iron joint boxes of proper dimensions, can be furnished.

For low working potentials, the practice of using lead sleeves, solder wiped, can be eliminated, as the joint can be made within the split cast iron joint box, which, after the completion of the joint, is filled with hot insulating compound and, after cooling, makes the joint absolutely waterproof.

All our steel taped cables are subjected to a factory test equal to two and one-half times the working voltage, also high insulation resistance guaranteed.

STANDARD SHIPPING LENGTHS OF CABLES AND OUTSIDE DIAMETERS

Outside diam., in. . .	.75	1.00	1.25	1.50	1.75	2.00	2.25 and over
Length, ft.	2000	1750	1500	1200	1000	800	700

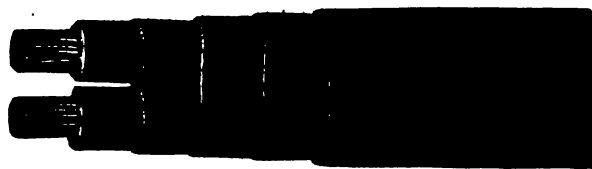
Inquiries—We make such a great variety of electric light and power cables, they are made in so many different sizes and with so many different thicknesses of insulation and finished in so many different ways that it would be impracticable to attempt to tabulate them all. This class of our product is making an enviable record and is well and favorably known in all parts of the country.

Inquiries containing full information are solicited.

If desired, can furnish competent men to make installations at a reasonable charge.

Americore and Globe Mining and Machine Cables.

Specifications—Consist of 2 flexible strands of tinned annealed copper of highest conductivity, each of which is insulated with code thickness of vulcanized rubber and protected with a braid of cotton saturated with weatherproof compound. The 2 finished cables are then placed side by side and covered with 2 or 3 strong cotton braids, thoroughly saturated in weatherproof compound.



MINING MACHINE CABLE
For low potential, 0-600 volts

Size, B. & S.	Number wires in strand	Thickness of rubber, in.	Weight per 1000 ft., 2-braid, lbs.	Weight per 1000 ft., 3-braid, lbs.	List number			Shipped on reel number
					Americore insulation 2 outer braids	Americore insulation 3 outer braids	Globe insulation 3 outer braids	
2	49	4-64	687	721	1442	942	1342	1002
3	49	4-64	573	605	1443	943	1343	1002
4	49	4-64	478	510	1444	944	1344	335
5	49	4-64	407	437	1445	945	1344A	335
6	49	4-64	348	376	1446	946	1346	335
8	49	3-64	212	233	1448	948	1348	1004
9	49	3-64	191	212	....	949	1348A	1004
10	49	3-64	164	186	....	950	1350	1004

While this cable is commonly used in sizes from 2 to 10 B. & S., other sizes will be made to specifications. Hard spun cotton cord braids will be substituted for the regular cotton braid at a slightly advanced price, when same is required for extra hard usage.

Americore Concentric Mining Machine Cable.

Specification A—Inner conductor is composed of 49 (7 x 7) tinned copper wires, insulated with rubber; this is finished with a tape or a braid; around this are placed tinned copper wires to equal in area the central conductor. A belt of rubber (code thickness) is then applied, and the whole finished with 3 braids or a tape and 2 braids—black finish.

Specification B—Same as A, without the outside belt of rubber.



DUPLEX CONCENTRIC STRANDED MINING MACHINE CABLE
For low potential, 0-600 volts

Size B. & S.	Number of wires in central conductor	Thickness of rubber, in.	Weight per 1000 ft., lbs.
CONSTRUCTION A			
2	49	$\frac{3}{16} \times \frac{3}{16}$	765
3	49	$\frac{3}{16} \times \frac{3}{16}$	615
4	49	$\frac{3}{16} \times \frac{3}{16}$	574
5	49	$\frac{3}{16} \times \frac{3}{16}$	500
6	49	$\frac{3}{16} \times \frac{3}{16}$	430
8	49	$\frac{3}{16} \times \frac{3}{16}$	266
CONSTRUCTION B			
2	49	$\frac{3}{16}$	634
3	49	$\frac{3}{16}$	520
4	49	$\frac{3}{16}$	458
5	49	$\frac{3}{16}$	380
6	49	$\frac{3}{16}$	313
8	49	$\frac{3}{16}$	200

Amerite High Grade 30% and Special Rubber Insulated Wires and Cables.

For station wiring, arc light and signal service, street railroad feeders and high voltage power transmission lines.

Rubber covered wires and cables made to the most exacting specifications; in any size or finish and for all services and voltages.

Insulated with rubber compounds containing only highest grades of Para rubber and other necessary preservative ingredients. The exact composition of rubber compound used and thickness of rubber insulation in every case determined by working voltage and by nature of service.

Conductors furnished solid, stranded or extra flexible as ordered, annealed and heavily tinned.

Signal Wires and Cables—Made to meet, in every respect, the rigid specifications of the Railway Signal Association. Insulated with 30% Para rubber or higher grade, as required by leading railroads.



Solid Conductor, Insulated and Braided



Twin Wires, Insulated and Braided



Armored Torpedo Cable
SIGNAL WIRES AND CABLES

These signal wires and cables may consist of single rubber covered conductors or of any number of such conductors stranded into a cable.

AMERITE RUBBER COVERED SIGNAL WIRES

30% Fine Para Rubber Compounded

MEG OHMS PER MILE AFTER A ONE-MINUTE ELECTRIFICATION AT 60° FAHR.

Circular mils	Thickness of insulation, in.									
	3-64	2-32	5-64	3-32	7-64	4-32	5-32	6-32	7-32	8-32
1,000,000	.....	.....	.....	.....	650	725	900	1025	1150	1350
900,000	.....	.....	.....	.....	675	750	925	1100	1250	1400
800,000	.....	.....	.....	.....	700	800	950	1150	1300	1450
700,000	.....	.....	.....	.....	750	850	1000	1200	1400	1550
600,000	.....	.....	.....	.....	800	900	1100	1300	1450	1650
500,000	.....	.....	.....	.....	750	850	950	1150	1400	1550
400,000	.....	.....	.....	.....	850	950	1100	1300	1500	1700
300,000	.....	.....	.....	.....	950	1100	1200	1400	1700	1900
250,000	.....	.....	.....	.....	1000	1150	1300	1550	1800	2050
Gage (B. & S.) stranded										
4-0	.....	.....	1000	1200	1300	1450	1750	2000	2250	2600
3-0	.....	.....	1050	1300	1450	1600	1850	2250	2500	2800
2-0	.....	.....	1200	1450	1600	1750	2100	2350	2700	3050
1-0	.....	.....	1300	1550	1750	1950	2250	2600	2950	3250
A. W. gage (B. & S.) solid										
1	.....	.....	1600	1850	2100	2350	2750	3100	3500	3825
2	.....	1500	1750	2000	2300	2550	3000	3350	3750	4150
3	.....	1600	1850	2250	2500	2750	3250	3700	4050	4500
4	.....	1750	2100	2500	2750	3000	3500	3950	4300	4700
5	.....	1950	2300	2700	3000	3250	3750	4250	4600	5050
6	.....	2100	2500	2850	3250	3500	4050	4500	4950	5400
8	1800	2500	3000	3350	3750	4100	4700	5200	5600	5950
9	2000	2750	3250	3600	4050	4350	5000	5500	6000	6400
10	2400	3000	3500	3900	4350	4700	5300	5850	6300	6800
12	2700	3500	4000	4500	4950	5300	6000	6550	7000	7550
14	3000	4050	4600	5100	5600	6000	6750	7300	7800	8300

MEG OHMS PER 1000 FT. AFTER A ONE-MINUTE ELECTRIFICATION AT 60° FAHR.

Circular mils	Thickness of insulation, in.									
	3-64	2-32	5-64	3-32	7-64	4-32	5-32	6-32	7-32	8-32
1,000,000					3430	3830	4750	5420	6080	7140
900,000					3560	3960	4880	5810	6600	7400
800,000					3700	4230	5020	6070	6870	7650
700,000					3960	4480	5280	6350	7400	8200
600,000					4230	4750	5810	6870	7650	8720
500,000					4480	5020	6070	7400	8200	9000
400,000					4480	5020	5810	6870	7920	9000
300,000					5020	5810	6350	7400	9000	11350
250,000					5280	6070	6870	8200	9500	11900
A. W. gage (B. & S.) stranded										
4-0			5280	6350	6870	7650	9250	10550	11900	13750
3-0			5550	6870	7650	8450	9770	11900	13200	14800
2-0			6350	7650	8450	9250	11100	12400	14250	16100
1-0			6870	8200	9250	10300	11900	13750	15600	17200
A. W. gage (B. & S.) solid										
1			8450	9770	11100	12400	14520	16400	18500	20200
2		7920	9250	10550	12150	13500	15900	17700	19800	21900
3		8450	9770	11900	13200	14520	17200	19600	21400	23800
4		9250	11100	13200	14520	15900	18500	20800	22700	24800
5		10300	12150	14250	15900	17200	19800	22450	24300	26700
6		11100	13200	15050	17200	18500	21400	23800	26150	28500
8		13200	15900	17700	19800	21650	24800	27500	29600	31450
9	10560	14520	17200	19000	21400	23000	26400	29050	31700	33800
10	12700	15900	18500	20600	23000	24800	28000	30900	33300	35900
12	14250	18500	21100	23800	26150	28000	31700	34600	37000	39900
14	15900	21400	24300	27000	29600	31700	35650	38600	41200	43800

VOLTAGE TESTS FOR A FIVE-MINUTE PERIOD

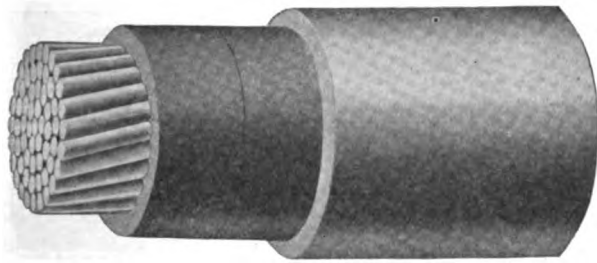
A. W. gage (B. & S.)	Thickness of insulation, in.									
	3-64	2-32	5-64	3-32	7-64	4-32	5-32	6-32	7-32	8-32
14 to 2	.....	.....	.....	.....	7500	9000	10500	13500	16300	19200
1 and larger	3000	4500	6000	7500	9000	10500	12500	14250	17250	20250

Electric Light and Power Cables, Lead Incased or Armored.

These are made in all types, aerial, underground and submarine. Made to the most rigid specifications, in any quantity, size or length, for any voltage, and finished for any service, single or multiple conductor or concentric laid.

Only the very best of materials enter into the construction of these cables.

Continued on next page.



AMERICORE LEAD INCASED CABLE
Stranded tinned copper conductor, rubber insulated, taped and lead incased

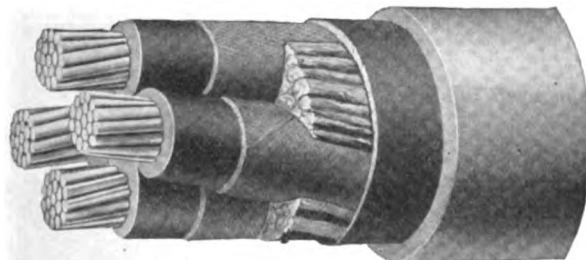


AMERICORE LEAD INCASED CABLE
Solid or stranded tinned copper conductor, rubber insulated, taped and lead incased

Rubber Insulated, Lead Covered Cables—We make a specialty of heavy rubber cables, lead sheathed, armored, or lead incased and armored, for all services and voltages, and finished in any style.

These are made to meet the most exacting requirements, such as those specified for government and for railway signal service, underground, submarine, or aerial.

While taped and braided rubber wires and cables are used for inside and submarine service with entire satisfaction without any lead sheathing, experience has demonstrated the advisability of enclosing the cable in a sheath whenever it is to be used in conduits for underground work, or where it would be exposed to acids, gases, extreme temperature changes, or other destructive agencies.



AMERICORE LEAD INCASED CABLE
4-conductor, stranded, rubber, tape, jute and lead

Any number of rubber insulated conductors can be stranded into a core or cable, the interstices between the conductors usually being rounded out with jute fillers. In this condition the cable is ready for the application of the tape and lead sheath, or as sometimes required, a supplementary belt of rubber insulation, and then the tape and sheath or other protection.

All copper conductors are annealed thoroughly and heavily and evenly tinned, and have a guaranteed conductivity of 98% or better.

Rubber insulated cables may be finished in any one of the following ways, as may be specified:

Taped and leaded.

Taped, leaded and braided, weatherproof, soapstone or flameproof finish.

Taped, leaded and juted.

Taped, leaded, juted and armored.

Taped, leaded, juted, armored and juted.

Taped, juted and armored.

Taped, juted, armored and juted.

A tracer thread is always laid underneath the tape.

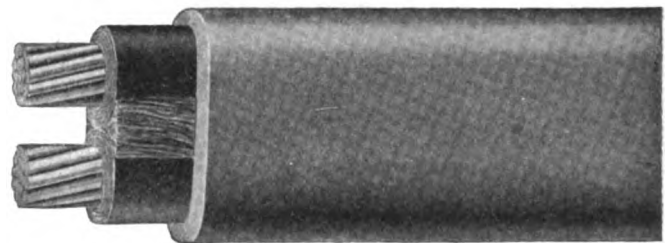
Cables may be taped and braided instead of taped, and in each case 1, 2 or 3 reverse layers of jute can be used.

Other combinations are sometimes required which can be made as specified.

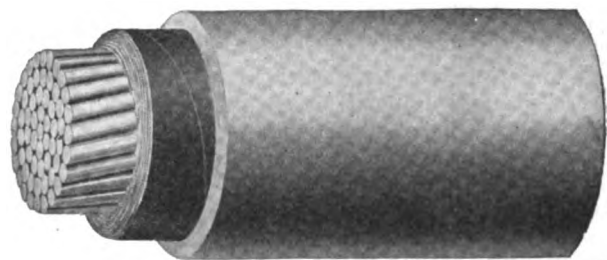
Paper Insulated Lead Sheathed Cables.

Used for electric light and power purposes. Made with single and multiple conductor, and to the most exacting specifications.

Narrow and very thin strips of pure manila paper are wound spirally about the conductor in sufficient number of layers for required dielectric strength. After paper covering is applied to single conductor, or core of conductors in the form of a belt, every trace of air and moisture is removed from cable by special processes, and while in this condition the core is thoroughly saturated and all interstices completely filled with hot insulating compounds.



TWIN LEAD INCASED PAPER CABLE



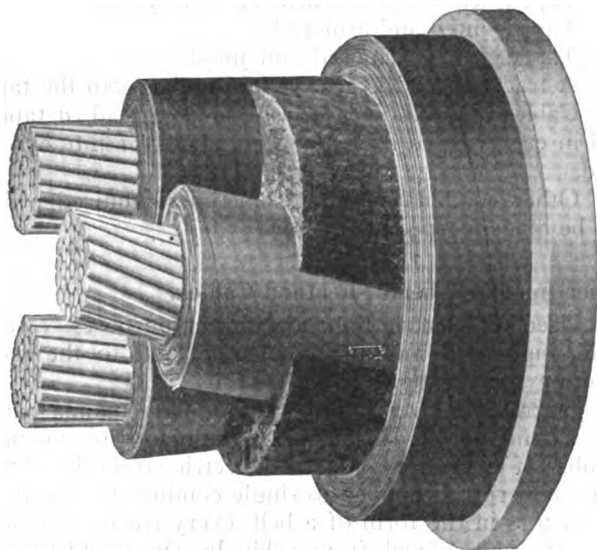
PAPER INSULATED AND LEAD COVERED CABLE

Cable is then put through a hydraulic press and covered with closely fitting lead sheathing so as to exclude all air and moisture and retain insulating compound. A tracer thread is placed lengthwise of all cables underneath the sheath.

Paper cables are generally cheaper and have lower electrostatic capacity than rubber or varnished cambric cables. Insulation is strong and uniform in quality, and except when frozen solid, is quite flexible.

Paper cables can be worked safely at higher temperature than can other kinds, and experience has demonstrated that their useful life is practically determined by the integrity of the sheathing. For this reason thickness of lead sheath should in general be greater than for corresponding sizes of rubber or cambric cables, by $\frac{1}{64}$ in. or $\frac{2}{64}$ in. Paper is less liable than rubber to deterioration from excessive electrostatic strains.

In short, paper insulated cable when properly constructed and sheathed can be recommended as one of the best for most conditions.



3-CONDUCTOR PAPER INSULATED LEAD INCASED CABLE

4/0 3-conductor, 37 wires each; diameter of each copper conductor, .53 in.; thickness of paper over each conductor, $\frac{3}{32}$ in.; thickness of supplementary paper, $\frac{9}{32}$ in.; thickness of lead, $\frac{1}{8}$ in.; diameter over lead, 2.281 ins.



NO. 6 B. & S. SOLID, 3-CONDUCTOR, PAPER INSULATED, LEAD INCASED CABLE

Varnished Cambric Cables.

A single conductor varnished cambric cable is made by winding tapes of thin varnished cotton or muslin cloth spirally about the conductor in a sufficient number of smooth, tightly drawn layers to make the required thickness of dielectric.

The cotton fabric is saturated with several applications of special non-hardening insulating varnish. The dielectric strength of this material is very high, as a single thickness of cotton well treated with this special varnish will withstand a stress of from 8,000 to 12,000 volts for 5 seconds, depending upon the number of coats of varnish.

The varnish prevents the tape from unwrapping when the cable is cut, and permits adjoining layers of varnished cambric to slide upon each other, thus insuring a concentric condition when the cable is bent. This compound of varnish prevents capillary absorption of moisture between the layers of tape, seals any possible skips in films and precludes air spaces.

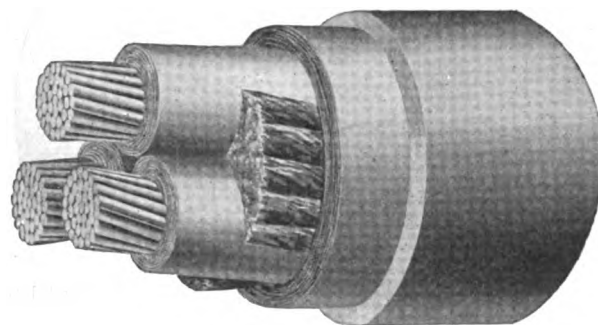
In multiple conductor cables, it is usual to place a portion of the required thickness of insulation in the form of a belt about the core of conductors, as in the case with paper cables.

This class of cables is in general more flexible than paper cables, more impervious to moisture, reasonable in cost, and can be used in dry places such as for station wiring without lead sheathing.

When no sheathing is required the cable is protected by a cotton braid, or with an asbestos braid for fire protection. These braids are saturated in weather-proof compounds or in slow burning compounds, as may be required.

These cables are made in any quantity, of any size or type and for any voltage or service condition, to the most rigid specifications.

Inquiries containing full information as to working conditions are solicited and prices will be quoted on application.



3-CONDUCTOR VARNISHED CAMBRIC LEAD CABLE

This class of material furnished to the most exacting specifications. Full information as to the purpose for which the cable is to be used, location, depth of water and working conditions should accompany requests for prices.

Installation of Underground Cables.

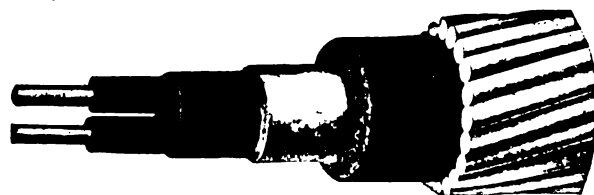
This company will furnish, install and guarantee its underground cables for almost any class of service. Rubber covered telephone or telegraph cables, electric light and power cables, single or multiple conductors insulated with rubber, paper or varnished cambric, made to carry current for any service at any pressure within practical working limits.

We maintain a fully equipped cable department, supervised by experienced and able engineers and manned by competent cable workmen, which has for many years and with marked success attended to all matters pertaining to underground and submarine cable installations.

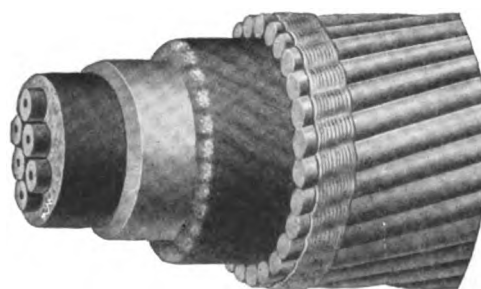
Through this department, we are at all times prepared to install cables, to make estimates or to advise customers regarding specifications, costs of installations and so on, or to furnish competent supervisors for installations made by the customer himself.

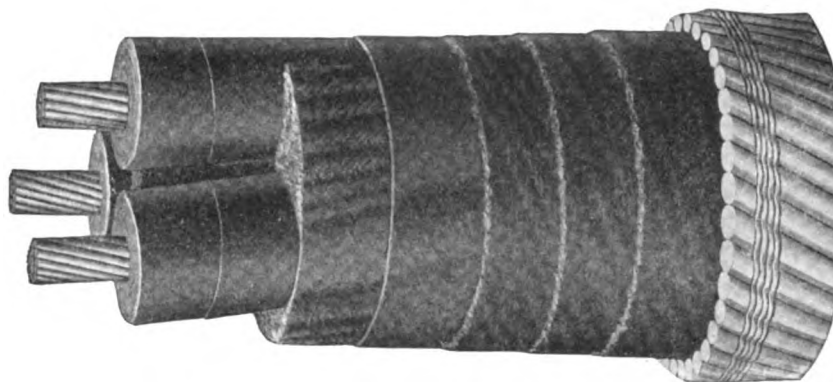
Submarine Cables.

Large quantities of submarine cables of every class are manufactured and installed for street railways, telegraph and telephone companies and electric light and power plants. These are used for crossing rivers, bays, ponds or lakes.



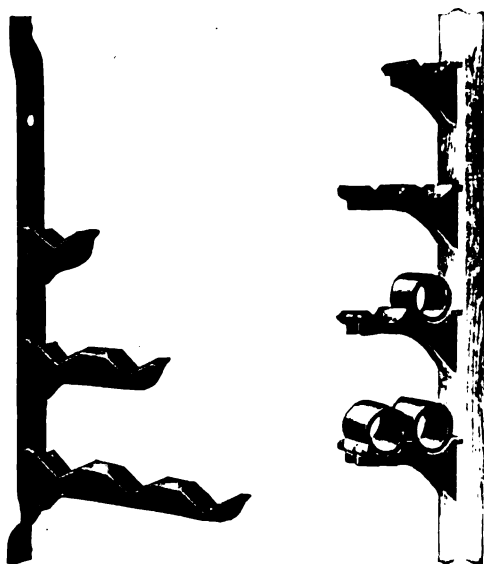
2-CONDUCTOR TWIN SUBMARINE CABLE, LEAD INCASED, JUTE SEWED AND ARMORED

SUBMARINE CABLE
Multiple conductor rubber insulated signal cable

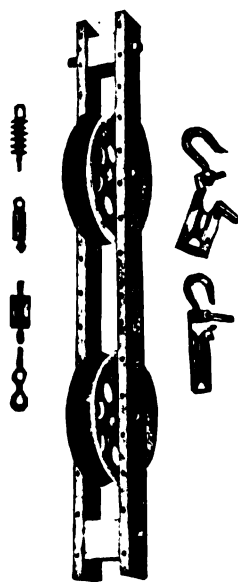


SUBMARINE CABLE FOR TRANSMITTING POWER AT 25,000 VOLTS

3-conductor, 2/0 cable, 19 wires in each strand; rubber insulation $\frac{10}{32}$ in. thick and taped. 3 conductors laid up with jute fillers and taped all over. Covered with 3 jute servings in reverse layers. 35 galvanized iron armor wires, each .25 in. in diameter. Outside diameter of cable, 3.41 ins. This particular cable, 7000 ft. long, has been in service under the St. Lawrence River for one year. A similar cable has been in service three years. Both are giving entire satisfaction.



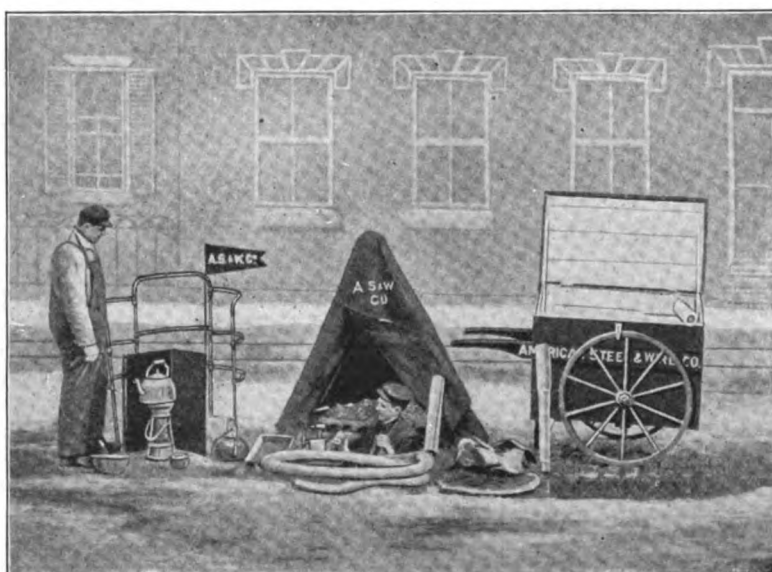
TYPICAL MANHOLE RACKS FOR CABLES



APPLIANCES USED IN CONNECTION WITH INSTALLATION OF CABLES



END BELL FOR 3-CONDUCTOR CABLE



MAKING UNDERGROUND CABLE JOINTS IN STORMY WEATHER

HABIRSHAW ELECTRIC CABLE CO., INC.

Manufacturers of Wires and Cables

YONKERS, N. Y.

Products.

INSULATED ELECTRIC WIRES and CABLES.

General.

Practically every kind of insulated electric wire and cable for the utilization, distribution and transmission of electrical energy, except weatherproof and slow burning.

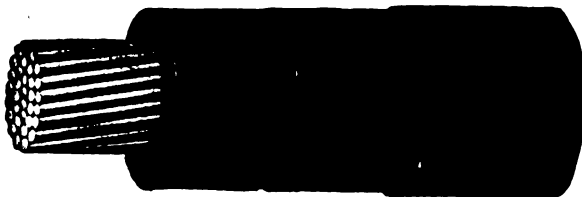
Data concerning the use of the types most commonly employed for house wiring, industrial application and for transmission purposes are given below.

Many other kinds of wire are made by this company. Additional information furnished on request.

Code House Cable, Single Conductor, Stranded.

Used in pairs for house wiring or with twin wires for the neutral of 3-wire systems.

Number of conductors, one. Range of sizes, No. 14 A.W.G. and all larger sizes, stranded. Insulation, "black core" rubber compound. Covering over insulation, one saturated braid, two saturated braids or rubber filled tape and one saturated braid as shown in table below. Type letter, R.



CODE HOUSE CABLE, SINGLE CONDUCTOR, STRANDED

Size, A. W. G.	No. of strands concentric	Thickness insulation, 64ths in.	Diam. over braid, in.	Weight per 1000 ft., lbs.	Type of package	Ft. in package	Shipping weight of package, lbs.
ONE BRAID							
8	7	3	.29	81	10 coils in case	5000	455
10	7	3	.24	57	10 coils in case	5000	315
12	7	3	.22	42	10 coils in case	5000	215
14	7	3	.20	31	10 coils in case	5000	175
DOUBLE BRAID							
8	7	3	.34	91	10 coils in case	5000	505
10	7	3	.27	67	10 coils in case	5000	365
12	7	3	.25	50	10 coils in case	5000	290
14	7	3	.23	39	10 coils in case	5000	235
TAPE AND BRAID							
2,000,000	127	8	2.00	6900	*	*	*
1,750,000	127	8	1.90	6079	*	*	*
1,500,000	91	8	1.79	5251	*	*	*
1,250,000	91	8	1.66	4445	*	*	*
1,000,000	61	7	1.50	3556	Reel	500	2238
950,000	61	7	1.47	3385	*	*	*
900,000	61	7	1.44	3223	Reel	500	2072
850,000	61	7	1.41	3050	*	*	*
800,000	61	7	1.37	2888	Reel	500	1904
750,000	61	7	1.34	2705	Reel	500	1733
700,000	61	7	1.31	2554	Reel	500	1657
650,000	61	7	1.27	2388	*	*	*
600,000	61	7	1.24	2215	Reel	500	1488
550,000	61	7	1.20	2049	*	*	*
500,000	37	6	1.09	1805	Reel	1000	2265
450,000	37	6	1.04	1640	Reel	1000	2100
400,000	37	6	1.00	1477	Reel	1000	1937
350,000	37	6	.95	1302	Reel	1000	1682
300,000	37	6	.90	1133	Reel	1000	1513
250,000	37	6	.84	962	Reel	1000	1342
0000	19	5	.77	807	Reel	1000	987
000	19	5	.71	656	Reel	1000	836
00	19	5	.66	535	Reel	1000	715
0	19	5	.61	438	Reel	1000	518
1	19	5	.57	350	Reel	1000	430
2	7	4	.50	284	Reel	1000	364
3	7	4	.47	234	*	*	*
4	7	4	.44	194	Coil	500	102
5	7	4	.41	161	Coil	*	*
6	7	4	.38	136	Coil	500	73

*Special packing as specified.

SWEET'S CATALOGUE

HABIRSHAW
"Proven by the test of time"
Insulated Wire
TRADE-MARK

Code House Cable, Twin (Flat) Stranded.

Used for wiring buildings, and is useful where it is to be drawn into a conduit with a single conductor cable.

Number of conductors, two. Range of sizes, No. 14 A.W.G. to 500,000 circular mils, stranded. Insulation on each conductor, "black core" rubber compound. Covering over insulation, one saturated braid except for No. 6 A.W.G. and larger where a rubber filled tape is used. Grouping of conductors, parallel. Covering over all, one saturated braid.

Type letters, R. D.



CODE HOUSE CABLE, TWIN (FLAT), STRANDED

Size, A. W. G.	No. of strands concentric	Thickness of insulation, 64ths in.	Diameter over outside braid, in.	Weight per 1000 feet, lbs.	Type of package
500,000	37	6	1.81 x 2.19	3674	*
250,000	37	6	1.42 x 1.71	1974	*
00000	19	5	1.29 x 1.56	1617	*
000	19	5	1.20 x 1.44	1352	*
00	19	5	1.11 x 1.34	1109	*
0	19	5	1.04 x 1.25	913	*
1	19	5	.93 x 1.12	725	*
2	7	4	.81 x .98	573	*
3	7	4	.76 x .91	473	*
4	7	4	.71 x .86	396	*
5	7	4	.67 x .81	326	*
6	7	4	.58 x .77	277	*
8	7	3	.52 x .63	180	*
10	7	3	.46 x .52	122	*
12	7	3	.42 x .47	90	*
14	7	3	.39 x .44	69	*

*Special packing as specified.

Upon inquiry, engineering department will furnish similar data for larger size conductors.

Code House Wire, Single Conductor, Solid.

Used in pairs for house wiring or with twin wires for the neutral of 3-wire systems.

DATA, CODE HOUSE WIRE, SINGLE CONDUCTOR, SOLID

Size, A. W. G.	Outside diameter, in.	Thickness of insulation, 64ths in.	Weight per 1000 ft., lbs.	Type of package	Feet in package	Shipping weight of package, lbs.
ONE BRAID						
8	.27	3	76	10 coils in case	5000	430
10	.23	3	54	10 coils in case	5000	310
12	.21	3	40	10 coils in case	5000	240
14	.20	3	30	10 coils in case	5000	170
TWO BRAIDS						
8	.32	3	86	10 coils in case	5000	480
10	.26	3	63	10 coils in case	5000	345
12	.24	3	48	10 coils in case	5000	280
14	.23	3	38	10 coils in case	5000	210
TAPE AND BRAID						
0000	.70	5	767	*	*	*
000	.65	5	623	*	*	*
00	.61	5	508	*	*	*
0	.57	5	415	*	*	*
1	.53	4	340	*	*	*
2	.47	4	268	*	*	*
3	.44	4	221	*	*	*
4	.41	4	184	*	*	*
5	.39	4	153	*	*	*
6	.37	4	129	*	*	*

*Special packing as specified.

Continued on next page

Number of conductors, one. Range of sizes, No. 0000 to 14 A.W.G., solid. Insulation, "black core" rubber compound.

Covering over insulation, one saturated braid, two saturated braids or rubber filled tape and one saturated braid as shown in table on preceding page.

Type letter, R.

Code House Wire, Twin (Flat), Solid.

Used for the same purpose as stranded twin code house wire.

Number of conductors, two. Range of sizes, No. 6 to 14 A.W.G. Insulation on each conductor, "black core" rubber compound.

Covering over insulation, one saturated braid.

Grouping of conductors, parallel. Covering over all, one saturated braid.

DATA, CODE HOUSE WIRE, TWIN (FLAT), SOLID

Size, A. W. G.	Thickness of insulation, each conductor, 64ths in.	Diameters over outside braid, in.	Weight per 1000 ft., lbs.	Type of package	Feet in package	Shipping weight of package, lbs.
6	4	.38x.71	261	*	*	*
8	3	.32x.58	169	5 coils in case	2500	470
10	3	.26x.49	118	5 coils in case	2500	340
12	3	.24x.44	87	10 coils in case	5000	485
14	3	.22x.41	68	10 coils in case	5000	390

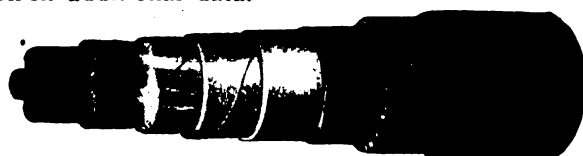
*Special packing as specified.

Armored Cable.

Armored cable, or submarine cable as it is sometimes called, is used under water for crossing rivers, bays and lakes. Armored cables may be insulated with paper, varnished cambric, or rubber compound. If insulated with paper or varnished cambric, a lead sheath is required. If insulated with rubber compound, a lead sheath is preferable, but may be omitted where the water in which the cable is to be laid does not contain injurious impurities. If the cable is rubber insulated and not lead covered, it has a rubber filled cotton tape.

The leaded or tapered core is served with jute yarn, run through hot asphalt compound, then armored with galvanized steel wires,* run through hot asphalt compound, served with 2 layers of yarn and finally run through asphalt compound. The asphalt and jute over the armor may be omitted if desired.

Upon receipt of inquiry stating the conditions of service, the engineering department of this company will furnish additional data.



ARMORED CABLE

Park Cable.

Used for transmission and distribution where it is preferable to bury the cables directly in the ground rather than to put them in ducts. Any kind of cable will be furnished with park cable covering, but the following types are in general use for distribution purposes:

Standard park cables (0-600 volts): number of conductors, one to three. Insulation on each conductor, "black core" rubber compound. Covering over insulation, rubber filled tape. Covering over tape, lead sheath. Covering over lead sheath, asphalted jute.

Protective armor, two galvanized steel tapes, wound

*Hot asphalt compound is also applied during armoring at the points the armor wires come into contact, insuring complete sealing of the armor.

in the same direction the outer tape covering the spaces between turns of the inner tape.

Outside covering, asphalted jute.

Upon receipt of inquiry stating conditions of service, the engineering department of this company will furnish additional data.



PARK CABLE

Size, A.W.G.	No. of strands concentric	Thickness of insulation, each conductor, 64ths in.	Thickness of lead covering, 64ths in.	Thickness of steel tape, in.	Outside diameter, in.	Weight per 1000 ft., lbs.	Type of package	Feet in package	Shipping weight of package, lbs.
ONE CONDUCTOR									
0000	19	5	4	.020	1.17	2108	Reel	1000	2568
000	19	5	4	.020	1.12	1874	Reel	1000	2334
00	19	5	4	.020	1.06	1670	Reel	1000	2138
0	19	5	4	.020	1.02	1508	Reel	1000	1888
1	19	5	4	.020	.98	1368	Reel	1000	1748
2	7	4	4	.020	.90	1187	Reel	1000	1567
4	7	4	4	.020	.84	1013	Reel	1000	1193
6	1	4	4	.020	.77	830	Reel	1000	1010
8	1	3	3	.020	.67	582	Reel	1000	762
10	1	3	3	.020	.65	525	Reel	1000	705
12	1	3	2	.020	.60	401	Reel	1000	481
14	1	3	2	.020	.58	372	Reel	1000	452

TWO CONDUCTORS, TWIN (FLAT)

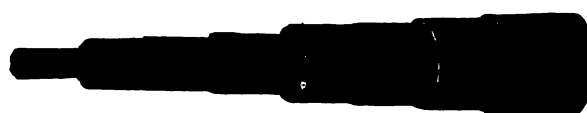
0000	19	5	5	.032	1.248x1.962	4277	Reel	1000	4927
000	19	5	5	.032	1.190x1.846	3791	Reel	1000	4441
00	19	5	5	.032	1.138x1.742	3387	Reel	1000	4037
0	19	5	5	.032	1.093x1.652	3017	Reel	1000	3477
1	19	5	5	.032	1.004x1.522	2710	Reel	1000	3170
2	7	4	4	.032	.902x1.349	1882	Reel	1000	2342
4	7	4	4	.032	.842x1.229	1592	Reel	1000	1972
6	1	4	4	.020	.772x1.089	1249	Reel	1000	1629
8	1	3	3	.020	.677x.930	850	Reel	1000	1035
10	1	3	3	.020	.650x.876	767	Reel	1000	947
12	1	3	3	.020	.629x.834	690	Reel	1000	870
14	1	3	2	.020	.581x.769	523	Reel	1000	703

THREE CONDUCTORS

0000	19	5	7	.032	2.19	7192	Reel	1000	8197
000	19	5	6	.032	2.03	5828	Reel	1000	6833
00	19	5	6	.032	1.92	5194	Reel	1000	6009
0	19	5	6	.032	1.82	4670	Reel	1000	5485
1	19	5	6	.032	1.73	4220	Reel	1000	4870
2	7	4	5	.032	1.54	3289	Reel	1000	3939
4	7	4	5	.032	1.41	2749	Reel	1000	3399
6	1	4	4	.032	1.18	1751	Reel	1000	2211
8	1	3	4	.032	1.04	1384	Reel	1000	1764
10	1	3	4	.020	.98	1228	Reel	1000	1608
12	1	3	3	.020	.90	946	Reel	1000	1326
14	1	3	3	.020	.87	867	Reel	1000	1247

Mine Cable, Concentric.

Used for the reels of gathering reel locomotives and for cutting machines. It has the advantage of being round and of having a small diameter.



MINE CABLE, CONCENTRIC

Type A—Number of conductors, two. Range of sizes, 2 to 8 A.W.G. Stranding of center conductor, flexible. Insulation, "black core" rubber compound.

DATA, TYPE A MINE CABLE, CONCENTRIC

Size, A.W.G.	Thickness insulation, 64ths in., center conductor	No. of strands center conductor	Thickness insulation, 64ths in., belt	Outside diam., in.	Weight per 1000 ft., lbs.	Type of package	Feet in package	Shipping weight of package, lbs.
2	4	49	4	.825	640	Reel	1500	1340
3	4	49	4	.780	550	Reel	1500	1205
4	4	49	4	.740	470	Reel	1500	1085
5	4	49	4	.700	400	Reel	1500	780
6	4	49	4	.670	340	Reel	1500	690
8	3	49	3	.550	230	Reel	1500	525

Stranding of outer conductor, ring of wires having total cross-sectional area equal to that of the center conductor.

Covering over insulation of center conductor, rubber filled tape. Covering over outside conductor, belt of "black core" rubber compound. Covering over belt, rubber filled tape. Covering over tape, 2 extra tight weatherproof braids.

Type B—Similar to Type A except that belt of rubber compound around outside conductor is omitted.

DATA, TYPE B MINE CABLE, CONCENTRIC

Size, A.W.G.	Thickness insulation, 64ths in., center conductor	No. of strands, center conductor	Thickness insulation, 64ths in., belt	Out side diam., in.	Weight per 1000 ft., lbs.	Type of package	Feet in package	Shipping weight of package, lbs.
2	4	49	None	.700	550	Reel	1500	1005
3	4	49	None	.655	460	Reel	1500	870
4	4	49	None	.615	385	Reel	1500	758
5	4	49	None	.575	320	Reel	1500	660
6	4	49	None	.545	275	Reel	1500	593
8	3	49	None	.456	185	Reel	1500	358

Mine Cable, Single Conductor.

Used for operating gathering reel locomotives run on steel tracks which can be used for the return current.

Number of conductors, one. Range of sizes, No. 2 to 6 A.W.G., flexible. Insulation, "black core" rubber compound.

Covering over insulation, rubber filled tape. Covering over all, one extra heavy or seine-twine (as specified), extra tight weatherproof braid.



MINE CABLE, SINGLE CONDUCTOR

Size, A.W.G.	No. of strands	Thickness of insulation, 64ths in.	Outside diameter, in.	Weight per 1000 ft., lbs.	Type of package	Feet in package	Shipping weight of package, lbs.
2	133	4	.59	337	Reel	1500	685
3	133	4	.55	271	Reel	1500	586
4	133	4	.52	234	Reel	1500	431
6	133	4	.46	167	Reel	1500	330

Mine Cable, Twin (Flat).

Used for gathering reel locomotives, cutting machines, hoists, drills and other electrical machines in mines.



MINE CABLE, TWIN (FLAT)

Size, A.W.G.	No. of strands	Thickness of insulation, 64ths in.	Outside diameter, in.	Weight per 1000 ft., lbs.	Type of package	Feet in package	Shipping weight of package lbs.	
DOUBLE BRAID								
2	49	4	1.094x	592	640	Reel	1500	1340
3	49	4	1.018x	554	550	Reel	1500	1205
4	49	4	.954x	522	460	Reel	1500	1070
5	49	4	.898x	494	390	Reel	1500	965
6	49	4	.846x	468	325	Reel	1500	668
8	49	3	.698x	394	220	Reel	1500	410
TRIPLE BRAID								
2	49	4	1.139x	637	703	Reel	1500	1430
3	49	4	1.063x	590	605	Reel	1500	1288
4	49	4	.999x	567	510	Reel	1500	1145
5	49	4	.943x	530	430	Reel	1500	1025
6	49	4	.891x	513	360	Reel	1500	720
8	49	3	.743x	439	250	Reel	1500	555

Number of conductors, two. Range of sizes, No. 2 to 8 A.W.G., flexible. Insulation on each conductor, "black core" rubber compound.

Covering over each conductor, one saturated braid. Grouping of conductors, parallel. Marker, raised thread in the braid of one conductor.

Covering over all, two or three saturated extra tight braids as specified.

Lead Covered Cable, Single Conductor, Stranded, 0 to 600 Volts.

Similar to solid single conductor lead covered wire except that it has greater flexibility and is made in larger sizes.

Number of conductors, one. Range of sizes, No. 14 A.W.G. to 2,000,000 C.M., stranded. Insulation, "black core" rubber compound. Covering, one rubber filled tape or braid. Covering over all, lead sheath.

Type letter, R. L.

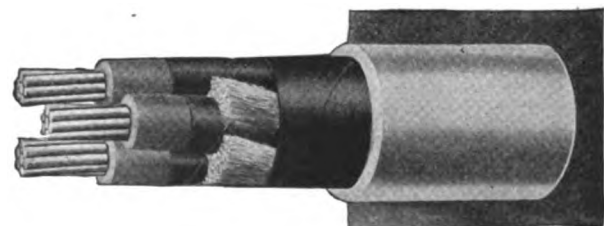
DATA, LEAD COVERED CABLE, SINGLE CONDUCTOR

Size, A. W. G.	No. of strands concentric	Thickness of insulation, 64ths in.	Thickness of lead sheath, 64ths in.	Diam. over lead, in.	Weight per 1000 ft., lbs.	Type of package	Feet in package	Shipping weight of package, lbs.
2,000,000	127	8	7	2.14	10171	Reel	1000	11176
1,750,000	127	8	7	2.03	9184	Reel	1000	10189
1,500,000	91	8	7	1.92	8171	Reel	1000	8986
1,250,000	91	8	7	1.79	7166	Reel	1000	7816
1,000,000	61	7	6	1.60	5616	Reel	1000	6266
950,000	61	7	6	1.57	5404	Reel	1000	6054
900,000	61	7	6	1.54	5201	Reel	1000	5851
850,000	61	7	6	1.51	4985	Reel	1000	5635
800,000	61	7	6	1.47	4781	Reel	1000	5431
750,000	61	7	6	1.44	4572	Reel	1000	5222
700,000	61	7	6	1.41	4354	Reel	1000	5004
650,000	61	7	6	1.37	4141	Reel	1000	4791
600,000	61	7	6	1.34	3918	Reel	1000	4378
550,000	61	7	6	1.30	3701	Reel	1000	4161
500,000	37	6	5	1.20	3108	Reel	1000	3568
450,000	37	6	5	1.15	2904	Reel	1000	3364
400,000	37	6	5	1.11	2678	Reel	1000	3138
350,000	37	6	5	1.06	2449	Reel	1000	2829
300,000	37	6	5	1.01	2220	Reel	1000	2600
250,000	37	6	5	.96	1984	Reel	1000	2364
200,000	19	5	4	.85	1529	Reel	1000	1909
150,000	19	5	4	.79	1324	Reel	1000	1504
100,000	19	5	4	.74	1156	Reel	1000	1336
75,000	19	5	4	.69	1016	Reel	1000	1196
50,000	19	5	4	.65	900	Reel	1000	1080
25,000	7	4	4	.58	757	Reel	1000	837
15,000	7	4	4	.55	678	Reel	1000	758
10,000	7	4	4	.52	612	Reel	1000	692
7,500	7	4	4	.49	555	Reel	1000	635
5,000	7	4	4	.47	508	Reel	1000	588
3,500	7	3	3	.37	306	Reel	1000	361
2,500	7	3	3	.34	259	Reel	1000	304
1,750	7	3	2	.28	156	Reel	1000	211
1,250	7	3	2	.26	137	Reel	1000	192

Lead Covered Cable, 3-conductor, Stranded, 0-600 Volts.

Used for 3-phase circuits where extra flexibility is required in the smaller sizes and always in the larger sizes where solid conductors would make the cable too stiff to handle.

Number of conductors, three. Range of sizes, No. 0000 to 14 A.W.G. Insulation on each conductor, "black core" rubber compound. Covering over insulation, one rubber filled tape. Grouping of conductors, twisted. Fillers, jute. Covering over jute, one rubber filled tape. Covering over all, lead sheath.



LEAD COVERED CABLE, 3-CONDUCTOR, STRANDED, 0-600 VOLTS

DATA, LEAD COVERED CABLE, 3-CONDUCTOR

Size, A. W. G.	No. of strands concentric	Thickness of insulation, 64ths in.	Thickness of lead sheath, 64ths in.	Diam. over lead, in.	Weight per 1000 ft., lbs.	Type of pack- age	Feet in pack- age	Shipping weight of pack- age, lbs.
0000	19	5	7	1.81	5459	Reel	1000	6109
000	19	5	6	1.65	4353	Reel	1000	5003
00	19	5	6	1.54	3807	Reel	1000	4457
0	19	5	6	1.44	3352	Reel	1000	4002
1	19	5	6	1.35	2973	Reel	1000	3435
2	7	4	5	1.16	2204	Reel	1000	2664
3	7	4	5	1.10	1968	Reel	1000	2348
4	7	4	5	1.04	1768	Reel	1000	2148
5	7	4	5	.98	1594	Reel	1000	1974
6	7	4	4	.90	1237	Reel	1000	1617
8	7	3	4	.75	934	Reel	1000	1114
10	7	3	4	.68	787	Reel	1000	967
12	7	3	3	.59	541	Reel	1000	621
14	7	3	3	.55	477	Reel	1000	557

Lead Covered Cable, Twin (Flat), Stranded, 0-600 Volts.

Used under the same conditions as stranded single conductor lead covered wire.

Number of conductors, two. Range of sizes, No. 0000 to 14 A.W.G., stranded. Insulation on each conductor, "black core" rubber compound. Covering over insulation, one rubber filled tape or braid. Grouping of conductors, parallel.* Covering over all, lead sheath.

Type letter, R D L.

DATA, LEAD COVERED CABLE, TWIN (FLAT)

Size, A.W.G.	No. of strands concentric	Thick- ness of insu- lation, 64ths in.	Thick- ness of lead sheath, 64ths in.	Diam. over lead, in.	Wgt. per 1000 ft., lbs.	Type of pack- age	Feet in pack- age	Shipping weight of pack- age, lbs.
0000	19	5	5	.87x1.59	3065	Reel	1000	3445
000	19	5	5	.82x1.47	2622	Reel	1000	3002
00	19	5	5	.76x1.37	2300	Reel	1000	2680
0	19	5	5	.72x1.28	2030	Reel	1000	2410
1	19	5	5	.68x1.20	1771	Reel	1000	2151
2	7	4	4	.58x1.02	1298	Reel	1000	1478
3	7	4	4	.54x .96	1160	Reel	1000	1340
4	7	4	4	.52x .90	1027	Reel	1000	1207
5	7	4	4	.49x .85	920	Reel	1000	1000
6	7	4	4	.47x .81	844	Reel	1000	924
8	7	3	3	.37x .64	504	Reel	1000	584
10	7	3	3	.34x .58	427	Reel	1000	507
12	7	3	3	.31x .53	368	Reel	1000	423
14	7	3	2	.26x .46	233	Reel	1000	288

Paper Insulated Cables.

Used for underground transmission and distribution for which they enjoy the advantage of cheapness, durability, low dielectric losses, low electrostatic capacity and high current carrying capacity.

Insulation consists of Manila paper applied helically to the conductor, and then saturated with a mineral oil compound which constitutes the essential insulation. In order to retain this oil, the cable must have an oil-proof covering which is almost invariably a sheath of lead.

As the electrostatic capacity and dielectric losses of paper insulated cables are considerably lower than those of other types, they are especially suitable for long transmission lines.

Habershaw paper insulated cables have particularly low dielectric losses without sacrifice of dielectric strength. Great care is also taken to make the cable flexible at all temperatures at which it is likely to be operated.

Paper insulated cables are made in all sizes from No. 6 A.W.G. to 2,000,000 circular mils and with any number of conductors within the usual limits.

Upon receipt of inquiry stating conditions of service, the engineering department of this company will furnish further data.

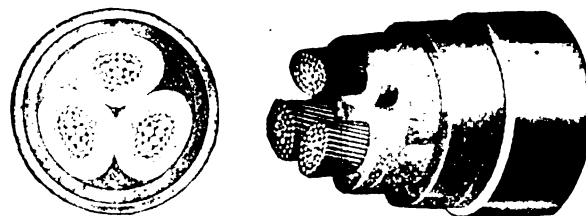
Sector Cable.

Used in preference to round conductor cables because for a given outside diameter, they have a greater carrying capacity. Habershaw sector cable has been

*Round cable with two conductors twisted will be furnished when specified.

designed so as to secure all possible advantages of that type of cable to the maximum degree.

The carrying capacity of sector cable is approximately the same as that of round conductor cable of the same conductor cross section.



SECTOR CABLE

Varnished Cambric Insulated Cables.

Used in power stations and substations for connecting machinery and apparatus of all voltages; in buildings in place of rubber insulated cables, especially for the larger sizes; for low voltage underground distribution, where special reliability is desired; on vibrating structures where paper insulation can not be used due to the crystallization of the lead sheath.

Varnished cambric insulation consists of varnished cambric tapes applied helically to the conductor with intervening layers of mineral base grease. The turns of tape overlap and the joints in successive layers are staggered. They are also reversed at least every three layers.

Varnished cambric insulated cables are usually covered as follows: Apparatus cable, saturated cotton braid; station cable, a rubber filled cotton tape and a flameproof braid; building mains, two saturated cotton braids; underground cables, lead sheath; cables for outdoor structures, a rubber filled cotton tape, two galvanized steel tapes and a layer of asphalted jute under and over the armor.

Upon receipt of inquiry stating conditions of service, the engineering department of this company will furnish additional data.



VARNISHED CAMBRIC INSULATED CABLE

Field Engineering Service.

Habershaw maintains a field engineering service for the benefit of customers and prospective customers. Whenever there is any doubt as to the type of wire or cable which will best fulfill the requirements of any given set of conditions, the engineering department of this company is prepared to send a representative to investigate and make recommendations.

Studies of the service conditions of various industries in which electrical power is used are constantly being made so that Habershaw engineers are in active touch with the latest tendencies and most modern installations.

Research Laboratories—Habershaw also maintains fully equipped electrical, chemical and mechanical research laboratories in which problems of structure and manufacture are studied. The facilities of these laboratories are at the service of those whose problems require this method of treatment. Here also many researches are carried on for the purpose of advancing the art of insulated wire and cable manufacture.

CROUSE-HINDS COMPANY

Manufacturers of Electrical Appliances

SYRACUSE, N. Y.

BRANCH OFFICES

NEW YORK, N. Y., 30 Church Street

CHICAGO, ILL., 417 South Dearborn Street
BOSTON, MASS., 201 Devonshire Street

Products.

CONDULETS (Conduit Outlets); CONDULET COVERS; PANELS and CABINETS; KNIFE SWITCHES; FLOODLIGHT PROJECTORS.

Also manufacturers of Wiring Devices, which include Plug and Lamp Receptacles, Cord and Fixture Rosettes; Distributing Boards; Iron Clad Safety First Switches; Voltmeter, Ammeter and End Cell Battery Switches; Receptacles for conduit boxes, moulding, cleat and temporary installations, as well as Heavy Duty Attachment Plug Receptacles, Plugs and Guy Anchors.



TRADE-MARK



TYPE V
CONDULET



TYPE QEE CONDULET WITH
BP PLUG INSERTED

Condulets.

Condulets (conduit outlets) are made in hundreds of types for all sizes of conduit from $\frac{3}{8}$ to 6 in. In fact, there is a condulet for every requirement. They are made of the best grade, gray cast iron and designed to secure maximum strength. They have tapered threads and integral bushings which insure an absolutely tight connection with the conduit, and they fit on the conduit as a part of it.



TYPE GS
CONDULET



TYPE FS CONDULET WITH
WATERPROOF COVER

Panels and Cabinets.

Crouse-Hinds standard line of panelboards includes types for cartridge or plug fuses only in branches and, also, for either type of fuses in connection with knife, rotary snap or push button switches; also dead front (safety first) and residence panelboards.

Special panelboards are designed for uncommon conditions and this service is free to customers.

The base consists of a high grade black Monson slate free from flaws and metallic veins. All panels are built in accordance with the rules of the National Board of Fire Underwriters.

Each steel trim and box is formed from one piece No. 10-gage sheet metal.



TYPE BN CABINET



TYPE EPS
SAFETY
PANEL

Switches.

All current carrying parts of Crouse-Hinds switches are of hard drawn copper, 98% conductivity, with a current density rating of 1000 amperes per sq. in. of sectional area. Sliding contacts are rated at 75 amperes per sq. in. Blades are ground in contact. Parts can not work loose.

Catalogues.

Crouse-Hinds catalogues and bulletins give complete illustrations, descriptions and listings. Copy of catalogues or bulletins on the product in which you are interested, sent on request.



TYPE SCA FLOODLIGHT



TYPE RM
PROJECTOR

SWEET'S CATALOGUE

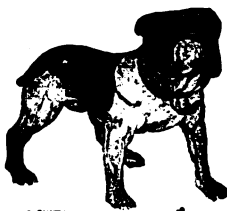
MUTUAL ELECTRIC & MACHINE CO.

Manufacturers of Electrical Controlling and Distributing Apparatus
DETROIT, MICH.

Products.

"BULL DOG" SYSTEM of MOTOR CONTROL.

"BULL DOG" KNIFE SWITCHES, SWITCHBOARDS, PANELBOARDS and CABINETS; "BULL DOG SUPER-SAFETY" APPARATUS.



THE SWITCH WITH POWERFUL ARM
TRADE-MARK

"Bull Dog" System of Motor Control. TRADE-MARK

This system of motor control is particularly adapted for large industrial plants having a number of induction motors of capacities varying from 5 to 50 h. p., which may be controlled from one central point. The system is adaptable for use under various conditions, and accomplishes the following results:

(a) Reduces the maximum demand in current, because the number of motors that can be started up at one time is limited.

(b) The use of fuses is unnecessary throughout the system.

(c) Induction motors ranging from 5 to 50 h. p. may be started from one central point without the use of individual compensators for motors.

(d) Any of the motors may be individually tested and proper readings made without interfering with the wiring installation or shutting down the motor.

(e) No live metal parts are accessible from the front of the board, which feature appeals particularly to plants that are in step with the "Safety-First" movement.

(f) Full protection is provided for the motors.

(g) Any motor may be shut down from any or several locations as desired, by merely pushing a button.

(h) Only authorized or experienced persons can start the motors.

(i) Materially reduces the cost of large motor installations, and particularly reduces the cost of maintenance, which is usually required where compensators are used.

The system may also be provided with a lock-out, which is an additional "Safety-First" feature, that does not permit the starting of the motor until this lock-out button is released.

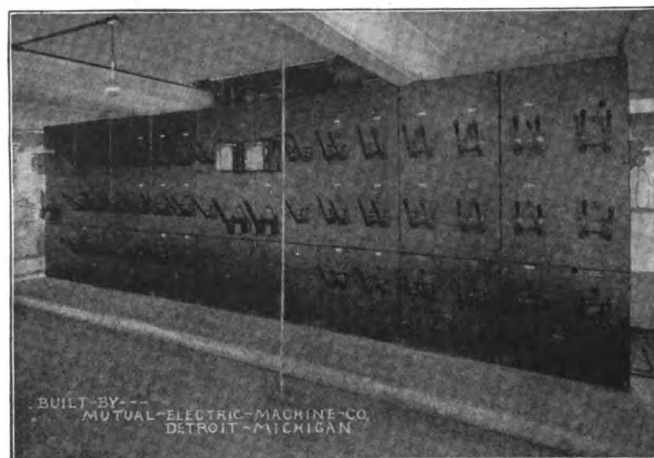
This "Motor Control System" is a switchboard or a group of boards similar to the cut shown above, consisting of double throw oil circuit breakers, which were particularly designed for this system, with a starting bus and running bus; special automatic compensator coils are provided in connection with the starting bus. A switch is first thrown in the starting position and then thrown on the running bus.

Indorsements—This system is not new, but has been in use for the past 10 years in the following plants:

Dodge Bros., Detroit, Mich.; Ford Motor Plant, Canada; Chevrolet Motor Company, Flint, Mich.; Studebaker Corporation, South Bend, Ind.; General Motors Corporation, Saginaw, Mich.; Timken-Detroit Axle Co., Detroit, Mich. and other manufacturing plants throughout the country.

Co-operative Service—Detailed information will be given to engineers who are interested in this system.

The MUTUAL ELECTRIC & MACHINE CO. will gladly co-operate in the determination of the adaptability of this system for particular requirements.



"BULL DOG" MOTOR CONTROL SYSTEM INSTALLED IN A GOVERNMENT SHELL PLANT

Double unit; each unit arranged for 18 motors. The system is particularly adaptable for controlling from 10 to 30 motors to the unit

"Bull Dog" Switches.

"Bull Dog" switches are made of pure copper, 98% conductivity, milled and sweated type. "Multiple" (two or more) blades are used with each pole of the switch larger than 200 amperes.

Round studs are regularly furnished on all back connected switches, 30 to 2000 amperes, respectively. "Laminated" busbar studs are used on switches of larger capacity.

RANGE OF "BULL DOG" SWITCHES

Capacity, amperes	30, 60, 100, 200, 300, 400, 600, 800, 1,000, 1,200, 1,500, 2,000, 2,500, 3,000, 4,000, 5,000, 6,000, 8,000, 10,000
Voltage*	A.C. 30, 125, 250, 440, 500, 600 D.C. 250, 600
No. of poles	Single, double, triple, four, five, six
Throw	Single or double
Fuse	With or without fuse holders
Connection	Front or back connected

* Switches of higher voltages are designed primarily for that installation.

"Dead Face" or "Super-Safety" Switchboards.

"Dead Face" switchboards are furnished for theaters, office buildings and industrial plants. There are no live metal parts on the face of the switchboards.

Switches are interlocking, and may be arranged so that a master shaft lever can operate the switches in groups.

"Dead Face" switches are double break type. Switches and fuses are dead when open.

"Bull Dog" Panelboards and Cabinets.

"Bull Dog" panelboards and cabinets are manufactured in all types to meet all conditions.

Mains may be 2, 3 or 4 wires, according to the system, with lugs only, fuse holders only, no fuse switch. or switch and fuse holders.

THE TRUMBULL ELECTRIC MFG. CO.

PLAINVILLE, CONN.

SALES OFFICES

NEW YORK, N. Y., 114 Liberty Street
Telephone, Rector 5321
BOSTON, MASS.

CHICAGO, ILL., 40 South Clinton Street
PHILADELPHIA, PA.
SAN FRANCISCO, CAL., 595 Mission Street

Products.

SAFETY SWITCHES; KNIFE SWITCHES and SWITCHBOARDS.

Also manufacturers of Dead Front Panelboards and Wiring Devices.

Catalogues.

Catalogue 12 and Switchboard Bulletins 1, 2 and 3 describe entire line.

Switchboards.

Owing to the great diversity of design in switchboard construction, it is impracticable to present comprehensive data on the subject, further than the statement that this company is thoroughly equipped to design, build and erect any kind of switchboard desired for either direct or alternating current.

An efficient engineering department is maintained and the factory equipment is of the best.

Knife switches used are our regular type "A." Any make of indicating instruments, circuit breakers and oil switches can be supplied.

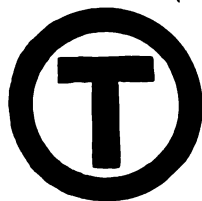
When drawings of switchboards are requested with quotations, they are charged for at actual cost and this charge is credited if the order is later placed with this company.

"Circle T" Knife Switches.

We manufacture a complete line of knife switches for both live and dead front switchboards, and for all other purposes where a knife switch is suitable.

"Circle T" "Safety" Switches.

A switch that is safe and one that meets every requirement of the liability insurance underwriters. That the "Circle T" "safety" switch does meet with these requirements is easily demonstrated by comparing it with the essential features necessary for a reliable safety switch as set forth in an article entitled "Unsafe Safety



TRADE-MARK

Switches" written by one of the engineers of the Travelers Insurance Indemnity Co. of Hartford and published in the June issue of their monthly magazine, "The Travelers Standard."

We quote here the special features they endorse and the specifications they suggest:

"In order to do away with this condition (i. e., the condition of having a switch so constructed that it is possible to open the box directly on a closed knife switch, unless the box is locked) manufacturers have produced a safety switch *with a locking device*, arranged so that the door of the enclosing case can not be opened unless switch is in 'off' position, and so that the *switch can not be closed until the door has been shut.*

"The switch jaws in the service or line side, however, are necessarily alive, and, therefore, a certain element of danger still remains. Protection against this hazard is provided by means of a shield which is attached to the line side of the switch box in such a way that it is impossible to touch the live parts except by intentionally removing the shield.

"There are other factors entering into the design of a *real safety switch*, such as quick make and quick break mechanism to minimize arcing—and consequently the hazard of burns, *locking arrangements* to prevent a switch from being closed while repair work is being done on some other part of the installation."

The article closed as follows:

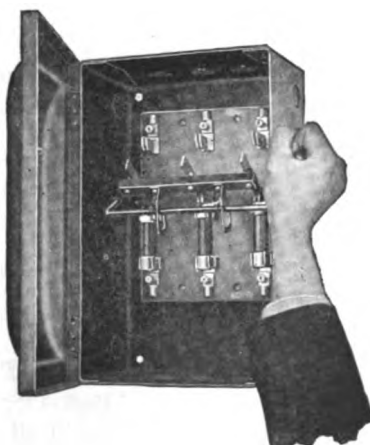
"From the foregoing, it is evident that a *real safety switch* should conform to the foregoing specifications. It should be externally operated—there should be no opening through which a dangerous arc may reach the operator; *the fuses and switch blades should be dead when the case is open*; (this means, of course, that box can not be opened until switch is in 'off' position) and labels or stamped marks should indicate plainly the proper wiring."

The Switch Itself is All Important.

It must be mechanically, as well as electrically, efficient. We realized this at the outset and so decided to use only our type "A," machine made, built-up switch that is recognized as a standard for quality the country over.



Switch in Running Position
Box can not be opened until switch is in "off" position



Box Open
Can not close the switch until cover is down



Switch Is Covered By a Protective Shield
Can not touch a live part

SAFETY FEATURES OF "CIRCLE T" SAFETY SWITCH

"Circle T" Motor Starting Safety Switches.

With Under Voltage Release and Shield—Operator throws handle forward to dead stop in first or no-fuse contact. When speed is up he draws handle back until plunger is released, then throws forward into second or running contact. Contact is never broken and there is no arc at any point of cycle of operation.



"CIRCLE T" MOTOR STARTING SWITCH WITH UNDER VOLTAGE RELEASE COIL

STRAIGHT THROUGH TYPE "A" SWITCHES WITH SHIELD

Amp.	Pole	Volt	Hand release		Under voltage release coil	
			Cat. No.	List*	Cat. No.	List*
30	2	250	13899s	\$16.24	13909½s	\$21.74
30	3	250	13900s	17.66	13910s	23.16
30	4	250	13901s	21.14	13911s	26.64
30	2	500 A.C.	13901½s	20.50	13911½s	26.00
30	3	500 A.C.	13902s	22.40	13912s	27.90
30	4	500 A.C.	13903s	25.80	13913s	31.30
30	3	550 A.C.	13903½s	33.00	13913½s	39.50
60	2	250	13903¾s	20.00	13913¾s	25.50
60	3	250	13904s	22.00	13914s	27.50
60	4	250	13905s	25.54	13915s	31.04
60	2	500 A.C.	13905½s	22.00	13915½s	27.50
60	3	500 A.C.	13906s	23.82	13916s	29.32
60	4	500 A.C.	13907s	27.62	13917s	33.12
60	3	550 A.C.	13907½s	35.00	13917½s	41.50
100	2	250	13907¾s	35.50	13917¾s	41.00
100	3	250	13908s	39.00	13918s	44.50
100	4	250	13909s	46.00	13919s	51.50

*List price without shield is \$1.00 less.

Fusible Type Service Switches—Made 30-1200 amperes, 250-volt, 2-3-4 pole; 30-600 amperes, inclusive, 500-volt A.C., 2-3-4 pole; 30-200 amperes, 600-volt, 2-3-4 pole.



"CIRCLE T" MOTOR OPERATING SWITCH WITH FUSIBLE BOTTOM

FUSIBLE TYPE SERVICE SWITCHES

Cat. No.	Amp.	Pole	Volt	List*	Cat. No.	Amp.	Pole	Volt	List*
14650	30	2	250	\$8.86	13670	400	2	250	\$50.00
14651	30	3	250	10.74	13671	400	3	250	65.00
14652	30	4	250	12.54	13672	400	4	250	88.00
14652½	30	2	500 A.C.	12.60	13673	400	2	500 A.C.	62.00
14653	30	3	500 A.C.	14.74	13674	400	3	500 A.C.	76.00
14654	30	4	500 A.C.	17.54	13675	400	4	500 A.C.	89.00
14655	60	2	250	11.00	13676	600	2	250	68.00
14656	60	3	250	14.50	13677	600	3	250	88.00
14657	60	4	250	17.22	13678	600	4	250	117.00
14657½	60	2	500 A.C.	12.80	13679	600	2	500 A.C.	82.00
14658	60	3	500 A.C.	15.00	13680	600	3	500 A.C.	98.00
14659	60	4	500 A.C.	17.80	13681	600	4	500 A.C.	120.00
14660	100	2	250	18.00	13682	800	2	250	137.00
14661	100	3	250	23.06	13683	800	3	250	182.00
14662	100	4	250	28.84	13684	800	4	250	237.00
14662½	100	2	500 A.C.	21.50					
14663	100	3	500 A.C.	25.00					
14664	100	4	500 A.C.	29.00	13685	1000	2	250	186.00
14665	200	2	250	25.66					
14666	200	3	250	32.24	13686	1000	3	250	255.00
14667	200	4	250	43.94					
14667½	200	2	500 A.C.	34.00					
14668	200	3	500 A.C.	38.50	13687	1200	4	250	337.00
14669	200	4	500 A.C.	44.06					
14770	30	2	600	21.00	14776	100	2	600	31.50
14771	30	3	600	23.80	14777	100	3	600	36.40
14772	30	4	600	27.60	14778	100	4	600	43.20
14773	60	2	600	21.50	13779	200	2	600	54.00
14774	60	3	600	24.50	13780	200	3	600	60.00
14775	60	4	600	28.60	13781	200	4	600	69.00

* On 250-volt and 500-volt A.C., list for shield added is \$1.00 for 30 to 200 amp. inclusive; \$1.50 above 200 amp.

Quick Make and Quick Break Type—Meets a growing demand, as a careless operator often neglects to follow handle through, leaving blade in partial contact with jaw posts. With quick make attachment, blade is automatically thrown into full contact as soon as handle passes center.



Closed
In "off" position



Open
In "off" position

QUICK MAKE AND QUICK BREAK TYPE WITH SHIELD

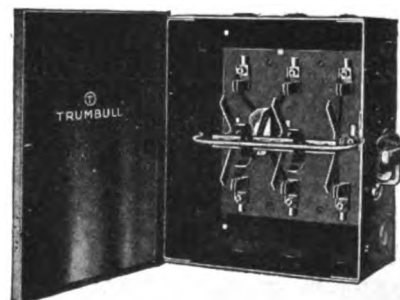
Cat. No.	Amp.	Pole	Volt	List*	Cat. No.	Amp.	Pole	Volt	List*
15650s	30	2	250	\$17.50	15665s	200	2	250	\$36.50
15651s	30	3	250	19.00	15666s	200	3	250	43.00
15652s	30	4	250	21.00	15667s	200	4	250	55.00
15652½s	30	2	500 A.C.	21.00	15667½s	200	2	500 A.C.	45.00
15653s	30	3	500 A.C.	23.00	15668s	200	3	500 A.C.	49.50
15654s	30	4	500 A.C.	26.00	15669s	200	4	500 A.C.	55.00
15655s	60	2	250	19.50	15670s	400	2	250	64.50
15656s	60	3	250	23.00	15671s	400	3	250	79.50
15657s	60	4	250	25.50	15672s	400	4	250	102.50
15657½s	60	2	500 A.C.	21.50	15673s	400	2	500 A.C.	76.50
15658s	60	3	500 A.C.	23.50	15674s	400	3	500 A.C.	90.50
15659s	60	4	500 A.C.	26.50	15675s	400	4	500 A.C.	103.50
15660s	100	2	250	29.00	15676s	600	2	250	82.50
15661s	100	3	250	34.00	15677s	600	3	250	102.50
15662s	100	4	250	40.00	15678s	600	4	250	131.50
15662½s	100	2	500 A.C.	32.00	15679s	600	2	500 A.C.	96.50
15663s	100	3	500 A.C.	36.00	15680s	600	3	500 A.C.	112.50
15664s	100	4	500 A.C.	40.00	15681s	600	4	500 A.C.	134.50
15770s	30	2	600	30.00	15776s	100	2	600	43.00
15771s	30	3	600	33.00	15777s	100	3	600	48.00
15772s	30	4	600	36.50	15778s	100	4	600	54.50
15773s	60	2	600	30.50	15779s	200	2	600	65.50
15774s	60	3	600	33.50	15780s	200	3	600	71.50
15775s	60	4	600	37.50	15781s	200	4	600	80.50

* List price without shield, 250- and 500-volt, deduct \$1.00, 30 to 200 amp. inclusive; \$1.50 above 200 amp.

Motor Reversing Switches.

The double throw, no-fuse type switches are used for reversing D.C. or A.C. motors.

Wires run between outer contacts reverse direction of current when switch is thrown from one set of contacts to the other. On 2-pole switch both wires are crossed between outer contacts; on 3-pole, one wire runs straight, the other two are crossed; on 4-pole, two wires run straight, and two crossed.



NO. 13957 SWITCH FOR REVERSING D.C. AND A.C. MOTORS

DOUBLE THROW, NO FUSE TYPE, FOR REVERSING MOTORS

Cat. No.	Amp.	Pole	Volt	List
13950	30	2	250	\$11.52
13951	30	3	250	13.80
13952	30	4	250	16.10
13953	30	2	500 A.C.	12.92
13954	30	3	500 A.C.	15.90
13955	30	4	500 A.C.	18.50
13956	60	2	250-500	13.70
13957	60	3	250-500	16.80
13958	60	4	250-500	19.60
13959	100	2	250-500	21.40
13960	100	3	250-500	26.60
13961	100	4	250-500	32.00
13962	200	2	250-500	30.40
13963	200	3	250-500	38.50
13964	200	4	250-500	46.30

BUSSMANN MANUFACTURING CO.

Manufacturers of Electric Fuses

ST. LOUIS, MO.

DEALERS AND DISTRIBUTERS IN EVERY PRINCIPAL CITY

Product.

ELECTRIC FUSES, all types.

Buss Renewable Fuses.

Ferrule Contact Type, 3 to 60 Amperes—Hands are all that are needed to renew these fuses. No fumbling or hunting for screwdrivers, etc. The full length cap gives large gripping surface for the hands.

Everything possible is done to insure good contact, thereby preventing burning of fiber tube. The full length cap, with unbroken surface, gives good contact in the fuse block clips; a recess in the cap takes the expelled metal and prevents it from injuring the contact points inside the cap; projection in cap insures a good contact with the link; cap being held by fuse block clips prevents vibration from loosening the contact.



FERRULE CONTACT
RENEWABLE FUSE

Knife Blade Type, 65 to 600 Amperes—End ring fastened *inside* the cartridge prevents shrinking or swelling of the fiber tube from having any effect on the operation or life of the fuses. Terminals are seated in metal grooves and can not possibly be out of line.



KNIFE BLADE RENEWABLE FUSE

Complete Fuses—All sizes are approved by the Underwriters' Laboratories, Inc., and labeled "Und. Lab. Inspected."

DATA, BUSS RENEWABLE FUSES

Amperes	Length over all, in.	Diam. tube, in.	Lbs. Per 100	Std. pkg.	List price
250-volt					
3 to 30...	2	1/4	6	100	\$0.50
35 to 60...	3	1/2	16	100	1.00
65 to 100...	5 1/4	1 1/4	48	50	2.00
110 to 200...	7 1/4	1 3/4	116	25	4.00
225 to 400...	8 3/4	2	235	25	7.50
450 to 600...	10 3/4	2 1/4	356	10	11.00
600-volt					
3 to 30...	5	3/4	19	100	1.10
35 to 60...	5 1/4	1	36	100	1.25
65 to 100...	7 1/4	1 1/4	74	50	3.00
110 to 200...	9 1/4	1 3/4	167	25	5.00
225 to 400...	11 3/4	2 1/4	462	25	11.00
450 to 600...	13 3/4	3	540	10	16.00

Renewal Links—Approved in all sizes by Underwriters' Laboratories, Inc., and stamped "Und. Lab. Insp."



RENEWAL LINK

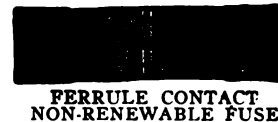
Identical in size and interchangeable with all standard makes of fuses.

DATA, BUSS RENEWAL LINKS

Amperes	Lbs. per 100	Std. pkg.	List price
250-volt			
3 to 30...	.12	100	\$0.03
35 to 60...	.65	100	0.05
65 to 100...	.75	50	0.10
110 to 200...	2.00	25	0.15
225 to 400...	4.00	25	0.30
450 to 600...	7.00	10	0.60
600-volt			
3 to 30...	.50	100	0.05
35 to 60...	1.70	100	0.06
65 to 100...	1.90	50	0.10
110 to 200...	6.00	25	0.15
225 to 400...	12.00	25	0.30
450 to 600...	20.00	10	0.60

Buss Cartridge Non-renewable Fuses.

Ferrule Contact Type, 3 to 60 Amperes—These sizes in the 250-volt range have no soldered joint on the inside, therefore no inaccuracies or variations in manufacture are possible.



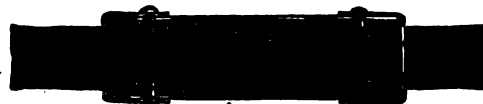
FERRULE CONTACT
NON-RENEWABLE FUSE

Knife Blade Type, 65 to 600 Amperes—The construction of Buss non-renewable cartridge fuses in the



KNIFE BLADE NON-RENEWABLE FUSE

knife blade sizes is such as to always assure positive alignment of blades. All parts riveted; no screws to come loose or fall out. Fusible element is riveted and soldered.



ILLUSTRATING STRIP USED IN NON-RENEWABLE FUSES

The strip as shown is an exclusive Buss feature and used in all Buss non-renewable cartridge fuses from 8 to 1000 amperes. This strip has been on the market 3 years; has thoroughly demonstrated that it makes the Buss fuse the coolest operating fuse, and enables us to guarantee that each and every Buss fuse will not burn or char the fiber tube at any overload.

Approved by the Underwriters' Laboratories, Inc., and labeled "Und. Lab. Inspected" except sizes larger than 600 amperes, which are not tested by them.

DATA, BUSS NON-RENEWABLE FUSES

Amperes	Length, over all, in.	Diam. tube, in.	Lbs. per 100	Std. pkg.	List price
250-volt					
1 to 30...	2	1/4	4.5	100	\$0.20
35 to 60...	3	1/2	11.0	100	0.30
65 to 100...	5 1/4	1	31.0	50	0.90
110 to 200...	7 1/4	1 1/4	80.0	25	2.00
225 to 400...	8 3/4	2	160.0	25	3.60
450 to 600...	10 3/4	2 1/4	275.0	10	5.50
650 to 800...	11 3/4	3	430.0	10	12.00
850 to 1000...	12 3/4	3	540.0	10	15.00
600-volt					
1 to 30...	5	3/4	15.0	100	0.40
35 to 60...	5 1/4	1	25.0	100	0.60
65 to 100...	7 1/4	1 1/4	55.0	50	1.50
110 to 200...	9 1/4	1 3/4	120.0	25	3.00
225 to 400...	11 3/4	2 1/4	290.0	25	5.50
450 to 600...	13 3/4	3	430.0	10	8.00
650 to 800...	14 1/4	3	540.0	10	15.00
850 to 1000...	15 3/4	3	725.0	10	18.00

"Buss" Plug Fuses.

Approved by Underwriters' Laboratories, Inc.

DATA, BUSS PLUG FUSES

Amperes	Catalogue No.	List price
3	803	\$0.07
6	806	
10	810	
12	812	
15	815	
20	820	
25	825	
30	830	

Packed 25 in a carton, 500 in standard package. Shipping weight, 70 lbs. per 1000.



BUSS PLUG FUSE

D & W FUSE WORKS

OF GENERAL ELECTRIC COMPANY

Fuses and Wiring Supplies

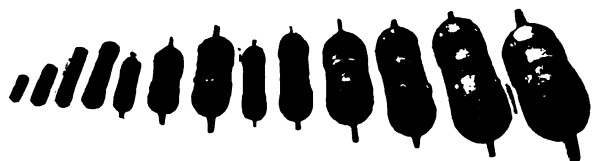
PROVIDENCE, R. I.

Products.

D & W FUSES; FUSE ACCESSORIES; OIL FUSE CUT-OUTS; DELTABESTON ASBESTOS INSULATED WIRES; INSULATING TAPE and SHEETING; D & W MAGNETIC CHUCKS.

D & W Fuses.

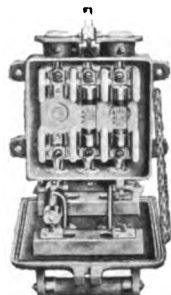
The manufacturers of D & W fuses have incorporated the soundest engineering principles in the design of each individual fuse, and the closest attention is given to all details in manufacture. The result is a fuse that is accurate in operation and that protects equipment under the most exacting conditions. D & W fuses range in size from 1 to 1000 amperes for all standard voltages.



D & W FUSES ARRANGED FROM 3 TO 1000 AMPS. CAPACITY

Fuse Accessories.

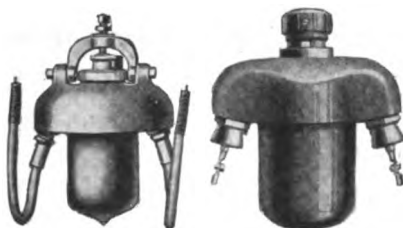
D & W fuse accessories include enclosed fuse cut-outs, cut-out bases, fuse boxes, fuse links and clips, service switches, telephone and telegraph protectors, etc. The same quality of workmanship and material enters into these devices as is found in D & W fuses and other products. Further information on this line is given in catalogue No. 15, mailed on request.



D & W WATER-PROOF SERVICE SWITCH BOX

Oil Fuse Cut-outs.

Oil fuse cut-outs are designed to protect all classes of circuits and are especially desirable for junction and primary protection near the source of current. They are made in four types: standard and heavy service pole types and standard and heavy service subway types. Heavy service types have increased interrupting capacities over the standard service types. The pole types, designed for overhead circuits range in size from 50 to 300 amperes at 2200 volts and up to 13,200 volts in smaller sizes. The subway types have the same ratings, and are especially protected against the entrance of moisture and water. This type performs satisfactorily even when totally submerged in water for days. Both types permit fuses to be renewed with ease and safety. D & W oil fuse cut-outs combine accurate overload protection with high interrupting capacity.



Subway Type Pole Type
50-200 AMPERE OIL FUSE CUT-OUTS



TRADE-MARK

Deltabeston Wires.

Deltabeston wires are all asbestos insulated, which renders them heatproof and vaporproof. Appliance manufacturers and others will find it to their interests to consult D & W specialists concerning the use of Deltabeston wires. Brief information on types of particular interest to engineers is given below. For detailed descriptions send for Catalogue PL-5015.

Magnet wires are designed for rewinding motor coils, arc lamp coils, headlight coils, and any kind of repair work where high temperatures exist. These can be furnished in various sizes in round, square, and rectangular styles.

Motion picture cable is extremely flexible, and may be used on cranes, controllers and searchlights.

Switchboard wire is a solid conductor, asbestos insulated, and finished with a hard asbestos braid.

Stove wire, of same general construction as switchboard wire, is particularly designed for the wiring of electric ranges and ovens.

Fixture wires are finished in plain asbestos, or with silk or cotton braids, and may be furnished with single or 2-conductor as desired. Lighting fixtures and other devices where heat would quickly destroy rubber are benefited by these wires.



Rectangular Magnet Wire



Switchboard Wire



Motion Picture Cable



Stove Wire

DELTABESTON WIRES

Insulating Materials.

Deltatape is a high heat resisting material having asbestos fiber as a base. Its thinness and flexibility make it especially applicable on covers and terminals of coils and between turns of flat wound motor coils. It can be furnished in any thickness from 10 to 25 mils., widths ranging from $\frac{3}{4}$ to $1\frac{1}{2}$ in.

Delta sheeting is the same in properties, texture, and finish as Deltatape. Furnished in rolls of any convenient length, the standard width being 8 in.

D & W Magnetic Chucks.

Magnetic chucks possess a very wide range of usefulness in holding steel and iron pieces for grinding, planing, shaping, and milling. D & W chucks include both flat and rotary types.

Standard equipment furnished with all chucks includes demagnetizing switches for releasing the work readily, and detachable waterproof extension cords.

D & W magnetic chucks will not operate on alternating current. For customers who have no direct current available the factory is prepared to furnish a small electric generator.

ECONOMY FUSE & MFG. CO.

2713 Greenview Avenue
CHICAGO, ILL.

ATLANTA, GA.
BALTIMORE, MD.
BOSTON, MASS.
BUFFALO, N. Y.

CINCINNATI, OHIO
CLEVELAND, OHIO
DETROIT, MICH.
DENVER, COLO.
SEATTLE, WASH.

KANSAS CITY, MO.
LOS ANGELES, CAL.
MILWAUKEE, WIS.
MINNEAPOLIS, MINN.
ST. LOUIS, MO.

NEW YORK, N. Y.
PHILADELPHIA, PA.
PITTSBURGH, PA.
SAN FRANCISCO, CAL.

ECONOMY FUSE & MFG. CO. OF CANADA, LTD., MONTREAL, CANADA

Complete Stocks Carried by All Leading Jobbers

Products.

Manufacturers of ECONOMY "APPROVED" RENEWABLE CARTRIDGE FUSES and RENEWABLE PLUG FUSES, "DROP-OUT" RENEWAL LINKS, "ARKLESS" NON-RENEWABLE INDICATING FUSES.

Also manufacturers of Non-renewable Plug Fuses, Electric Composition Insulation, Moulded Insulation, Screws of all kinds, S & C High Potential Fuses (in Canada).

Economy "Approved" Renewable Fuses.

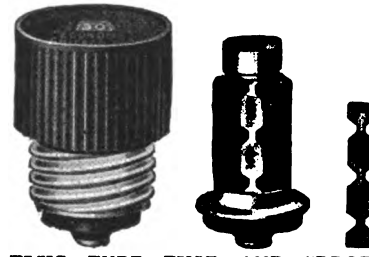
Economy fuses are made in three general types (ferrule, plug, and knife blade) with a full line of capacity ranges for all commercial voltages. This was the first line of fuses approved in all capacities by the Underwriters' Laboratories, Inc., established and maintained by the National Board of Fire Underwriters, employing an inexpensive bare link for restoring a blown fuse to its original efficiency.

The fusible elements are of the "drop-out" renewal link type, accurately rated and of definite design. Every part of an Economy fuse is built on the "safety first" principle, which means that the design is right from an electrical standpoint, and that material entering into the construction of the completed fuse is the best that money can buy.

Improved Economy Renewable Fuse—Study the renewable link feature. See the two narrow bridges of metal holding the "drop-out" features in place. In operations on short circuits, these two bridges fuse. The entire fuse metal does not volatilize, only the two narrow bridges. This very greatly decreases the danger factor due to the tremendous pressure generated when an entire strip of fusible metal is instantly converted into gases. No powdered filler to deteriorate or solidify. Only the fuse metal is destroyed; the fuse itself is ready for years of service. See the new winged washer which makes it easy for any one to replace the "drop-out" renewal link in a few minutes.

Economy Fuse Savings—There is 80% of fuse maintenance cost saved yearly, as compared to the cost of securing adequate protection by the use of non-renewable "one-time" fuses.

Economy Fuse Users—Users include industrial plants, large corporations, light and power companies, arms

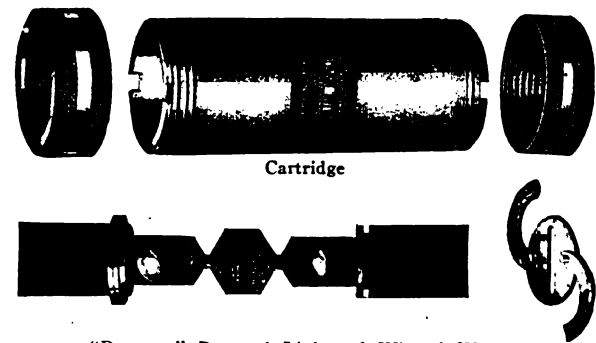


PLUG TYPE FUSE AND "DROP-OUT" RENEWAL LINK

and munition plants, powder mills, mining and smelting companies, department and large stores, publishing companies, flour mills, food product plants, hotels, theaters, public buildings, steamships, wireless stations ashore and afloat, and various departments of the United States Government.

Why Economy Approved Renewable Fuses are Used—They furnish proper protection under all conditions of service. Unlike "one-time" fuses, which are discarded after operation, Economy fuses are used over and over again to obtain complete protection against the fire and accident hazards of overloads and short circuits.

"Drop-out" Renewal Link—It is the heart of an Economy fuse. It instantly restores a blown Economy fuse to its original efficiency at the absolute minimum of cost. A stock of "Drop-out" links, always on hand, represents a small investment.



"Drop-out" Renewal Link and Winged Washer
ECONOMY KNIFE BLADE TYPE FUSE DISASSEMBLED

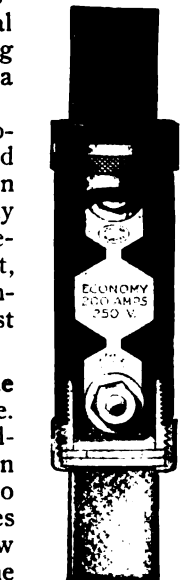
Safety—The use of economy fuses in establishments where the fire hazard is great (powder factories, arms and munition plants, chemical works, flour mills, submarines, battleships, etc.), and where "safety first" is the highest consideration (department stores, hospitals, schools, hotels, theaters, institutions, ships, railway cars, etc.), is the proof of their safety in use.

"Arkless" Non-renewable Indicating Fuses.

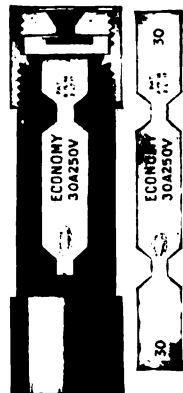
We are also sole manufacturers of "Arkless," the non-renewable fuse with the "100% guaranteed indicator." For use on circuits not subject to frequent overloads.

Samples.

Any capacities sent on request, provided they are to be used for comparison and tests. Ask for Catalogue 17 when ordering samples.



KNIFE BLADE TYPE



FERRULE TYPE FUSE AND "DROP-OUT" RENEWAL LINK

FEDERAL ELECTRIC COMPANY

Manufacturers of Renewable Fuses

8700 South State Street

CHICAGO, ILL.

SAN FRANCISCO, CAL., 91 New Montgomery Street

NEW YORK, N. Y., 627-649 West 43d Street

BRANCHES IN ALL LARGE CITIES

Stocks Carried by Leading Jobbers and Dealers

Product.

NATIONAL RENEWABLE FUSES for the protection of electrical circuits.

Approval.

The National renewable fuse is the only renewable fuse that has been approved by *all* of the following insurance regulating bodies:

Associated Factory Mutual Fire Insurance Companies
Hydro-Electric Power Commission of Ontario, Canada
Millers' Mutual Fire Insurance Companies
Western Factory Insurance Association
Underwriters' Laboratories, Inc.
Mutual Fire Prevention Bureau
Factory Insurance Association

Description of National Renewable Fuses.

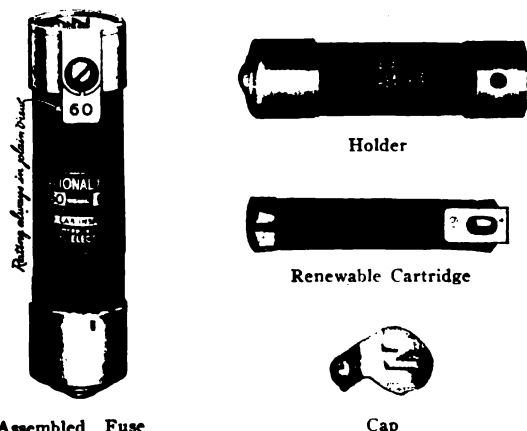
The fuse consists of an inner cartridge containing the fuse element and smothering powder, an outer fiber cartridge of suitable contacts, and a permanent metallic indicator (which is part of the element) for identifying the capacity of the renewable element used, without opening the outer cartridge.

The knife blade fuses and elements are both provided with gas vents in the ends to allow the gases to escape on short circuits.

The ferrule on the ferrule type is staked, and on the knife blade type is riveted to the fiber casing, and not screwed on the threaded fiber.

Distinctive Features.

Only one element of the proper size and rating can be used at a time.



Assembled Fuse

Cap

Holder

Renewable Cartridge

FERRULE TYPE NATIONAL RENEWABLE FUSE
Only 3 parts; other ferrule type renewable fuses have 6 or more parts

SWEET'S CATALOGUE

Powder packed element confines and smothers the fierce heat of the arc when the fuse blows, and also protects and increases the life of the outer casing or holder.

The indestructible metallic tell-tale indicator tells the amperage rating at a glance.

Simplicity—easy to reload.

Economy.

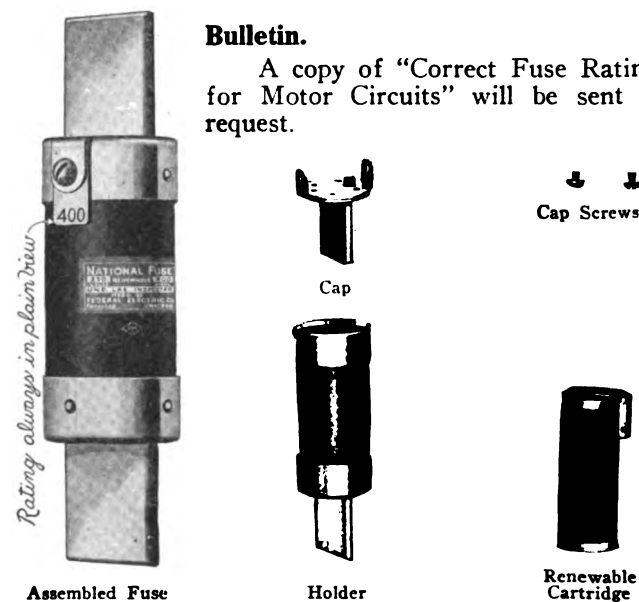
Wherever the National renewable fuse is used, a big saving is effected. First, because the renewable cartridge costs but a small part of the cost of the old style one-time fuse; and second, because its initial cost and maintenance expense are less than those of most renewable fuses.

Indorsement.

The National renewable fuse is indorsed and used extensively by prominent industrial plants throughout the country.

Sizes.

Manufactured in 250 and 600 volts, up to and including 600 amperes.



Assembled Fuse

Holder

Renewable Cartridge

Bulletin.

A copy of "Correct Fuse Ratings for Motor Circuits" will be sent on request.

KNIFE BLADE TYPE NATIONAL RENEWABLE FUSE
Only 5 parts; other knife blade type renewable fuses have 9 or more parts

THE ART METAL MFG. CO.

Manufacturers of Illuminating Units

East 61st Street and Curtis Avenue
CLEVELAND, OHIO

NEW YORK, N. Y.

CHICAGO, ILL.

SALES OFFICES
PITTSBURGH, PA.

LOS ANGELES, CAL.

TORONTO, CAN.

Products.

"Amco" INDUSTRIAL LIGHTING UNITS.

Description.

"Amco" industrial lighting units are of steel construction and finished in genuine porcelain enamel. The lower reflector is attached to the upper reflector by three small adjustable rods.

Lamps can be taken out or replaced without disturbing the fixture. The large reflector is made in two pieces spun together, forming a hollow body, and provided with a standard 2¼-in. fitter that will receive the standard 2¼-in. shade holder.

The lower reflector is made in one piece open at the top and bottom, and so formed that the lamp filament is focused at the intersection of the upper and lower parts. The light is projected downward at a 45° angle through the lower reflector, and also passed upward and projected outwardly from the top reflector over a wider field, thus producing *uniform illumination without glare*.

"Amco" units are attractive and substantial; they are scientifically designed and constructed. They are different in that they furnish at one time a soft, yet penetrating light for general illumination over a wide area, and a strong, clear light for local illumination over a more concentrated area.



TRADE-MARK
(Registered)

Advantages.

Proper mill or factory lighting means neither overlighting nor underlighting; it means a precise control of light that makes every ray a working ray just where needed—*without waste and without glare*.

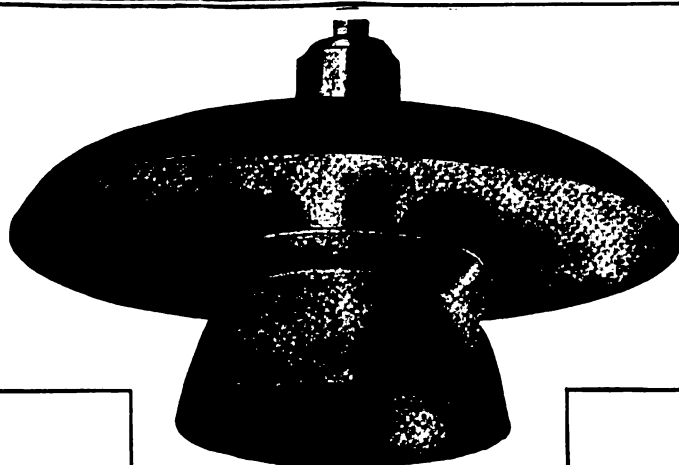
Such lighting pays big dividends. It speeds up production, improves the product, reduces spoilage, prevents accidents, saves the eyes and health of employees, conserves electric current.

SIZES OF AMCO LIGHTING UNITS

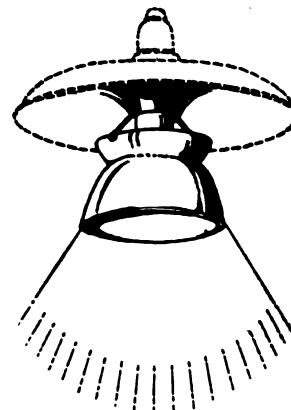
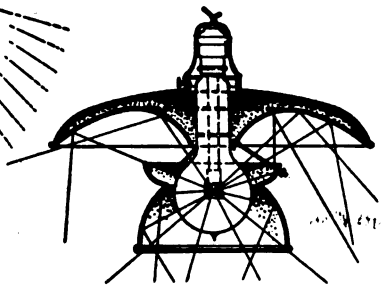
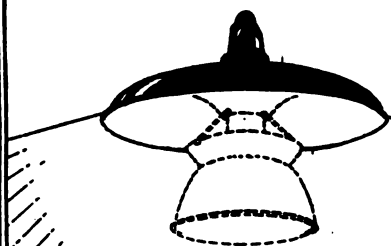
No.	Top reflector, in.	Finish	Size of lamp, watts	Socket	Weight, lbs.
302	17	P Enamel	300 to 500	Mogul	5
300	15	P Enamel	200	Edison	3
301	12	P Enamel	100	Edison	2

"Amco" industrial lighting units insure these results; they mark the greatest step forward in industrial illumination since the advent of the high intensity lamp.

No matter how large or small the mill or factory, or what the product, "Amco" industrial lighting units are needed. There is a size for every requirement, including a small size for use over individual machines.



"AMCO" INDUSTRIAL LIGHTING UNIT
All metal. No glass and no glare



Note:—Two Reflectors in One. Horizontal and Perpendicular Illumination from the same Unit.

Art Metal Mfg. Co.
Cleveland, Ohio.

"AMCO" INDUSTRIAL LIGHTING UNIT

Date: January 1921.

IVANHOE-REGENT WORKS

OF GENERAL ELECTRIC COMPANY

Manufacturers of Ivanhoe Reflectors

5716 Euclid Avenue
CLEVELAND, OHIO

Products.

Manufacturers of IVANHOE METAL REFLECTORS; IVANHOE GLASS-TOP REFLECTORS and FITTINGS for Industrial Plants.

Types of Reflectors.

Based upon wide experience in industrial lighting, the Ivanhoe line has been redesigned—the manufacturer standardizing on four essential types with an addition of a few special service reflectors.

Each type, scientifically designed, is made to produce certain characteristic results which can be applied to any class of industry.

These different types are shown on the following pages and the characteristic distribution of light is shown for each.

Finishes of Reflectors.

Ivanhoe reflectors are made of open hearth drawn steel with 3 standard finishes: porcelain enamel, aluminum, and paint enamel.

Porcelain Enamel—This finish is applied to the inside of the reflectors in 3 coats. The first is a binding coat, and it is covered by 2 coats of white porcelain enamel. The outside of the reflectors is treated with the same binding coat, and covered with 1 application of dark green porcelain enamel.

Aluminum—The aluminum finish is applied in 5 coats, 3 to the inside, and 2 to the outside. The final inside coat is transparent and washable, and the finishing coat on the outside is green paint. The metal form is thoroughly cleaned before the aluminum is applied, and the various coats are baked on separately. The finished reflector is well protected against rust; and although the reflecting surface does not collect dirt readily, it is easily cleaned by washing with a pure soap lather, or with a solution of 4 parts of warm water to 1 part ammonia.

Paint Enamel—The inside of the reflector is covered with a binding coat, and 2 coats of glossy white paint enamel. A glossy green paint enamel is applied to the outer surface, and baked on to insure a tough and durable finish. The color is permanent.

Holders.

Ivanhoe reflectors are made with 3 distinct types of extension to conform to different systems of wiring and installing. These are the B-heel extension, the extension equipped with the D holder, and the R extension.

B-heel Type—The B-heel is the name applied to the fitter at the top of one type of extension. It



B-HEEL TYPE



TRADE-MARK

provides a convenient and practical method of attaching the reflector to a separable holder.

The B-heel is $2\frac{1}{4}$ in. for medium base lamps and $3\frac{1}{4}$ in. for reflectors used with mogul base lamps. B-heels of $2\frac{1}{4}$ in. fit the standard form "O" holders or holders Nos. 902, 822, 824 or 884. B-heels of $3\frac{1}{4}$ in. fit holders Nos. 622, 672 or 705.

D Type—A second type of extension is furnished with a brass clip ring reinforced by the D clamp strap, or holder, for attaching directly to brass shell sockets.

R Type—The R extension gives its reflectors the name of "solid top." This extension contains a porcelain socket which is held in place by a lock nut at the top of the extension. The socket is designed to fit a $\frac{1}{2}$ -in. conduit. Besides providing for easy wiring, all R type reflectors are weatherproof.



D REFLECTOR ON SOCKET

To hang a D reflector on a socket, loosen screw, snap socket in ring, and tighten screw



WIRING TYPE R REFLECTORS

Loosen lock nut at top of extension and raise reflector on pipe

RLM Standard Dome Reflectors.

For all sizes of Mazda C lamps. These reflectors are made in accordance with the specifications and design of the reflectors standardized by the Reflector and Lamp Manufacturers and therefore bear their standard designation RLM.

Recommended as the highest standard of the distributing type.

They are porcelain enameled, green outside and white inside.

For uniform illumination they should be spaced not to exceed one and two-thirds times their height above the work.

In ordering, the Ivanhoe number should be given.

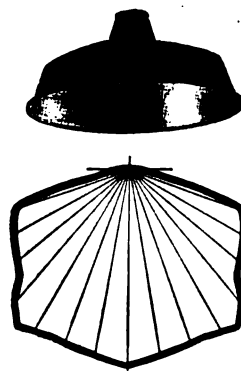


METHOD OF WIRING HOLDER

Cover of holder raised on pipe in order to wire holder and clamp it to B-heel



STANDARD B-HEEL TYPE



CHARACTERISTIC DISTRIBUTION

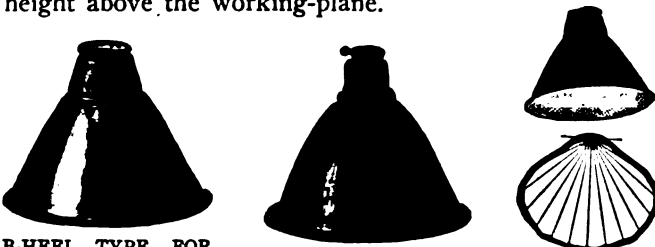


D TYPE FOR ATTACHING TO BRASS SHELL SOCKETS R TYPE WITH SOLID TOP CONTAINING PORCELAIN SOCKET
STANDARD B-HEEL TYPE, FOR USE WITH IVANHOE SEPARABLE HOLDERS; D AND R TYPES, WITH HOLDERS ATTACHED

Ivanhoe No.	Mazda C lamp, watts	RLM Standard designation	Dimensions, in.		Packing		List price, each
			Diam.	Depth	No. in standard package	Approx. ship'g wt., lbs.	
BEDD- 75	75	Dome-75	12½	5½	10	30	\$2.00
BEDD- 100	100, 150	Dome-100	14½	6½	10	35	2.40
BEDD- 200	200	Dome-200	16½	7½	5	25	2.76
BEDD- 500	300, 400, 500	Dome-500	18½	7½	5	25	3.84
BEDD-1000	750, 1000	Dome-1000	20½	10½	3	25	5.70
DEDD- 75	75	Dome-75 (for D type reflectors)	12½	5½	10	30	2.12
DEDD- 100	100, 150	Dome-100 (for D type reflectors)	14½	6½	10	35	2.52
DEDD- 200	200	Dome-200 (for D type reflectors)	16½	8½	5	25	2.88
REDD- 75	75	Dome-75 (for solid top reflectors)	12½	8½	10	55	3.50
REDD- 100	100, 150	Dome-100 (for solid top reflectors)	14½	9½	5	30	3.80
REDD- 200	200	Dome-200 (for solid top reflectors)	16½	10½	5	45	4.60
REDD- 500	300, 400, 500	Dome-500 (for solid top reflectors)	18½	12½	5	50	5.70

Standard Bowl Reflectors.

These reflectors for 25-, 40-, 50-, 60-, 75-, 100-, 150-, 200-, 500- and 1000-watt Mazda lamps replace the two Ivanhoe lines formerly listed as "Extensive Enamel" and "Intensive Enamel" porcelain enameled, green outside and white inside; their bowl shape furnishes an effective shield against the glare of the lamp. Spaced not to exceed one and two-thirds times their height above the working-plane.



B-HEEL TYPE FOR USE WITH IVANHOE SEPARABLE HOLDERS

D TYPE FOR ATTACHING TO BRASS SHELL SOCKETS

CHARACTERISTIC DISTRIBUTION

STANDARD BOWL REFLECTORS, B-HEEL TYPE, FOR USE WITH IVANHOE SEPARABLE HOLDERS; AND D TYPE, WITH HOLDERS ATTACHED

Ivanhoe No.	Mazda lamp, watts	Dimensions, in.		Packing		List price, each
		Diam.	Depth	No. in standard package	Approx. ship'g wt., lbs.	
BEB- 60	25, 40, 50, 60	7½	5	10	15	\$1.20
BEB- 75	75	8½	6½	10	15	1.44
BEB- 100	100-150	8½	7	10	20	1.50
BEB- 200	200	10½	8½	10	25	2.26
BEB- 500	300, 400, 500	12½	8½	10	35	3.10
BEB-1000	750, 1000	16½	11½	10	55	4.40
DEB- 60	25, 40, 50, 60	7½	5½	10	15	1.32
DEB- 75	75	8½	6½	10	15	1.56
DEB- 100	100, 150	8½	7½	10	25	1.62
DEB- 200	200	10½	8½	10	25	2.38
REB- 60	25, 40, 50	7½	7½	20	40	2.70
REB- 100	60, 75	8½	9½	10	35	3.12
REB- 200	100, 150	10½	11½	10	35	3.80
REB- 500	200	12½	12½	5	30	4.70

Porcelain Enameled Angle Type.

These angle reflectors for 25-, 40-, 50-, 60-, 75-, 100-, 150-, 200-, 500- and 1000-watt Mazda lamps should be used in industrial plants where overhead lighting is impractical, requiring the outlets to be placed along the wall. The weatherproof, easy-wiring R type is especially adapted to billboard lighting.



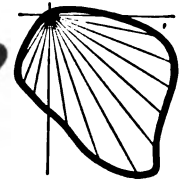
B-HEEL TYPE ENAMELED OR ALUMINUM FINISH FOR USE WITH IVANHOE SEPARABLE HOLDERS



D TYPE FOR ATTACHING TO BRASS SHELL SOCKETS



R TYPE WITH SOLID TOP CHARACTERISTIC DISTRIBUTION PORCELAIN SOCKET



STANDARD ANGLE REFLECTORS

Ivanhoe No.	Mazda lamp, watts	Dimensions, in.		Packing		List price, each
		Diam.	Depth	No. in standard package	Approx. ship'g wt., lbs.	

ALUMINUM, B-HEEL TYPE, FOR USE WITH IVANHOE SEPARABLE HOLDERS; AND D TYPE, WITH HOLDERS ATTACHED

BAL- 40	25, 40, 50	6½	5½	50	40	\$0.62
BAL- 60	60	8½	6½	40	40	.90
BAL-100	75, 100, 150, 200	10½	9	20	35	1.50
DAL- 40	25, 40, 50	6½	5½	50	40	.74
DAL- 60	60	8½	7½	40	40	1.02
DAL-100	75, 100, 150, 200	10½	9½	20	35	1.62

ENAMELED, B-HEEL TYPE, FOR USE WITH IVANHOE SEPARABLE HOLDERS

BEL- 40	25, 40, 50	6½	5½	50	40	\$1.40
BEL- 60	60	8½	6½	30	35	1.64
BEL- 100	75, 100, 150, 200	10½	9	20	40	2.40
BEL- 500	300, 400, 500	12½	11½	5	30	4.40
BEL-1000	750, 1000	15½	15½	5	50	6.50

ENAMELED, D AND R TYPES, WITH HOLDERS ATTACHED

DEL- 40	25, 40, 50	6½	5½	50	40	\$1.52
DEL- 60	60	8½	7½	30	35	1.76
DEL-100	75, 100, 150, 200	10½	9½	20	40	2.52
REL- 60	25, 40, 50, 60	8½	9½	20	40	3.20
REL-100	75, 100, 150, 200	10½	11½	10	40	4.20
REL-500	300, 400, 500	12½	16	5	30	6.20

Holders for Medium and Mogul Base Lamps and Reflectors.

No. 822 is a porcelain socket holder, tapped at the top for ½-in. conduit. It is attached to the B-heel type by means of 3 clamps, which are locked into place by a ring.

No. 824 is No. 822 with top casting fitted to take a weatherproof green porcelain enameled canopy.

No. 884 is a green porcelain enameled setscrew holder containing porcelain socket.

No. 902 is a steel holder finished in green paint and can be used with any 2¼-in. B-heel reflector with either porcelain or composition socket.

No. 622 is a porcelain socket holder, tapped at the top for ½-in. conduit. It is attached to the B-heel by means of 3 clamps, which are locked into place by a ring.

No. 672 is No. 622 with top casting fitted to take a weatherproof green porcelain enameled canopy.

No. 705 is a green porcelain enameled set screw holder containing porcelain socket.



622



672



705

HOLDERS FOR MOGUL BASE LAMPS AND REFLECTORS
3¼-in. fitters



902



822



824



884

HOLDERS FOR MEDIUM BASE LAMPS AND REFLECTORS
2½-in. fitters

HOLDERS FOR MEDIUM AND MOGUL BASE LAMPS AND REFLECTORS

Ivanhoe No.	Dimensions, in.		Packing		List price, each	List price, each, with Lamp-grip Sockets
	Diam., fitter	Length	No. in standard package	Approx. ship'g wt., lbs.		
622	3¼	5¼	10	30	\$2.00	\$2.07
672	3¼	6¼	10	40	3.10	3.17
705	3¼	5¼	10	25	2.35	2.42
822	2½	2½	10	10	1.20	1.27
822—With Pull-chain or Lock Socket	2½	2½	10	10	With Lock Socket \$2.00 With Pull-chain Socket, \$2.11 1.85	....
824	2½	3¼	10	15	With Lock Socket \$2.65	1.92
824—With Pull-chain or Lock Socket	2½	3¼	10	15	With Pull-chain Socket, \$2.76 1.19	....
884	3¼	3¼	10	10	1.60	1.67
902	3¼	3¼	50	..	.19	....

Holders including sockets can be supplied with lamp-grip sockets, if so desired.

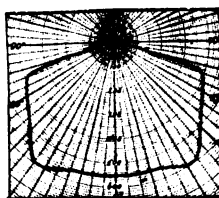
Ivanhoe Glass-top Reflectors—Dome Type.

These reflectors are made only in the standard dome type, their contour conforming to that of the RLM standard dome reflectors. The metal part of the reflector is one compact piece, the form and the heel being connected by substantial legs rigidly welded.

A glass section of good quality opal glass of light density and excellent diffusing properties permits a portion of the light to be transmitted above the hanging height of the reflector. The glass section is firmly held in place by metal clips.



Fixture
IVANHOE GLASS-TOP REFLECTOR



Characteristic distribution, BEDD-200—G.T.

DATA, IVANHOE GLASS-TOP DOME REFLECTORS, B-HEEL TYPE, FOR USE WITH IVANHOE SEPARABLE HOLDERS

Ivanhoe No.	Mazda C lamp, watts	Dimensions, in.		No. in standard package	Approx. ship'g wt., lbs.	List price, each
		Diam.	Depth			
BEDD-75-G. T.	75	12¼	5¼	10	30	\$3.43
BEDD-100-G. T.	100	14¼	6¼	10	35	3.70
BEDD-200-G. T.	200	16¼	7¼	5	25	4.14

EXTRA TOPS FOR GLASS-TOP REFLECTORS

6062	Glass Tops are of the same dimensions for all sizes of Glass-top Reflectors.....	40	50	\$0.55
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The light transmitted by the glass section is not large in comparison with that in other directions, but it is sufficient to serve the definite purpose of relieving the contrast between the areas below and above the plane of the lighting units as well as lighting any equipment, such as pulleys, belts, and shafting, mounted above the level of the reflectors.

Reflectors with Pull-chain and Lock Sockets.

Ivanhoe R Type reflectors with solid tops, containing medium screw sockets, as well as standard Ivanhoe holders for medium base lamps, can be supplied with pull-chain or lock sockets.

The pull-chain sockets are furnished with 6 ft. of ventilator cord attached to the chain. They permit the control of individual units in a lighting system which is controlled by a single switch, and eliminate the necessity for any other cut-out device.

Lock sockets in reflectors or holders prevent the removal of lamps from sockets except by the use of the proper key. Two keys are supplied with each order of such reflectors or holders; additional keys will be furnished on order at prices quoted.

R TYPE REFLECTORS WITH SOLID TOPS CONTAINING PULL-CHAIN OR LOCK SOCKETS

Ivanhoe No.	Recommended Mazda lamp, watts	Dimensions, in.		Packing		List price each with lock socket	List price each with pull-chain socket
		Diam.	Depth	No. in standard package	Approx. ship'g wt., lbs.		
RED - 60	40, 50, 60	12¼	7	10	45	\$4.16	\$4.27
REDD-75	75	12¼	8¼	10	50	4.30	4.41
(RLM Dome)							
REDD-100	100, 150	14¼	9¼	5	30	4.60	4.71
(RLM Dome)							
REDD-200	200	16¼	10¼	3	25	5.40	5.51
(RLM Dome)							
REB - 60	25, 40, 50	7¼	7¼	20	40	3.50	3.61
	60, 75	8½	9¼	10	35	3.92	4.03
REB -100	100, 150	8½	9¼	10	35	4.60	4.71
REB -200	200	10½	11¼	5	20	4.00	4.11
REL - 60	25, 40, 50	8¼	9¼	20	40	4.00	4.11
	60	10½	11¼	10	40	5.00	5.11
REL -100	75, 100, 150	10½	11¼	5	20	4.25	4.36
REW - 75	75	14	5¼	5	25	4.60	4.71
REW -100	100, 150	16	5¼	5	35	5.45	5.56
REW -200	200	18	6¼	5	35	5.45	5.56

HOLDER WITH PULL-CHAIN OR LOCK SOCKET

822	For lamp with Medium Screw base	Fitter 2¼	2½	10	10	\$2.00	\$2.11
824		2¼	3¼	10	15	2.65	2.76

Specify pull-chain or lock socket when ordering.
Additional keys for lock sockets come 10 in package; the list price is 7¢ per key.

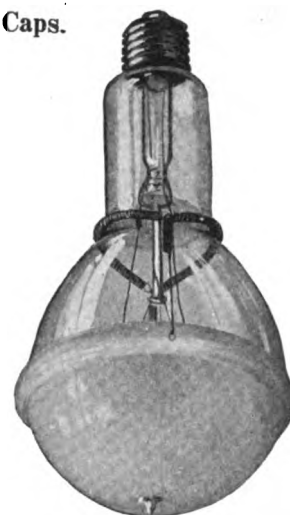
Ivanhoe-Regent Opal Lamp Caps.

The Ivanhoe-Regent opal lamp cap is made of Genco glass, which combines splendid diffusion with low absorption. This cap improves the illumination by hiding the filament and cutting down glare. It is designed particularly for use with reflectors, both glass and steel, which do not give sufficient eye protection.

OPAL LAMP CAP

Ivanhoe-Regent No.	For use with Mazda C lamps	Standard quantity, dozen	List price, each
GC-75	75	4	\$0.85
GC-100	100, 150	4	.91
GC-200	200	4	.96
GC-300	300	3	1.12
GC-500	400, 500	3	1.32

The prices listed include cap and spring as illustrated.



OPAL LAMP CAP ATTACHED TO MAZDA C LAMP WITH SPRING WIRE HOLDER

WESTINGHOUSE LAMP CO.

Manufacturers of Incandescent Lamps

GENERAL OFFICE
165 Broadway
NEW YORK, N. Y.

WORKS
BLOOMFIELD, N. J. MILWAUKEE, WIS. TRENTON, N. J. MIDDLETOWN, CONN. BROOKLYN, N. Y.
INDIANAPOLIS, IND.

SALES OFFICES

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BOSTON	CLEVELAND	DETROIT	MILWAUKEE	PHILADELPHIA
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CHICAGO	DALLAS	LOS ANGELES	NEW ORLEANS	ST. LOUIS
SAN FRANCISCO	SEATTLE	SYRACUSE	WASHINGTON	

EXPORT: WESTINGHOUSE ELECTRIC INTERNATIONAL Co., Incandescent Lamp Department, 165 Broadway, NEW YORK, N. Y.
CANADA: CANADIAN WESTINGHOUSE Co., LIMITED, HAMILTON, ONT.

Product.

WESTINGHOUSE MAZDA LAMPS in every style and size, for all lighting requirements.

Quality.

For forty years, lamps labeled "Westinghouse" have stood for the highest attainment in the art of lamp manufacture, so that the name has come to be recognized as a guarantee of quality on incandescent lamps.

Made in four modern, completely equipped factories, WESTINGHOUSE MAZDA lamps embody all the latest developments and improvements. Uniform quality and absolute dependability are the characteristics which have established for them an unusual record for satisfactory service.

Sizes, Voltages, etc.

WESTINGHOUSE MAZDA lamps are made in every required size for every conceivable lighting service.

Regular Multiple Burning Lamps—In sizes from 10 to 500 watts for standard voltage ranges. Straight side and round bulbs.

Mazda C (Gas-filled) Lamps—In sizes from 75 to 1000 watts for standard voltage ranges. Pear shape bulbs.

Series Burning Lamps—60 to 1000 c.p. in standard ampere ranges for street lighting. Straight side and pear shape bulbs.



TRADE-MARK

Sign Lamps Multiple Burning—11 to 12½, 55 to 65, and 110 to 125 volts. Straight side bulbs.

Series Burning Electric Railway Lamps—Five in series on voltage ranges 525 to 650. Straight side bulbs.

Multiple Burning Train Lighting Lamps—30 to 34 volts, round bulbs. Also locomotive headlight lamps, round bulbs.

Stereopticon Lamps—Round Bulbs.

Showcase Lamps—Tubular bulbs.

Compensator Lamps—Straight side bulbs.

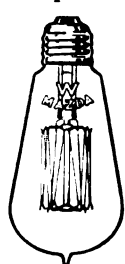
Flood Lighting Lamps—Round bulbs.

Prices and Information.

The Westinghouse Incandescent Lamp Data Book contains full information as to prices, discounts, sizes and dimensions of lamps, with drawings to scale, and will be sent free on request.

Engineering Service.

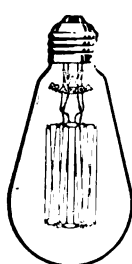
The services of the Lighting Service Department of the WESTINGHOUSE LAMP Co. are always available for assistance and advice on designing lighting installations.



40- AND
50-WATT
MAZDA



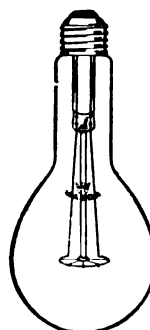
25- AND
50-WATT
MILL TYPE MAZDA



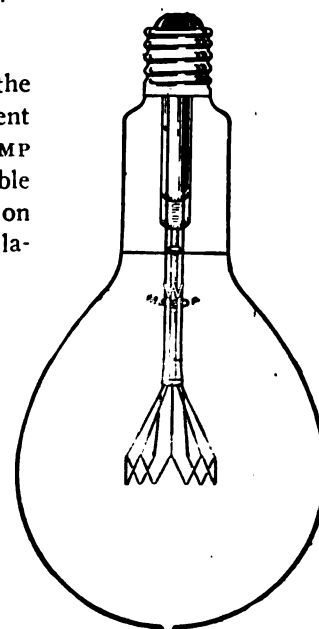
60-WATT
MAZDA



50-WATT
WHITE
MAZDA



100- AND
150-WATT
MAZDA



1000-WATT MAZDA

THE SCREW MACHINE PRODUCTS CORPORATION

Manufacturers of Select-O-Phone, Automatic Telephone and Man Finder

PROVIDENCE, R. I.

Products.

The SELECT-O-PHONE SYSTEM, a combined Automatic Telephone and a General, or Factory Calling Service.



Description.

The Select-O-Phone automatic telephone service consists of an automatic switchboard and telephone instruments. It has an ultimate capacity of 33 direct lines and 2 extensions for each line. All of these are intercommunicating with each other.

Simplicity.

The Select-O-Phone requires no expensive and complicated cable arrangements or terminal boxes. Wiring for its operation is very simple and inexpensive, and stations already installed may be moved easily. This simplicity also facilitates the addition of new instruments to the system.

Flexibility.

The Select-O-Phone is built throughout on the unit plan. One of the chief objects kept continually in mind during its development was to design a system that would be flexible; one, the first cost of which would not be prohibitive to the user who required a small number of stations, but at the same time a system that could be added to as requirements demand.

Special Features.

- Requires no operator.
- Gives a service of 24 hours.
- Gives connection in 4 seconds.
- Secret conversation.
- Speeds up city telephone service by relieving overburdened switchboard.
- No cut-offs during conversations.
- Conference of 3 or more on the same wire—all remaining at their post of duty.
- Executive control for special messages of the chief.

General Calling Service.

The general calling service, when combined with the Select-O-Phone automatic telephone service, provides a means of instantly locating and verbally connecting with a desired person anywhere in the plant. They step to the nearest Select-O-Phone station, answer the call and proceed on their way without loss of time.

It is not necessarily a part of the Select-O-Phone system, but the many advantages it offers makes it a valuable adjunct, especially for factories and large institutions. Its omission in no way interferes with the telephone service, as rendered by the Select-O-Phone, and it need not be installed unless desired. Provision is made in every system for its addition at any time.

Standard Desk Type.

The Select-O-Phone standard desk instrument is finished in dull black, with heavily nickeled fittings, and is practically identical in size and appearance with the usual desk telephone for exchange service, but contains the numbered dial with which connections are obtained without a switchboard operator.

There are 5 types of instruments.

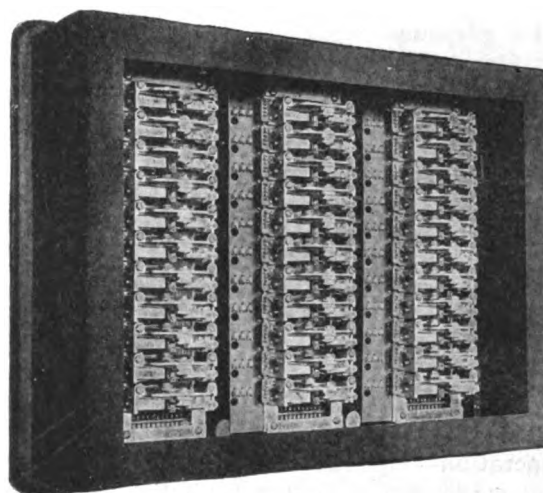


Automatic Switchboard.

Type M-33—The cabinets are made of selected, well-seasoned hardwood, finished in dull black, size 28½ by 20½ by 8 in., and are designed to mount on wall. The glass front cover is removable.

They are handsome pieces of furniture, harmonizing with any office and occupying a very small space.

STANDARD
DESK TYPE
SELECT-O-PHONE



TYPE M-33 AUTOMATIC SWITCHBOARD

Type M-33 switchboards are always furnished with the "busy" unit, and fully wired for mounting the general call relay and additional racks as needed.

Type M-11—A smaller switchboard of a similar design is made to meet the demands of those requiring an ultimate capacity of only 11 lines.

Catalogue.

Special engineers' catalogue containing schematic wiring plan, power plants, etc., sent on request.

STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY

GENERAL OFFICES AND FACTORIES

1050 University Avenue
ROCHESTER, N. Y.

BRANCH SALES OFFICES

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TORONTO, CAN., 10 Front Street, East
KANSAS CITY, MO., Coco-Cola Building

Products.

Manufacturers of INTER-COMMUNICATING TELEPHONE SYSTEMS, TELEPHONE APPARATUS, TELEPHONE CABLES and SUPPLIES.

Inter-communicating Telephone System No. 1.

Selective ringing, selective talking, with 6-, 12-, 22-, and 32-station capacity; cost of a switchboard system and an operator's salary are saved; each telephone station may select, ring and talk with any of the other stations *without interference with remaining stations which may be using system simultaneously*.

Adaptability—For offices, factories, public buildings, large residences, etc., where simultaneous conversations are necessary.

Service—This consists of 3 kinds: (1) For communication between a certain group of local stations. (2 and 3) This local service with additional service to and from city or town telephone system of either the "central energy" or local battery type, by means of one or more exchange trunk lines. One station on local system designated as the answering station.

The telephone exchange may be of two styles: (a) "central energy" type, with which the answering station handles and transfers *incoming calls only*—the outgoing calls being controlled from each local station; (b) "generator call" type, where both the incoming and outgoing calls are conducted through the answering station.

Standard Equipment—All telephone apparatus and accessories, including desk, wall and combination telephones, long distance transmitters and receivers, 3-position type switching key mechanism, key boxes, extension bells and other trunk line equipments, cables, terminal boxes, mounting standards, bell ringing transformers, batteries, etc. Each part is of the same high quality as used in regular city exchange systems.

Operation—To ESTABLISH CONNECTION—*Press 1 button once only*; same button is used for selecting and ringing desired telephone. Push button switching keys have 3 operating positions—normal, talking and ringing; pushing button all the way down closes a circuit which *causes bell of distant telephone to ring*; button being released, it snaps back half way to *talking position*, completing talking circuit with the telephone called; receiver is then removed and conversation may begin.

Switching keys interlock by means of a tumbler plate so that, when any call is made, any key button still remaining in talking position is restored to normal position when any other key button is pressed.

To ANSWER A CALL—Connection is made with party calling by pressing the white "home" button and by taking receiver from hook; "home" button is restored automatically when next call is made on system.

Telephones for System No. 1.

No. 905, for use at regular stations, consists of two pieces—a No. 989 desk stand and either a No. 8R, 9R, 10R or 11R key box. For answering stations, see table.

Key boxes contain switching key, vibrating ringer, impedance coil and line and battery terminals; directory spaces opposite each key button for inserting names of stations; removable covers for testing and inspection.



NO. 905-A DESK TELEPHONE
DESK TELEPHONES FOR SYSTEM NO. 1

Code number	Capacity	Desk stand number	Key box number	Key box mounting space	List price
FOR REGULAR STATIONS					
905-A	6 stations	No. 989	8R	4 $\frac{3}{4}$ " x 6 $\frac{3}{4}$ "	\$72.60
905-B	12 stations	" 989	9R	5 $\frac{1}{4}$ " x 6 $\frac{3}{4}$ "	81.40
905-C	22 stations	" 989	10R	5 $\frac{1}{4}$ " x 9 $\frac{3}{4}$ "	111.00
905-D	32 stations	" 989	11R	5 $\frac{1}{4}$ " x 12 $\frac{1}{4}$ "	134.00
FOR ANSWERING STATIONS					
906-A	6 stations	No. 990	8A	4 $\frac{3}{4}$ " x 6 $\frac{3}{4}$ "	\$72.60
906-B	12 stations	" 990	9A	5 $\frac{1}{4}$ " x 6 $\frac{3}{4}$ "	81.40
906-C	22 stations	" 990	10A	5 $\frac{1}{4}$ " x 9 $\frac{3}{4}$ "	111.00
906-D	32 stations	" 990	11A	5 $\frac{1}{4}$ " x 12 $\frac{1}{4}$ "	134.00
DESK TELEPHONE PARTS					
No. 989	Desk telephone		(Regular)		\$35.20
No. 990	Desk telephone		(Answering)		35.20
8R	Key box 6 stations		(Regular)	4 $\frac{3}{4}$ " x 6 $\frac{3}{4}$ "	37.40
8A	Key box 6 stations		(Answering)	4 $\frac{3}{4}$ " x 6 $\frac{3}{4}$ "	37.40
9R	Key box 12 stations		(Regular)	5 $\frac{1}{4}$ " x 6 $\frac{3}{4}$ "	46.00
9A	Key box 12 stations		(Answering)	5 $\frac{1}{4}$ " x 6 $\frac{3}{4}$ "	46.00
10R	Key box 22 stations		(Regular)	5 $\frac{1}{4}$ " x 9 $\frac{3}{4}$ "	76.00
10A	Key box 22 stations		(Answering)	5 $\frac{1}{4}$ " x 9 $\frac{3}{4}$ "	76.00
11R	Key box 32 stations		(Regular)	5 $\frac{1}{4}$ " x 12 $\frac{1}{4}$ "	99.00
11A	Key box 32 stations		(Answering)	5 $\frac{1}{4}$ " x 12 $\frac{1}{4}$ "	99.00

Wall Telephones—

No. 903 is regularly manufactured and carried in stock with a quarter sawed oak cabinet having a dull golden oak finish and nickelplated trimmings. Built in 4 sizes—see table on succeeding page. All apparatus (except switching key) mounted within hinged front section of cabinet, affording convenient access.



NO. 903-B TELEPHONE
Wall type

WALL TELEPHONES FOR SYSTEM NO. 1

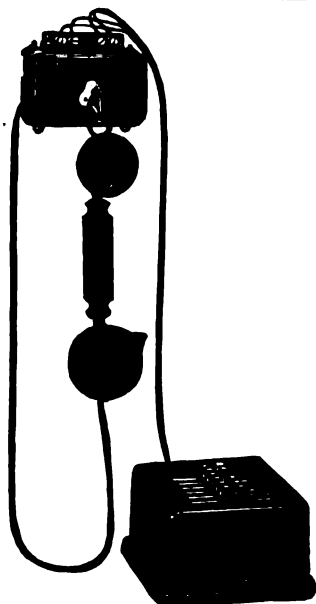
Code number	Capacity	Key box mounting space	List price
FOR REGULAR STATIONS			
903-A	6 stations	6 $\frac{3}{4}$ " x 11 $\frac{5}{8}$ "	\$59.40
903-B	12 stations	6 $\frac{3}{4}$ " x 11 $\frac{5}{8}$ "	69.30
903-C	22 stations	6 $\frac{3}{4}$ " x 14 $\frac{1}{2}$ "	103.40
903-D	32 stations	6 $\frac{3}{4}$ " x 17 $\frac{1}{4}$ "	132.00
FOR ANSWERING STATIONS			
904-A	6 stations	6 $\frac{3}{4}$ " x 11 $\frac{5}{8}$ "	\$59.40
904-B	12 stations	6 $\frac{3}{4}$ " x 11 $\frac{5}{8}$ "	69.30
904-C	22 stations	6 $\frac{3}{4}$ " x 14 $\frac{1}{2}$ "	103.40
904-D	32 stations	6 $\frac{3}{4}$ " x 17 $\frac{1}{4}$ "	132.00

Combination Type No. 1128—Convenient for either office or residence use.

Installed as either a wall or desk telephone outfit.

THE BATTERY—Two separate sets of dry cells required to operate system—one set of about 7 cells to supply for *talking purposes*, and other set of 7 to 10 cells for ringing the telephone bells.

Number of cells in ringing battery depends on length of lines.



No. 1128-A TELEPHONE

COMBINATION TELEPHONES FOR SYSTEM NO. 1

Code number	Capacity	Combination telephone	Key box number	List price
FOR REGULAR STATIONS				
1128-A	6 stations	10-I	8R	\$77.00
1128-B	12 stations	10-I	9R	85.00
1128-C	22 stations	10-I	10R	115.50
1128-D	32 stations	10-I	11R	138.60
FOR ANSWERING STATIONS				
1129-A	6 stations	10-IC	8A	\$77.00
1129-B	12 stations	10-IC	9A	85.00
1129-C	22 stations	10-IC	10A	115.50
1129-D	32 stations	10-IC	11A	138.60

Cabling of System—Cables contain all wires (Nos. 18 and 22 B & S gauge copper) necessary for operation of system; full metallic circuit wiring between all stations; and any pair of wires are identified by their coloring, making installation work easy. Each wire is tinned and insulated with servings of silk and cotton in opposite directions. Splices or junctions in cable should be made with the terminal boxes (for all sizes of cable).

TYPES OF CABLES—(1) Braided sheath type, recommended for interior use. (2) Leaded type, for all outdoor use or places subject to excessive moisture or corrosive fumes, dampness, etc.



CABLE

Inter-communicating Telephone System No. 2.

Service is equivalent to No. 1 System with these exceptions:

(1) It transmits one conversation only at a time; and (2) it is not arranged for connections with a public service telephone exchange.

Any or all stations may be called in rapid succession. Wiring arranged for local service between all stations.

Adaptability—Used for small size local service systems such as small commercial establishments, factories, clubs and residences. The circuits are simple and do not require the 3-position switching key.

Sizes—Instruments and accessories furnished in 2 standard sizes: for 6 and 11 stations.

Installation and Operation—Further details will be mailed on application.

No. 1122-B WALL TELEPHONE FOR SYSTEM NO. 2
Mounting space, 5 $\frac{1}{4}$ by 9 in.**Inter-communicating Telephone System No. 3.**

A central station system for communication between one master station and a number of outlying stations as in schools, small hotels and public institutions. Arrangement provides for talking and ringing between master station and all outlying stations over a 3-wire circuit—2 common talking circuit wires and an individual signalling wire to each station. Outlying stations can not call each other direct, but must first call the master station, which in turn calls desired station. All calls, therefore, are checked. One conversation only can be maintained at a time.

Equipment—Master station is equipped with both wall and desk telephones similar to those illustrated on preceding page; outlying stations are fitted with desk, wall and combination telephones, impedance coil (for regulating supply of current to transmitters of the various telephones) and all accessories.

Sizes—Instruments and accessories are furnished in 4 sizes: for 5, 10, 20 and 30 stations. A complete system need not be installed at the beginning—additional stations can be provided at any time, if master station capacity is of sufficient size.

No. 965 WALL TELEPHONE FOR SYSTEMS NO. 3 AND NO. 4
Mounting space, 5 $\frac{1}{4}$ by 7 $\frac{1}{4}$ in.**Inter-communicating Telephone System No. 4.**

For communication between any 2 points not farther than 1,500 ft. apart. An ideal equipment for a private line between 2 offices, 2 departments in a factory, and for house to garage lines, etc.

Equipment—System No. 4 is equipped with wall, desk and combination telephones and other necessary accessories.

Prices and Further Information.

On receipt of full particulars, estimates and detailed information, with catalogues, bulletins, etc., will be mailed without delay.

References:

Extensive lists of satisfied users of this company's inter-communicating telephone systems will be forwarded to interested inquirers on application.

BENJAMIN ELECTRIC MFG. CO.

Manufacturers of Electrical Specialties and Enameled Steel Products

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Products.

INDUSTRIAL SIGNALING DEVICES; INDUSTRIAL LIGHTING EQUIPMENT; LIGHTING PANELBOARDS and CABINETS.

Also manufacturers of Marine Lighting and Signaling Equipment, Wiring Devices, Automobile Push Buttons, Stampings, Drawings, Spinings, Castings, Porcelain Enameled Products.

Benjamin Industrial Signals.

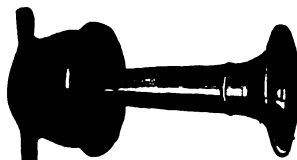
These signals have a clear, penetrating tone pitch. Furnished in weatherproof and non-weatherproof types for both direct current and alternating current circuits, with either bell type or conical projector. Weatherproof



NON-WEATHERPROOF TYPE SIGNAL

Bell projector, open wiring

casing is cast iron, tapped for 1/2-in. conduit entrance, and has a one-piece drawn brass projector welded to front cover. Non-weatherproof casing is pressed steel with approved insulated wire opening; mechanism is vibrator type. Standard voltage is 110 D.C. or A.C., but any voltage from 6 to 250 D.C. or A.C. may be specified. Specify voltage when ordering. Complete catalogue on request.



WEATHERPROOF TYPE SIGNAL

Bell projector, 1/2-in. conduit

DATA, BENJAMIN INDUSTRIAL SIGNALS

Catalogue No.	Type of projector	Connection	Type of signal	Circuit
8326H	Brass bell	1/2-in. conduit	Weatherproof	D. C.
8326A	Brass bell	Open wiring	Non-weatherproof	D. C.
8354A	9-in. conical	Open wiring	Non-weatherproof	D. C.
8355A	Brass bell	Open wiring	Non-weatherproof	A. C.
8152L	9-in. conical	Open wiring	Non-weatherproof	A. C.
8346H	Brass bell	1/2-in. conduit	Weatherproof	A. C.

Any of the above signals can be furnished with a special 14-in. conical projector if specified.

Double Projector Signals.

These signals provide a means of signaling up and down alleys, passageways, corridors, etc., from a central point. Furnished in weatherproof and non-weatherproof types for both D.C. and A.C. circuits. The mechanism is similar to that in the above signals. Any voltage from 6 to 250 D.C. or A.C. may be specified.



DOUBLE PROJECTOR SIGNAL

DATA, DOUBLE PROJECTOR SIGNALS

Catalogue No.	Type of projectors	Connection	Type of signal	Circuit
8784	Brass bell	Open wiring	Non-weatherproof	D. C.
8785	Brass bell	Open wiring	Non-weatherproof	A. C.
8788	Brass bell	1/2-in. conduit	Weatherproof	D. C.
8790	Brass bell	1/2-in. conduit	Weatherproof	A. C.

Benjamin Telecode Relay.

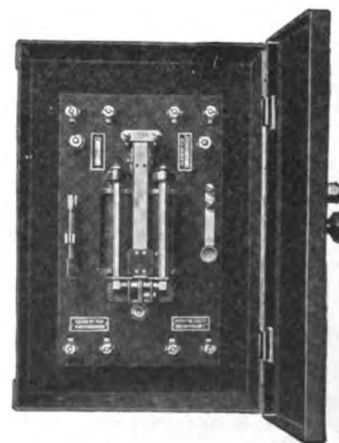
With the aid of the telecode relay it is possible to utilize Benjamin industrial signals on any type of telephone system, and have the calls heard in the most remote corners above the noise. It may be equipped for operation on telephone circuits utilizing alternating current or direct current as their ringing energy. For use on standard telephone circuits, specify resistance of telephone bells on telephone line where relay is to be used. When

direct current is utilized for ringing energy, specify voltage of ringing current. Carrying capacity at contacts of relay is equal to two Benjamin industrial signals. Mounted on porcelain base and furnished in weatherproof and non-weatherproof types.

Catalogue describing non-weatherproof telecode relay No. 8311 and weatherproof type No. 8312, will be sent on request.

Benjamin Master Relay Panel.

The master relay panel serves as a means of opening and closing the high voltage current necessary to operate a number of Benjamin industrial signals on one circuit. By use of it, it is possible to operate a number of signals, wired in series or multiple, with a commercial current up to 250 volts D.C. Four sets of binding post terminals, plainly marked, make errors in connections impossible. Relay contacts are heavy carbon, with a capacity of 24 Benjamin industrial signals. Relay, with primary switch, test button and binding post terminals, is mounted on 1/2-in. slate panel, incased in heavy sheet steel box with cover and lock. Standard windings of relay coil are for 4, or 6 volts, D.C. Special windings for other voltages can be furnished when specified on order.



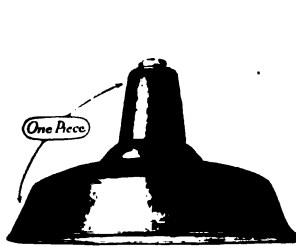
MASTER RELAY PANEL

Benjamin Reflector Sockets for Industrial Lighting.

The reflector is of one piece of drawn steel, on which is fused the highest grade porcelain enamel. The socket is two-piece, porcelain, easy-to-wire type with lamp grip.

A heavy, separable, brass-to-iron supporting fitting carries the socket and the weight and strain of the reflector.

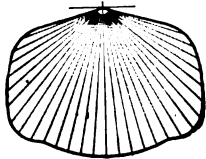
R.L.M. dome reflectors are suitable for general lighting. The cut-off is 17° below the horizontal which under ordinary conditions prevents glare in the line of



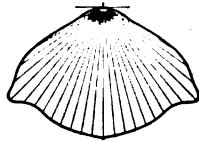
R.L.M. STANDARD DOME



BOWL TYPE



DISTRIBUTION



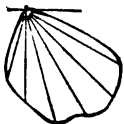
DISTRIBUTION

DATA, R. L. M. DOME AND BOWL TYPE REFLECTORS

R. L. Dome		Lamp, watts	Bowl Type	
Diam., in.	Catalogue No.		Diam., in.	Catalogue No.
12	5640	40, 50, 60	7	X6166
12	5641	75	8	X6161
14	5642	100, 150	9	X6189
16	5643	200	10	X6169
18	5644	300, 500	12	X6173
20	5645	750, 1000		



ELLIPTICAL ANGLE REFLECTOR



DISTRIBUTION



PARABOLITE

Intended for illuminating long narrow aisles, platforms, etc. Is also used for protective lighting along fences.



DISTRIBUTION

DATA, ELLIPTICAL ANGLE AND PARABOLITE REFLECTORS

Elliptical Angle		Lamp, watts	Parabolite	
Diam., in.	Catalogue No.		Length, in.	Catalogue No.
8 1/4 x 13 1/4	5522	60, 75	20	1234
8 1/2 x 13 1/2	5525	100, 150	20	1235
10 1/2 x 15	5526	200	20	1236
14 x 20	5537	300, 500	20	1237
14 x 20	5538	750, 1000		

SWEET'S CATALOGUE

vision. Bowl reflectors are used for general lighting where it is not necessary to illuminate vertical surfaces—also for individual bench lighting. Elliptical angle reflectors are used where conditions require that the light come from the side of the areas lighted.

Benjamin Lighting Units for Special Industrial Applications.

Cast Top Reflector Unit—This unit is for use in railroad shops, steel mills and other places where smoke or dust in the atmosphere is excessive and reflectors need to be removed frequently for cleaning. It is a very rugged fixture, consisting of a heavy, cast iron top,

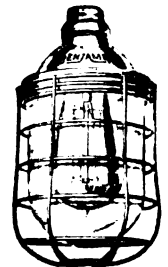


CAST TOP REFLECTOR UNIT

tapped for stem and containing a lamp socket, and a porcelain enameled steel reflector joined to the top by a heavy thread. This unit can be furnished in two general types, one for mounting directly on an outlet box and one for mounting on a stem. The pendant type can be furnished with bowl and symmetrical angle reflectors

and the outlet box type with bowl and R.L.M. reflectors, sizes to take 75-watt to 1000-watt lamps.

Moistureproof and Dustproof Fixtures—These fixtures are for use in damp places, or under conditions where it is necessary to protect the lamp from dust or dirt floating in the atmosphere. They are made with guard as shown, or less guard. They can be furnished in either copper or aluminum, and in sizes to take from 25-watt to 100-watt lamps.



MOISTUREPROOF AND DUSTPROOF FIXTURE



WATERPROOF FIXTURE

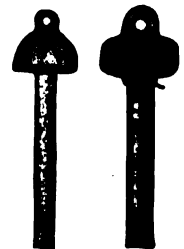
Waterproof Fixtures—The lighting unit shown is one type of a line of watertight, gasproof and vapor-proof units. They are suitable for the industries where there is a prevalence of moisture, dust or atmospheric gases. The metal casing is cast iron or brass, and the entire construction is very strong and durable. They are furnished with or without plunger switches, and in sizes to take from 40-watt to 100-watt lamps.



No. 5061



No. 5066



No. 5063

SUSPENSION DEVICES FOR FIXTURES

No. 5060—1/4-in. pipe. Shock absorber with loop for hanging on a hook.
No. 5061—1/4-in. pipe. Shock absorber with screwholes, for mounting.
No. 5063—1/4-in. pipe with weatherproof fitting.
No. 5064—1/4-in. pipe. Weatherproof fitting with insulated, wire openings.
No. 5066—1/4-in. pipe. Extends 30 in. Shown with pole fitting. Wall fitting can be furnished.

Stems have standard length of 12 in. but can be furnished in any required length

Continued on next page

Benjamin Starrett Panelboards in Cabinets.

In the Benjamin-Starrett panelboards, the most intricate requirements in panelboard construction have been reduced to the plain and simple terms of a standardized product—staple merchandise. It is a sane development toward safety for those operating such equipment, as well as toward economy of time and effort for those installing it.

All Benjamin-Starrett panelboards are built on bases of molded composition, which is mechanically and electrically superior to slate, and permits the manufacture of a smaller, lighter and better panel without delays. Bus bars are always concealed. In the case of the standardized panelboard, they are mounted at the back of the base; in the case of the stock panelboard, they are buried in the base.

Barriers are made of approved composition material, and are slotted to receive the branch circuit wires and the main feed wires. The corner irons which carry the barriers are secured to the panel mounting, thus making the barriers and panel a unit, and the entire barrier mounting independent of the cabinet. Barrier sides are removable by simply loosening two wing nuts. Removable complete by loosening four barrier mounting screws. Removable complete, attached to the panel, by loosening four panel mounting screws.

Standardized Panelboards—The requirements of practically all lighting installations may be met with

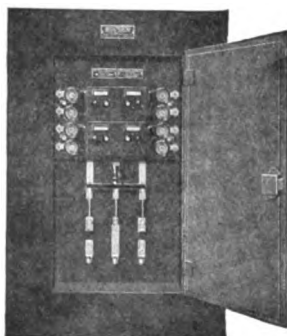
to all the switches and fuses on the face of the board. For this reason it is usually installed in places where the manipulation of switches and the renewal of fuses are attended to by some authorized person. The combined Yale lock, latch and knob excludes all other persons and renders tampering and the theft of fuses impossible.

Stock Panelboards—In the stock panelboard, provision has been made for certain sizes, as shown below, to be carried in stock at the factory and on the jobber's shelves. This panel, already packed before the order is received, besides satisfying all emergency demands in the quickest possible time, will meet 85% of all panelboard requirements. As a main center of distribution it is suitable for residences, stores, offices, shops, or small factories requiring not over ten circuits. As a subcenter of distribution it may be used in an installation of any size.

Complete Catalogue S-3 sent on request.

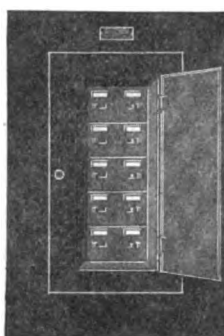
To Specify Panelboards Give—

- (1) Type symbol.
- (2) Number of branch circuits.
- (3) Mains (whether 2 or 3 wires).
- (4) Main connections (lugs only, fusible mains, fuseless switch, fusible switch).
- (5) Branch fuses (whether plug or cartridge).
- (6) Branch switches (push, tumbler or knife).
- (7) Cabinet mounting (flush or surface).



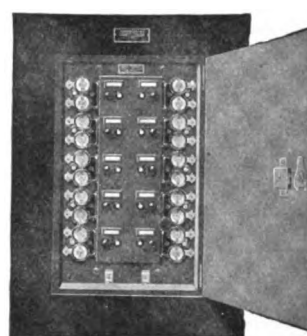
OPEN FRONT, STANDARDIZED PANEL

Range—4 to 30 circuits
Wire mains—2-2 or 3-2, 125 volts
Main connections—lugs only, fusible mains, fuseless main switches, fusible main switches
Cabinet mountings—flush or surface



DEAD FRONT, STANDARDIZED PANEL

Range—4 to 30 circuits
Wire mains—2-2 or 3-2, 125 volts
Main connections—lugs only, fusible mains, fuseless main switches, fusible main switches
Cabinet mountings—flush or surface



OPEN FRONT, STOCK PANEL

Range—4 to 10 circuits
Wire mains—2-2 or 3-2, 125 volts
Main connections—lugs only.
Cabinet mountings—flush or surface

Benjamin-Starrett standardized panels, open or dead front. This last, the dead front panel, has safety features which make it a real necessity in places where inexperienced persons must have access to the branch circuit switches. The factory or office worker can operate the branch circuit switches of a dead front panel as easily as he can operate the ordinary enclosed wall switches in every-day use.

The dead front board, the highest type of safety panel, is equipped with a "double" door, one small door within a larger one. The large door opening exposes the full face of the panel, the smaller gives access only to the switches of the branch circuits. This panel is recommended for installations where branch circuit switches are manipulated by inexperienced persons and fuses are renewed by a maintenance man. The large door has a combined Yale lock, latch and knob, which effectively prevents the theft of fuses and any tampering with the branch or main connections.

The open front panel is identical with the dead front, except that it has a single door, which gives access

DATA, BENJAMIN-STARRETT PANELBOARDS

	STANDARDIZED PANELBOARDS		STOCK PANEL BOARDS
	Open Front	Dead Front	Open Front
BRANCHES ARRANGED FOR EDISON PLUG FUSES			
Without switches in branches...	Type OP		Type SP
Knife switches in branches...	Type OPK		Type SPK
Tumbler switches in branches...	Type OPT	Type DPT	
Push switches in branches...	Type OPP	Type DPP	Type SPP
BRANCHES ARRANGED FOR CARTRIDGE FUSES			
Without switches in branches...	Type OC		
Knife switches in branches...	Type OCK		
Tumbler switches in branches...	Type OCT	Type DCT	
Push switches in branches...	Type OCP	Type DCP	

ADAPTATIONS OF THE STANDARDIZED PANELBOARD
(Furnished in Open Front or Dead Front)

Panels with 1320-watt branches Through feed panels:
Panels with increased mains With lug connections at top
Subfeed panels: Convertible panels
With fusible connections at top, Panels with meter loops
With fusible switch connections Cabinets with 4- or 5-in. gutters at top

THE INTERNATIONAL TIME RECORDING COMPANY OF NEW YORK

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50 Broad Street
NEW YORK, N. Y.

WORKS: ENDICOTT, N. Y.

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Products.

SYNCHRONIZED TIME SYSTEMS.
IMPULSE TIME SYSTEMS.
MASTER CLOCKS.
SECONDARY CLOCKS.
PROGRAM DEVICES.
TIME RECORDERS: Card, Dial and Autograph.
JOB TIME RECORDERS.
TIME STAMPS.
RECORDING DOOR LOCKS.

International Service.

This company will furnish, without cost, specifications, layouts of conduit, wiring diagrams and estimates covering installations of electric clock systems, upon receipt of necessary information, plans, etc.

Special designs or styles to suit architects' specifications can be secured in any model of International time systems and time recording devices.

The company will contract for installing its products where necessary; but the apparatus is so simple and substantial, that the average electrical contractor can install to the company's specifications and render perfect satisfaction.

Experience, Reputation and Quality of Products.

THE INTERNATIONAL TIME RECORDING COMPANY OF NEW YORK is the largest manufacturer in the world of time systems, time and cost recording equipment and allied products.

Its thoroughly equipped plant is the largest devoted to the manufacture of the above products and is the impressive result of nearly 40 years of consistent

advancement, reflecting in every department the efficient operating policies represented by International products.

The large force of skilled and experienced engineers and mechanics build into International products a degree of mechanical reliability and an appreciation of high manufacturing ideals, which is the finest and surest guarantee of satisfaction to the user.

International products are designed with utmost care by specialists; they embody the best materials and are scrupulously and repeatedly inspected and tested. They measure up in the minutest detail to the standards of accuracy, simplicity and durability upon which the dominance of International products has been built.

They are backed up by a field service of competent men to look after them.

Synchronized Time Systems.

For 25 years there has been nothing basically new in electric time system construction, nor have any great improvements been made in connection therewith.

In the past, minute impulse systems were erroneously termed "synchronized time systems."

A distinctive disadvantage of the impulse system was that, if the electric current were shut off, all secondary units in the system stopped (as they were not complete units in themselves, depending upon electrical impulses from the master clock), and when the current was again applied, secondary clocks and other devices were not in synchronism.

Synchronism was thus not fully maintained in the past by impulse systems, and THE INTERNATIONAL TIME RECORDING COMPANY OF NEW YORK, recognizing the disadvantages of such systems, developed and placed upon

the market a new method which gives synchronism its *full meaning and value* for the first time.

The elements that have proved troublesome in impulse electric time systems have thus been eliminated.

Distinctive Features of The New International Synchronized Time System—In the new International system, should the electric current be cut off for any reason, especially over week-ends and holidays, all units in the system (being independent and self-winding) will continue operation. When the current is again applied, the secondary clocks and all other devices, become synchronous with the master clock. Thus accurate time is assured throughout the entire system and all battery troubles are eliminated.

This system will operate with equal accuracy and satisfaction on 110 and 220 volts A.C., 25 to 60 cycles or 110 to 220 volts D.C. The electric current consumed is so remarkably small that the expense is negligible.

The new International time equipment is operated by a 2-wire system from master clock to all units, and all units are electrically wound each day by the current wires from the nearest electric incandescent light or wall plug. Each separate unit is wound daily by its own electric motor, and thus all key or manual winding is eliminated.

All units in the system will run 7 days without electric current.

Interruption of current can not harm or upset accurate operation of the system.

Any unit may be removed from the system and run independently with satisfactory results, as each unit is equipped with a reliable *marine clock movement* which *will run in any position*. There are no pendulums except in the master clock.

Each unit is self-corrective when added to the system and becomes synchronous with the master clock at the next synchronizing period, which is every hour.

No auxiliary apparatus, such as batteries, rectifier, pilot clocks, stepping keys, etc., is required.

The International system is a decided improvement over the impulse system employing minute jumpers as secondaries. International secondaries are complete clocks, not dependent upon a master clock for *operation*; but each secondary is synchronized every hour with the master clock, so that there is absolute unison with the International system. The lasting qualities of all contacts is thus 60 times greater than on the impulse system, because in the International synchronized system there is one contact an hour instead of one each minute, or 24 a day instead of 1440.

International synchronized time systems provide efficient time service at the lowest possible cost of upkeep and they do not require periodical inspection and attention.

Component Parts of the System—The units comprising a typical International synchronized time system are a master clock, secondary clocks, program devices, time recorders, job time recorders, time stamps, relays, bells, gongs and whistles.

MASTER CLOCK—International master clocks are self-winding and control any number of secondary clocks, program devices, time recorders, job time recorders and time stamps, bringing the entire system into synchronism.

Escapement is Graham dead beat, all parts are highly polished, pinions are of cut steel carefully hardened and burnished, pendulums have wooden rods with metal bob or mercurial compensation as desired, and circuit closers are platinum tipped.

Dials, hands and cases are standard in numerous styles, but can be varied to suit special requirements.

SECONDARY CLOCKS—These clocks are controlled by means of the master clock every hour and all clocks throughout the building are in exact synchronism with the master clock.

These units are complete clocks within themselves and will continue to keep time should the master clock be stopped for cleaning or any other purpose. They do not require regulation, winding, setting, etc.; are not affected by temperature changes or vibrations; are dust-proof, and their construction eliminates expensive cost of upkeep.

Secondary movement is of the highest refined special marine type.

These clocks can be located in places best suited for observation with reference to accessibility.

Any number of secondary clocks can be operated from one master clock regardless of the distance between master clock and outlying stations.

Dials, hands and cases are standard in a number of styles, but can be varied to suit requirements.

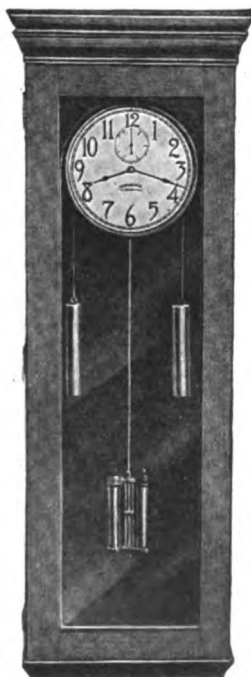


Round Case



Octagonal Case

SECONDARY CLOCKS



INTERNATIONAL MASTER CLOCK



Card Recorder



Dial Recorder

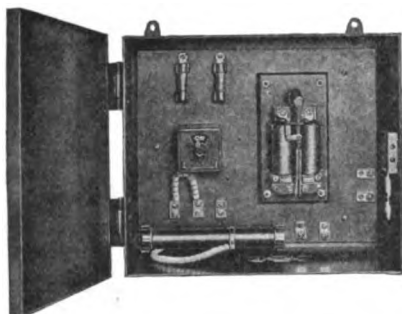
SYNCHRONIZED RECORDERS

RECORDERS—Any number of recorders may be added to the synchronized system. These recorders contain self-winding clock movements, which are synchronized hourly by a master clock.

The card recorder produces individual card records of in-and-out time of employees, while the dial recorder produces a similar record of all employees on one paper sheet form.

RELAYS—International relays are used to open and close local circuits and insure uniform current throughout the system.

Relay cabinets are furnished as illustrated.



INTERNATIONAL RELAY CABINET

Method of Wiring—Method of wiring is in accordance with Class C, National Code, which is generally known and understood by the average electrical contractor.

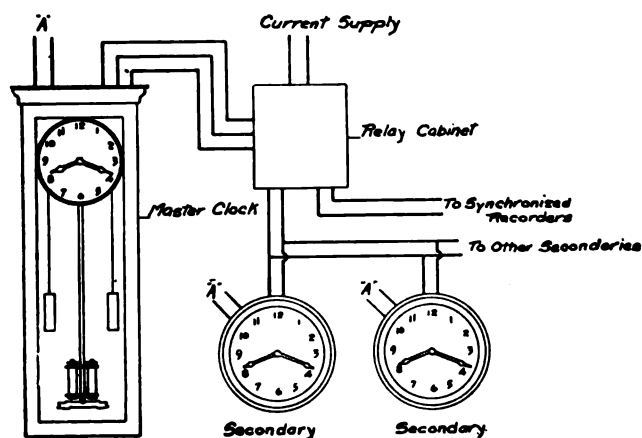


DIAGRAM SHOWING VARIOUS DEVICES OF THE NEW INTERNATIONAL SYNCHRONIZED TIME SYSTEM

Taps "A" connect to nearest electric light wires (for winding motor)

Electric Impulse Time Systems.

In these systems, the controlling and operating energy is drawn from storage batteries or from commercial current.

The system is operated by a master clock, which is self-winding and controls any number of secondary clocks, program devices, time recorders, job time recorders, time stamps, bells, gongs and whistles.

The master clock actuates the secondary clocks and other devices by minute or half-minute electrical impulses.

Polarized Secondary Clocks—These clocks do not contain clock movements but depend for their operation on minute or half-minute electrical impulses transmitted by the master clock.

They have a decided advantage over ordinary secondary clocks in that their peculiar construction renders their operation noiseless. In ordinary secondary clocks, the minute hand, upon receiving an impulse from the master clocks, gives a decided "click." The polarized

secondary clock is so designed that it overcomes this objection, and thus silent and efficient time service is assured.

Power Required—The International impulse system is provided with a storage battery of the proper size for the successful operation of the system. The International impulse system can be equipped with an automatic charging device, which minimizes the misuse of the battery system by inexperienced or careless operators.

Program Devices.

International program devices are used to automatically control a series of signals such as bells, gongs or whistles, or the operation of other devices according to a predetermined schedule.

They are actuated by the master clock and will ring a regular program in any 12-hour period at minute or longer intervals, and will automatically change to another program during a selected 12-hour period. They will also eliminate the programs for any given hour or day of the week.

Changes in programs or schedules can be quickly and easily effected without interfering with the mechanism of the program devices and without the use of special tools.

Duration of signals can be changed over a very wide range to meet all requirements.

Made in 2-, 4-, 6- and 8-circuit sizes, each circuit controlling a group of bells, gongs or whistles that are operated or sounded in unison.



INTERNATIONAL PROGRAM DEVICE

Time Recorders.

International time recorders give elastic systems of time recording and are popular because of their flexibility and accuracy.

They are manufactured in many different styles and sizes, in either spring driven or electric models.

All have the same basic mechanism, but additional features make them applicable to any possible requirement.

Such features as automatic in-and-out, automatic day-to-day and automatic 2-color ribbon shift are embodied in International time recorders.

Standard cases or cabinets are made from first quality kiln dried quartered oak. Special woods and finishes furnished when specified.

These recorders may be provided for use with the International synchronized time system or with the impulse system.

Card Time Recorders—These recorders are made in many styles. They are adaptable to any business and will meet all requirements.

They provide individual time card records for daily, weekly, biweekly or semimonthly, and monthly pay periods.



Electric Drive



Spring Drive

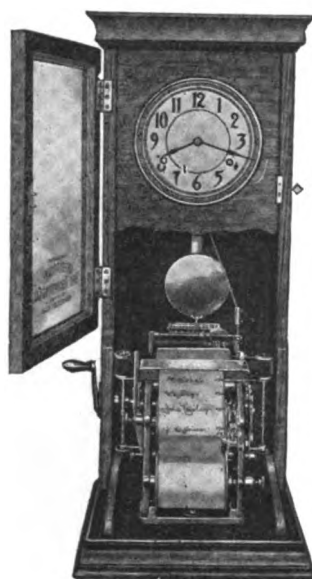
INTERNATIONAL CARD TIME RECORDERS

Autograph Time Recorders—These recorders are specially adapted for places where arrival and departure of employees are irregular.

When registering time of arrival or departure, each employee is required to affix his signature in the place provided; thus it positively identifies the person who makes the record.

Dial Time Recorders—Register time on daily or weekly sheet form and render a printed pay roll record complete.

Made in electric or spring driven models, in 50-, 100- and 150-capacity sizes, and in automatic and non-automatic types.



INTERNATIONAL AUTO-GRAPH TIME RECORDER WITH CASE OPEN



Electric Drive with Spacing Device



Spring Drive

INTERNATIONAL JOB TIME RECORDERS

Time Stamps.

International time stamps are in extensive use for registering time and date of receipt of letters, telegrams, cards, correspondence, messages, and all other papers passing through offices, hotels, garages, shops, freight



INTERNATIONAL DIAL TIME RECORDER



INTERNATIONAL TIME STAMP, ELECTRIC DRIVE

offices and many other places where they have been found indispensable for this purpose.

The printed impression of the International time stamp shows the hour, fractions of the hour, also the month, the day and the year. Time may be shown in hours, minutes, or in tenths or hundredths of the hour.

International electrically operated time stamps eliminate the objections of derangement of mechanism and incorrect time, as they have no delicate parts to be injured by severe service.

They are made in electric models of various types to meet all demands, and can be used in conjunction with the International synchronized time system or with the impulse or battery system.

International Time Recording Lock.

Functions—This lock, when installed in connection with the International autograph time recorder, offers one of the greatest protections that can be secured.

It can be installed on any door for the purpose of recording the time when place of business is opened and closed; who opened the door and who closed it; from which side of the door the key was used; whether anybody was in the establishment outside of business hours, and if so, how long. The time each employee arrives in the morning, goes to lunch, returns from lunch and leaves at the close of business, and the amount of time each employee spends in the establishment each day are all recorded on a paper roll within the autograph recorder.

This lock will not interfere with the ordinary operation of the door, nor will it detract from its beauty or appearance.

The action of this lock is positive and as many as 8 locks and 8 different keys are available in each unit.

Made to fit wood or metal doors of any thickness, either right hand or left hand.

The record of 8 locks and 64 watchmen's boxes can be recorded on each autograph time recorder.

Standard finish is dark golden oak. Special finishes made to order.

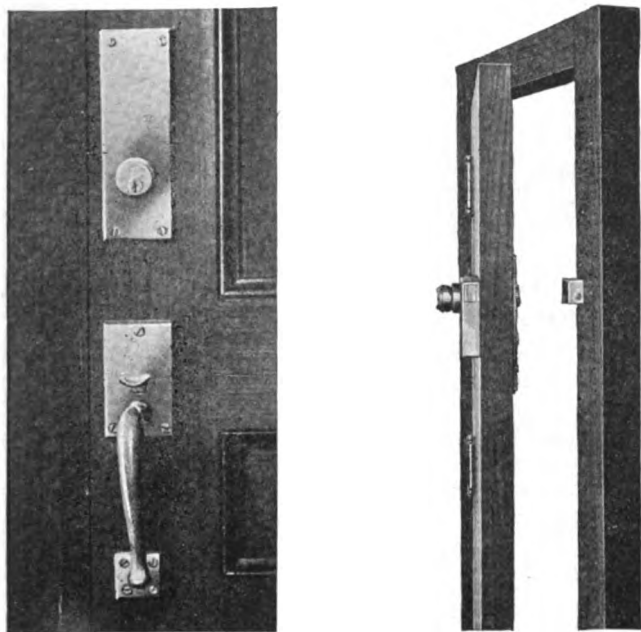
Operation—The simple turning of the key in this lock makes a record in the recorder. Every key prints its identity and positively identifies the user with the record made.

Keys—To provide additional security, duplicate keys will be furnished to users only on their order.

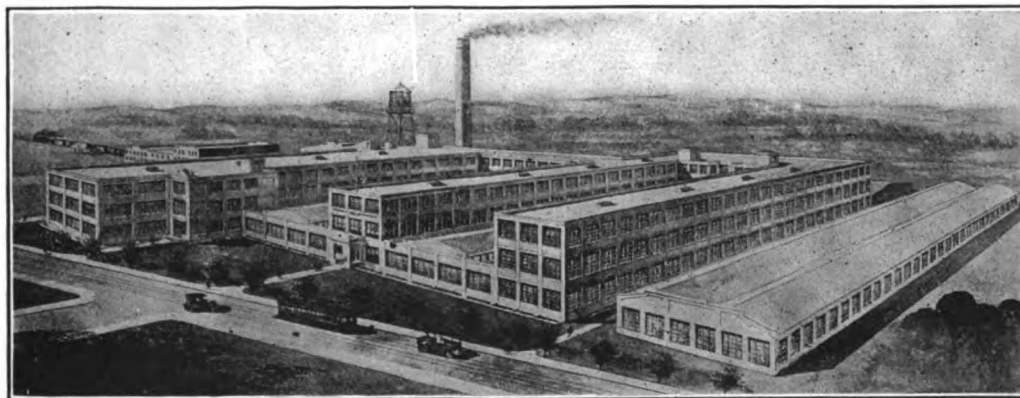
Prominent Installations.

Below is given a partial list of prominent installations of International time systems and time recording equipment:

Adams Express Co., New York, N. Y.
 American Brass Co., Waterbury, Conn.
 American Car & Foundry Co., Detroit, Mich., and Depew, N. Y.
 American Radiator Co., Chicago, Ill.
 American Sugar Refining Co., New York, N. Y.
 American Telephone & Telegraph Co., New York, N. Y.
 Ansco Company, Binghamton, N. Y.
 Armour & Co., Chicago, Ill.
 Atchison, Topeka & Santa Fe R. R., Chicago, Ill.
 Babcock-Wilcox Co., Barberton, Ohio
 Bethlehem Steel Co., Bethlehem, Pa.
 Burroughs Adding Machine Co., Detroit, Mich.
 Chicago Pneumatic Tool Co., Chicago, Ill.
 Colgate Co., Jersey City, N. J.
 Colts Patent Fire Arms Co., Hartford, Conn.
 E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
 Endicott, Johnson & Co., Endicott, N. Y.
 Erie R. R. Co., New York, N. Y.
 Federal Shipbuilding Co., Newark, N. J.
 Ford Motor Co., Detroit, Mich.
 General Electric Co., Schenectady, N. Y.
 International Harvester Co., Chicago, Ill.
 International Paper Co., New York, N. Y.
 Interborough Rapid Transit Co., New York, N. Y.
 Morris & Co., Chicago, Ill.
 National Biscuit Co., New York, N. Y.
 Pittsburgh Plate Glass Co., Pittsburgh, Pa.
 Remington Arms Co., Ilion, N. Y.
 Remington Typewriter Co., New York, N. Y.
 Sears, Roebuck & Co., Chicago, Ill.
 Southern Pacific R. R. Co., San Francisco, Cal.
 Standard Oil Co., New York, N. Y.
 United Cigar Stores, Chicago, Ill.
 United States Steel Corporation, various branches
 Western Electric Co., Chicago, Ill.
 Winchester Repeating Arms Co., New Haven, Conn.
 Youngstown Sheet & Tube Co., Youngstown, Ohio



ILLUSTRATIONS SHOWING INTERNATIONAL TIME RECORDING LOCK INSTALLED ON DOOR



FACTORY OF THE INTERNATIONAL TIME RECORDING COMPANY OF NEW YORK, ENDICOTT, N. Y.

THE E. HOWARD CLOCK CO.

NEW YORK OFFICE:
309 BROADWAY
Telephone, Worth 9354

373 Washington Street
BOSTON, MASS.
TELEPHONE, MAIN 643

CHICAGO OFFICE:
31 NORTH STATE STREET
Telephone Connection

Products.

CLOCKS and CLOCK SYSTEMS including: Magneto Watchman Recording and Regulator Clocks; Master and Secondary Clocks; Program Clocks for ringing bells at stated intervals; Tower Clocks; Electric Clock Systems for public buildings; Post and Bracket Clocks; Astronomical Clocks for observatories; Westminster Chiming Clocks for private estates; Library, Church and Banking Room Clocks; Hall, School and Office Clocks, and specially designed clocks from architects' drawings; Locomotive and Marine Clocks; Sidewalk Clocks, etc.

Magneto Watchman Clock System.

This system furnishes an indisputable record of time of each visit of one or more employees to each of as many substations as may be arranged for. This system furnishes a continuous record for 48 hours without removing record sheet.

Recording Clock—The recording clock is located in the office or other convenient place, and is connected with the station boxes by a separate wire to each box and one wire from all the boxes.

Any number of stations can be connected with one recording clock.

An attachment on the door records on the record sheet, in a place provided for said record, each opening and closing of the door, so that it is impossible for the clock to be tampered with without the record sheet showing it.

Record Sheet—Can be furnished either rectangular or circular and is ruled for 24 or 48 hours as desired.

Each station has a separate space on the record sheet.

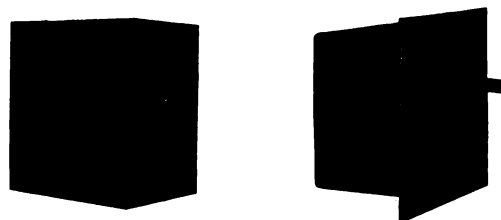
Mechanism—Station boxes are made of wood, metal or fiber and contain magnetos which generate enough electricity from a turn or two of the watchman's crank key, which fits all stations, to charge the magnet

in the recording clock connected with said box, which in turn attracts a lever armed with a perforating needle. This is set vibrating and punctures the record sheet, which is rectangular in shape and ruled into ten-minute spaces in such a way that the perforation indicates at a glance the exact moment at which the magneto station was set in operation by the watchman.

The record sheet is lowered across the bank of perforating needles, its passage being regulated by a sprocket wheel and chain device connected with a clock movement, so that the ruled spaces indicating the divisions of time are brought opposite the recording points in accordance with the time of day.

The mechanism is operated by an eight-day, double spring clock movement with jewelled escapement.

As no battery is used and there is no current, except as generated by the watchman at the station, the clock can not be affected by short circuiting or interference of any kind with the wires.

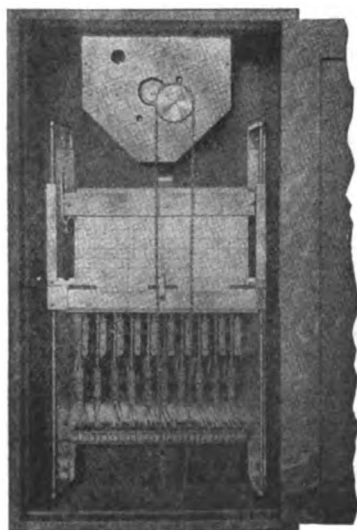


MAGNETO STATION BOXES

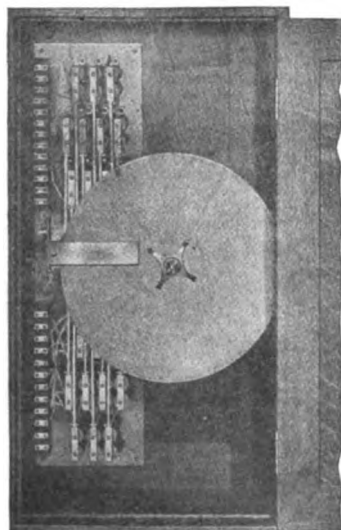
Regulators.

In place of the recording clocks a regulator may be used, which gives an accurate office timepiece and a master clock, connected with which may be any number of secondary clocks distributed about the plant.

The advantage of such a time system is that all departments are working on exactly the same time. In addition, the clocks can be arranged to announce the time on any program of work, so that all may begin and end in unison.

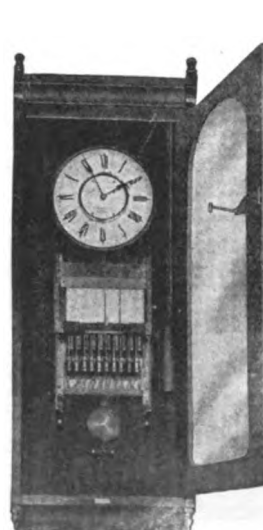


Rectangular Record Sheet

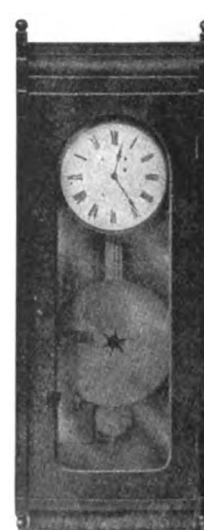


Circular Record Sheet

HOWARD MAGNETO WATCHMAN CLOCKS



Rectangular Record Sheet



Circular Record Sheet

HOWARD REGULATOR AND WATCHMAN CLOCK

Secondary Clock Systems.

This system consists of a master clock, secondary movements and a source of current supply, and is adapted for use in factories, schools, institutions, etc.

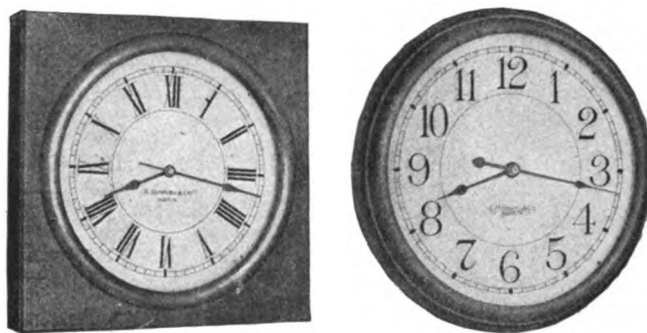
Master Clocks—The master clock can be any of our seconds-beating regulators, 8-day weight driven, or self-winding. The movement is constructed of the best materials and is of the finest workmanship throughout. The wheels are all accurately machine cut from hard hammered brass; pinions and arbors are cut from solid bar steel, and are highly polished. The escapement is usually Graham's dead beat, but can be Dennison's double three-legged gravity when the most exacting results are desired. The pendulum can be a well-seasoned cherry rod with heavy bob of brass filled with zinc, or a steel rod with jars filled with mercury, for compensation.

This movement is equipped with specially designed minute or half-minute platinum tipped contacts consisting of an oscillating arm and a rotary arm with gold contact surface. This rotary arm is mounted on the seconds arbor of the movement, and once each minute forms a contact, for about one-third of a second, with the oscillating arm. This operates a relay which in turn operates any number of secondary clock circuits.

Relay—The function of the relay is to close the secondary circuits once each minute or half-minute. One relay will operate any number of secondary circuits. The relay is specially designed for clock system service, and is so made with double set of platinum tipped contact fingers working on carbon and platinum surfaces that burning and corrosion are eliminated. The relay is usually mounted in the master clock case, but on large systems it may be located on the switchboard, with the pilot dials and charging apparatus.

Secondary Clocks—The secondary clocks consist of a mechanism for moving the hands forward each minute or half-minute. They are positive in operation, and are made with the same care and of the same high grade of material and workmanship as our other clocks. The magnets are wound to $6\frac{1}{2}$ ohms resistance and operate on one volt. The usual current discharge per circuit is about $\frac{1}{10}$ of an ampere. Secondary clocks may be grouped into circuits of from 10 to 20 clocks, depending on the conditions at the building. The clocks are operated on a series circuit, all circuits being brought

to a busbar, which in turn is connected with the relay. Each secondary circuit should have about the same resistance. No. 14 or No. 16 R. C. wire should be used.



HOWARD SECONDARY CLOCKS

Operating Current—The operating current for large systems should be preferably taken from a storage battery. For small installations, however, a high grade primary battery may be used.

Program Clocks.

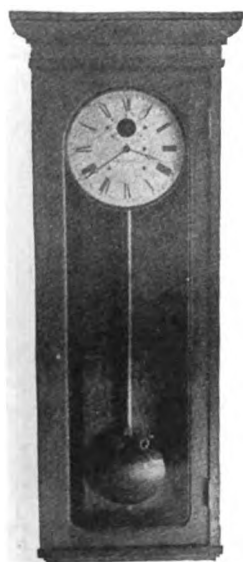
Used in factories, schools and institutions to automatically operate a system of bells, buzzers, whistle-blowing devices, etc. Can be located in same case as master clock or cased separately.

The program device is operated by the master clock in the same manner as the secondary clocks. The mechanism of a large secondary movement is used, operating a 24-hour tape, in which a perforation can be made for any minute of the 24 hours that it is desired to ring the bells.

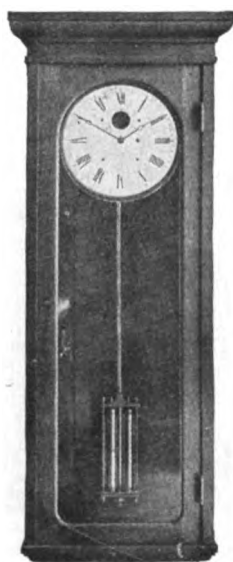
References.

Below are given a few recent installations of watchman magneto and secondary clock systems:

Waltham Watch Co., Waltham, Mass.
Walworth Mfg. Co., Boston, Mass. and Kewanee, Ill.
General Electric Co., Schenectady, N. Y.
Western Electric Co., Chicago, Ill. and New York, N. Y.
Corn Products Co., Waukegan, Ill.
U. S. Subtreasury, New York, N. Y.
Johns Hopkins University, Baltimore, Md.
Northern Pacific Depot, Tacoma, Wash.
Central High School, Cleveland, Ohio.
Library of Congress, Washington, D. C.
Pressed Steel Car Co., McKees Rocks, Pa.
Canadian Pacific R. R. Station, Winnipeg, Can.

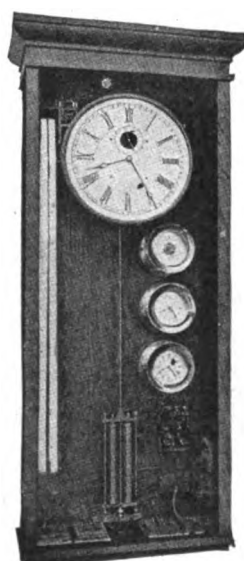


Cherry Red Pendulum

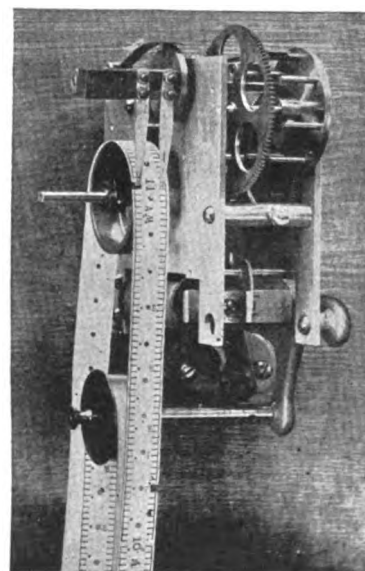


Two-jar Mercurial Compensated Pendulum

HOWARD MASTER CLOCKS



HOWARD PROGRAM CLOCK



MECHANISM OF HOWARD PROGRAM CLOCKS

ESTABLISHED 1884

INCORPORATED 1888

THE STANDARD ELECTRIC TIME CO.

SPRINGFIELD, MASS.

SALES OFFICES AND SERVICE STATIONS

NEW YORK, N. Y., 50 Church Street
 BOSTON, MASS., 261 Franklin Street
 CHICAGO, ILL., 1363 Monadnock Building

COLUMBUS, OHIO, 421 New

SAN FRANCISCO, CAL., 461 Market Street
 BIRMINGHAM, ALA., Brown-Marx Building
 MINNEAPOLIS, MINN., 801 Eighth Street, S. E.
 First National Bank Building

Products.

The "STANDARD" ELECTRIC TIME SYSTEMS, which include Electric Self-winding Master Clocks or Regulators, Electric Secondary Clocks, Program Clocks, with Bells, Horns, Whistles, etc.

Also manufacturers of Tower Clocks, Street Clocks, Time Stamps, Employees' Time Registers, or Synchronizers for keeping other makes of clocks in perfect unison with the "Standard" time systems.

"Standard" Factory Time System.

"Standard" electric clocks furnish a reliable, uniform time and signal service throughout any plant and can be arranged to operate any number of secondary clocks, employees' time registers and time stamps, whistles, bells, etc., depending on the size and arrangement of plant. They require no winding, oiling nor individual setting; everything is automatic and electrically operated and the system secures the promotion of more careful use of paid-for time and greater efficiency.

"Standard" equipment has been perfected as the result of years of practical experience. It is an effective, simple and reliable system, free from experimental features or devices likely to give trouble.

"Standard" Master Clock.

The master clock, or regulator, is the source of time for the whole plant, or system. "Standard" master clocks are self-wound every minute and are fitted with dead beat escapement and platinum contacts throughout. The master clock should preferably be of seconds beat type with mercurial compensating pendulum for greatest accuracy.

It is so arranged that it will electrically operate and control any number of secondary clocks, bell signals, synchronizers or other time keeping apparatus.

Secondary Clocks.

"Standard" centralized control permits secondary clocks to be located at the most advantageous point of observation, regardless of accessibility. They can be used for service that wind-up clocks will not adequately meet; are not affected by temperature or vibration, and never require oiling.

Automatic Control.

"Standard" electric time systems are now furnished with full automatic control of battery charging, reducing care and attention to a minimum.

Finishes.

"Standard" cases for master clocks and secondaries are of oak, in three shades: light, medium and dark. Other finishes are supplied when desired to match the interior trim of the building.

Secondary clocks in metal cases, or with marble faces and with special hands, furnished in accordance with the engineer's designs.

References.

This company will be glad to supply a list of manu-

SWEET'S CATALOGUE

facturing concerns where "Standard" electric time systems have been installed.



ANY MAKE OF TIME RECORDER CAN BE SYNCHRONIZED OR ELECTRICALLY DRIVEN BY THE "STANDARD" SYSTEM



CALLING INSTRUMENT AS FURNISHED WITH "STANDARD" ELECTRIC TIME SYSTEM

Operates on same signals used for sounding factory schedule

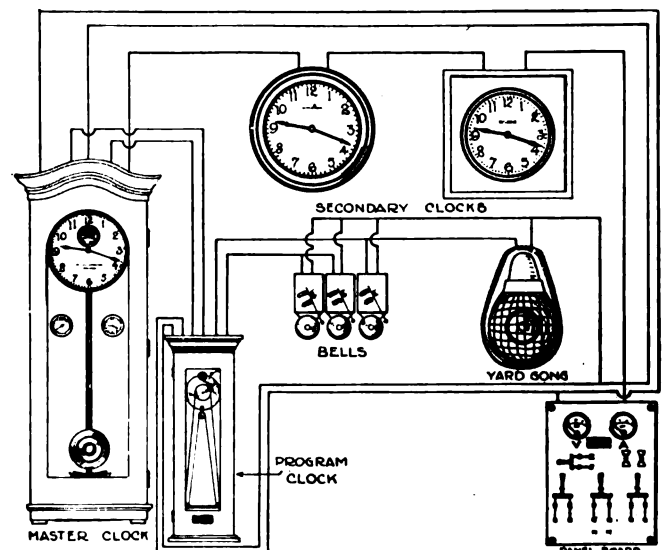


DIAGRAM SHOWING METHOD OF OPERATION AND DIFFERENT PARTS OF THE STANDARD ELECTRIC TIME CO.'S SYSTEM

THE BARBER-FOSTER ENGINEERING CO.

Manufacturers of Cranes and Hoists

602-603 Swetland Building
CLEVELAND, OHIO

Products.

ELECTRIC TRAVELING CRANES, Wall, Jib and Gantry Types; MONORAIL HOISTS, BUCKET HOISTS and MONORAIL SYSTEMS.

Also Special Hoisting Equipment designed to suit unusual needs.

Built for Service.

American electric hoists and cranes are built for long and continuous service under the most severe operating conditions. Totally enclosed throughout, including gearing and mechanical brakes. Iron clad electrical brakes running in transmission grease. Enclosed motors of standard make, both alternating and direct current. Drum type and face plate control both of standard manufacture. Gears and pinions throughout are cut from solid bar stock or forgings and are heat treated and hardened. All shafting heat treated, hardened and ground. Hyatt bearings throughout. Plow steel hoisting cable on all equipment.

CLEARANCE DIMENSIONS, STANDARD MONORAIL HOISTS

Frame No.	Cap., tons	Hoisting speed, ft. per min.	Under-side of beam to hook, min., in.	Ltgh., in.	Wdth., in.	Size wheel, diam., in.	Min. I-beam, in.
1	1½	35	31	36½	19	5	7
	1	18	32				
2	1½	70	34	43½	24½	6	8
	1	33	35				
	2	18	36				
3	1	60	37	53½	29½	8	10
	2	30	38				
	3	20	38				
	4	15	45				
4	2	45	42	57½	29½	10	12
	3	30	42				
	4	22	49				
	5	18	49				
	6	15	49				

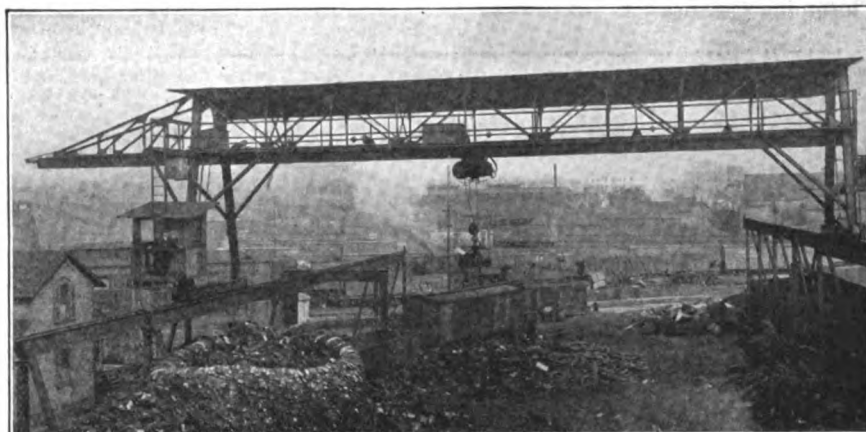


2-MOTOR HOISTING TROLLEY USED ON 3-MOTOR TRAVELING CRANE

Three-motor cranes furnished in various spans and capacities from 2 to 15 tons with floor control or cab operation. For indoor or outdoor service. All parts scientifically designed, assuring greatest possible rigidity

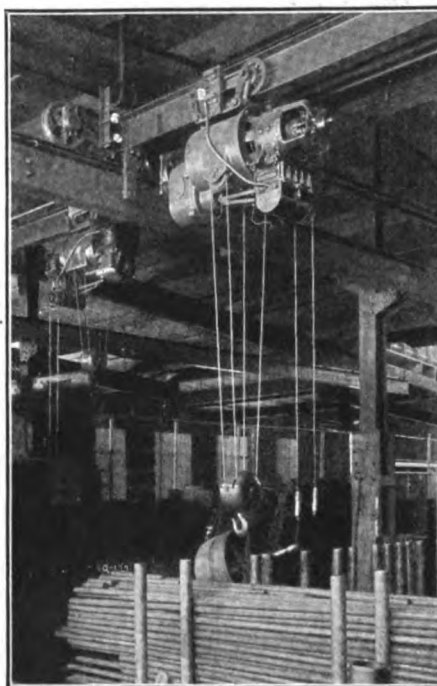
COMPARATIVE TEST ON HYATT EQUIPPED AND PLAIN TWO-TON ELECTRIC HOISTS

Load on hook, lbs.	Average hoisting speed, ft. per min.				Increase in speed, per cent. Hyatt over plain		Power consumption kilowatts				Saving			
	Plain		Hyatt		up	down	Plain		Hyatt		Kw.		Per cent.	
	up	down	up	down			up	down	up	down	up	down	up	down
4179	31.1	33.9	37.3	41.0	20	22.7	4.35	2.47	3.76	2.15	.59	.32	13.6	13
0	47.3	47.3	50	50	5.7	5.7	2.4	2.35	2.0	1.93	.4	.42	16.7	17.9



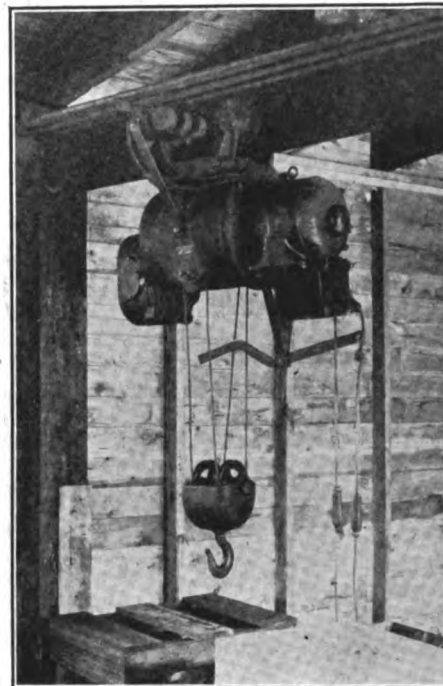
GANTRY CRANES

In various spans and capacities with or without cantilever and arranged with plain hoist hook or magnet cable winding drum for magnet handling purposes. Capacity from 2 to 15 tons. Also with grab bucket for handling coal and other loose material up to 1½-yd. capacity



SINGLE I-BEAM CRANE WITH FLOOR CONTROL

End trucks of semisteel or steel castings as may be required of I-beam section with U-shape ends, having a bearing on both sides of track wheel. Bearings fitted with Hyatt rollers with caps so that they are easily removable, and load is supported equally on the two bearings of each wheel



STANDARD MONORAIL HOIST

In 1- or 2-motor type, both floor operated and remote control, and with or without operator's cab, either enclosed or open type. Also with double truck and with 2 or 4 hooks for special purposes

THE CHAMPION ENGINEERING COMPANY

Manufacturers of Electric Traveling Cranes

MAIN OFFICE AND WORKS

KENTON, OHIO

BRANCH OFFICES

NEW YORK, N. Y., J. W. SPENSLEY, 149 Broadway
BALTIMORE, MD., A. E. HOGREBE, Catonsville, Md.
SEATTLE, WASH., HALLIDIE MACHINERY Co.
PITTSBURGH, PA., LAUGHLIN & BARNEY, 819-21 Wabash Building

PORTLAND, ORE., PORTLAND MACHINERY Co.
SAN FRANCISCO, CAL., LOUIS G. HENES, 76 Fremont Street
TOLEDO, OHIO, W. C. LLOYD & Co., 1113 Second National Bank Building
LOS ANGELES, CAL., LOUIS G. HENES, Title Insurance Building

Product.

ELECTRIC TRAVELING CRANES for all classes of service.

Champion Cranes.

Champion cranes are designed to meet every possible requirement and contingency of crane service. Simplicity, accessibility and perfect interchangeability of parts are the predominating features. Even the most exacting requirements, such as those of steel mills, are conformed to, and at the same time, a machine of high operating efficiency is produced.

Specifications for Champion Cranes.

Trolley—The side frames consist of two heavy castings connected by a wide, heavy steel girt or separator. The component parts are constructed staunch enough to withstand the heavy shocks and severe strains encountered in any class of service.

To facilitate occasional repairs and to insure perfect alignment, all fastenings throughout are effected by through bolts with U. S. standard nuts. Bearings are provided with caps fitted with split bronze bushings. All shafts are of forged steel and located in a horizontal plane; each shaft, with its pinions and gears or hoisting drum, can be lifted individually. Bearings are proportioned to produce comparatively low bearing pres-

sures. All parts are manufactured in jigs to insure perfect interchangeability.

The trolley track wheels are of heavy pattern cast steel. They are keyed to the axles, revolving in M. C. B. pattern phosphor bronze bearings.

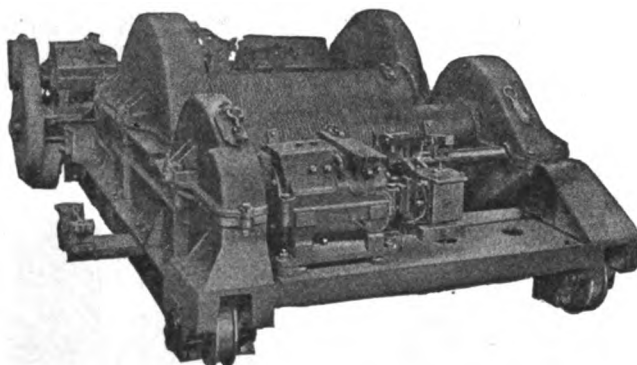
The cable drum, keyed to the drum shaft, is grooved from a solid casting and provided with large guarding flanges. The grooves are large enough to completely bury the cable.

The lower block is of side plate design, the hook forged according to special specifications and wrought by a special process. It swivels on bearings equipped with nickel-chrome balls.

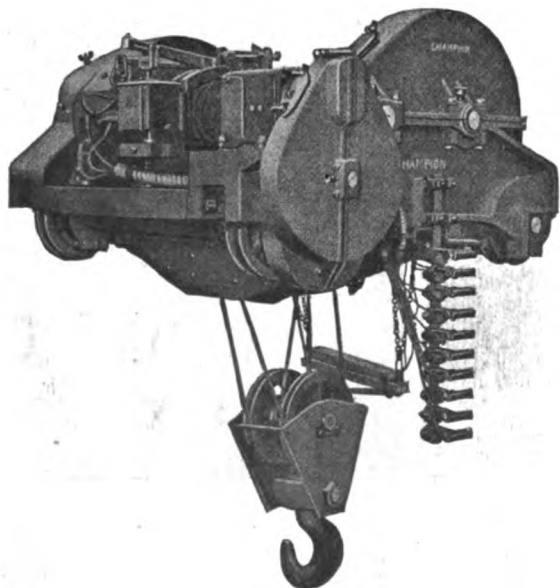
Hoisting Elements—All gears in the machine are of steel with cut teeth. All pinions are cut from steel forgings. Gears are designed with wide faces and substantial arms, capable of bearing overloads caused by the sudden starting, stopping and reversing of the motor.

Mechanical Brake—A differential, flexible band brake is used on all Champion cranes, which quickly grips the brake wheel or case when lowering. The advantage of this type of band is that it applies itself without undue shock, making the operation certain, smooth and noiseless.

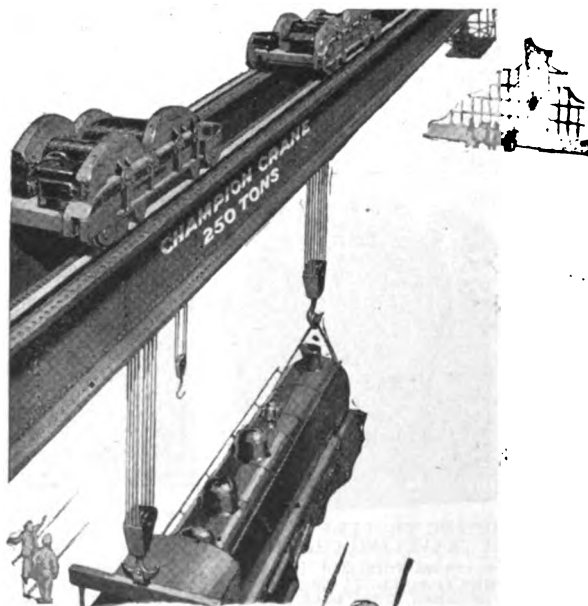
Motor Brakes—Full-torque, direct current. Champion solenoid brakes are standard with Champion hoisting equipment. Champion solenoid brakes are self-contained and gravity set. The brake wheels are finished all over and have taper or straight bore to suit the particular motor, as specified. The wheels are large in diameter, and have wide faces.



CHAMPION DOUBLE HOOK TROLLEY



SIDE AND FRONT VIEW OF COMPLETE TROLLEY



CHAMPION CRANE HOISTING A LOCOMOTIVE

Champion full-torque brakes are standard with Champion hoisting equipment.

Champion full-torque brakes have a maximum retarding torque of not less than the full torque of the motors on which they are used, and a maximum holding torque of not less than 110% of the full load torque.

Bridge—The Champion standard crane bridge on which trolley operates, consists of two box section steel girders mounted and carried on end truck of structural steel with cast steel end brackets. Gusset plates arrest the tendency of the crane structure to get out of square owing to defects in crane runway, to sudden stopping and starting when the load is close to one end of the crane, or to similar causes.

The bridge motor is in a horizontal position and is located near the center of the span, attached to the front girder.

The end lengths of the shafts on which the truck pinions are geared are made very short, so that when it becomes necessary to remove the end section in order to replace the pinion, only the short section need be removed. This prevents disturbing the balance of the cross shafting.

A powerful foot brake is provided for stopping the crane on the runway at any point without reversing the bridge motor. The brake wheel is large in diameter and contains a band lined with asbestos friction material. The brake wheel is located on the bridge motor extension, and operated from the crane operator's cage.

All gears are of cast steel, pinions of forged steel, and truck wheels are of rolled steel. All bushings are of bronze.

Platform—The platform extends from one end of the girders to the other and is provided with a toe board at least 6 in. high. The platform extends from the outer toe board angle clear to the web of the girders, so that no machinery parts or tools can fall through and injure workmen below. The bridge motor is mounted in a horizontal position on heavy structural steel brackets. This design permits of adjustments and perfect accessibility to all motor parts. The motor armature can be moved with facility and landed on the platform.

When required, as in the case of cranes for heavy steel mill service, the platforms will be entirely of steel. In all cases of commercial or mill type cranes, the platform is provided with a top rail 42 in. from the floor, and an intermediate rail 21 in. below this. The vertical posts are located at frequent intervals.

Wiring—All Champion cranes are wired in accordance with the U. S. A. National Board of Underwriter's rules. All wiring is done in flexible steel or rigid conduit with condulets.

Adaptability.

Champion cranes can receive any crane hoist motor and motor brake, using either alternating or direct current.

Safety.

The trolley frame is so constructed that any overload which the bridge is capable of sustaining will not cause deflection, thus precluding the possibility of binding the machinery.

The hoist mechanism is provided with an automatic switch which limits the upward travel of the hook and prevents damage in case of overhoisting or double block-

ing. This device or limit contact is actuated by the hook itself when it arrives at the predetermined limit. The magnetic switch is normally closed and held in a closed position at the switchboard in the operator's cage. It is opened whenever the circuit is interrupted.

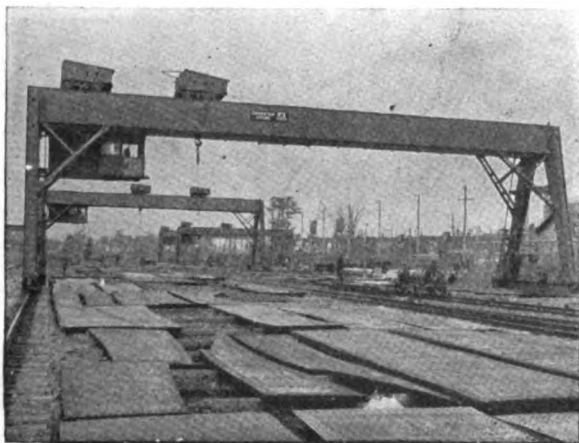
In other words, the safety hoist limit operates by "breaking" and not making a circuit. The latter method can not be accomplished with certainty. The trolley is also designed to receive any form of limit contact in the market. All standardized safety devices, such as truck wheel guards, bumpers and safety pans, can be quickly attached, as well as side platforms, which are attached to the sides and ends of trolleys for the purpose of securing more perfect accessibility.

Ordering.

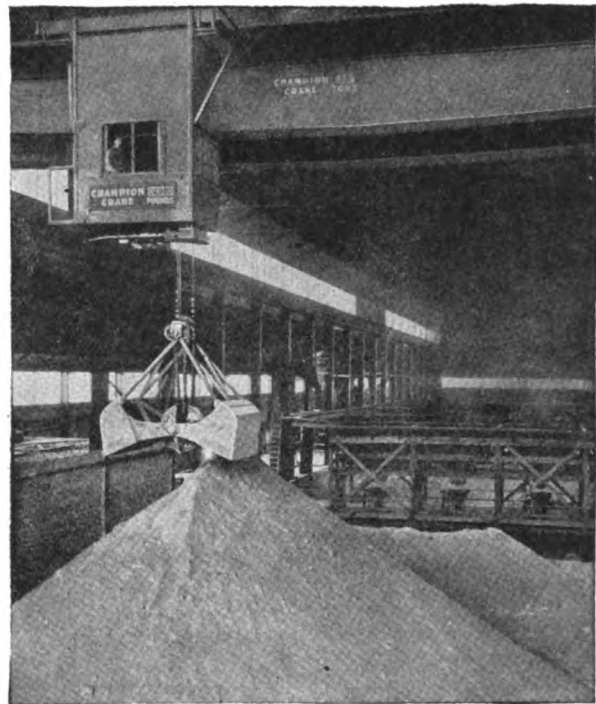
All cranes are completely assembled and tested out before being packed for shipment.

In order that prices may be intelligently quoted, inquiries concerning Champion cranes should contain the following information:

- (a) Capacity of main and auxiliary hoist, if any.
- (b) Class of service—whether for foundry, machinshop, power house, etc.
- (c) Whether crane is to be operated indoors or outdoors.
- (d) Span or center to center of runway rails.
- (e) Maximum lift from floor line to hook in highest position.
- (f) Distance from top of runway rail to lowest point of roof of truss.
- (g) Distance from center of runway rail to wall or face of column.
- (h) Dimensions of wind braces if any.
- (i) Distance from floor line to top of runway rail.
- (j) Distance from floor line to top of any obstruction which may interfere with bottom of operator's cage or crane.
- (k) Whether crane is controlled from cage, floor or fixed platform.
- (l) Location of cage—whether at end or center of bridge, and whether attached to trolley or operating with it.
- (m) Direct or alternating current—give voltage, cycles and phase.
- (n) If any preference, in regard to speed requirements for all movements, please so state.
- (o) Number of movements to be operated by electric motors, and what movements are to be operated by hand, if any.



CHAMPION OUTDOOR INSTALLATION



CHAMPION INDOOR INSTALLATION

CHESAPEAKE IRON WORKS

Traveling Cranes and Steel Structures; General Machine Work

BALTIMORE, MD.

Products.

ELECTRIC TRAVELING CRANES.
STEEL BUILDINGS and BRIDGES.
STRUCTURAL STEEL and ORNAMENTAL
IRON WORK; GENERAL MACHINE WORK.

Chesapeake Electric Traveling Cranes.

They are the most rugged cranes built, and are designed along the most approved lines of modern crane construction.

The trolleys are of the simplest possible construction, and all working parts are extremely heavy, thereby assuring maximum life under the most adverse operating conditions.

Due to the extreme simplicity of design, all parts are accessible for inspection and repair. Each unit can be removed without disturbing any other unit.

Trolley—The trolley incorporates, in every respect, those features which make for durability, and incorporates in the simplest manner these essential details:

A rigid "H" frame carries all mechanism, and does not rely on any part of the mechanism for rigidity.

All gears and shafts are extremely heavy. All bearings are bronze bushed.

Gear covers or guards protect all gears.



TRADE-MARK

• **Girders**—The girders, of various types to suit span and other conditions, are of the most efficient design, to counteract the abuse of the most reckless operator.

The bridge drive is of the heavy type, having the driving motor located near the center of the span.

A platform, with angle toe guards and double bar hand rail, extends the entire length of the bridge drive girder.

"Safety First" Features—The "safety first" features include many details which are furnished regularly only on Chesapeake cranes.

Switchboard, mounted in steel cabinet with steel door and lock, includes a double pole main switch, contactor and independent overload relays for each direct current motor.

Limit switch, which prevents overhoisting, is operated by hook block in conjunction with no-voltage contactor on switchboard, with re-set push button in front of operator.

All gears are enclosed or suitably protected.

Bumper blocks on bridge ends.

Rail sweeps on bridge ends.

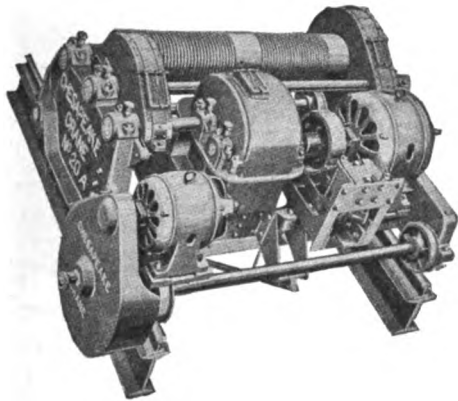
Extreme accessibility to all parts for inspection and removal for repairs.



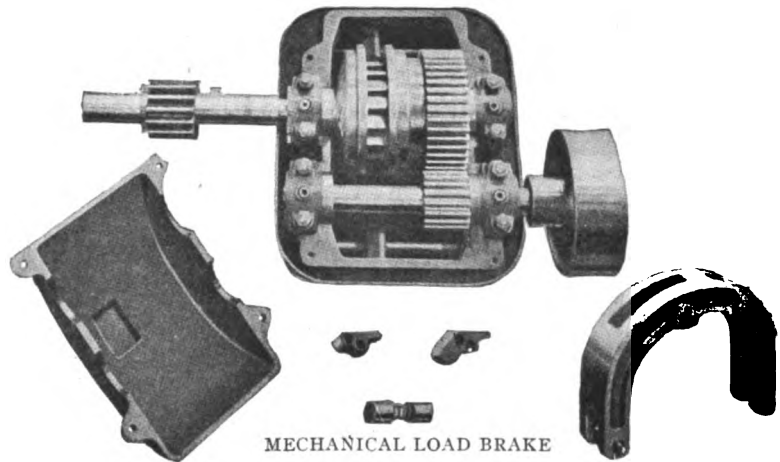
CHESAPEAKE ELECTRIC TRAVELING CRANES IN PLANT OF EASTERN ROLLING MILLS CO., BALTIMORE, MD.

One of 9 Chesapeake cranes in this plant. Capacity of each, 25 tons, with 10-ton auxiliary hoist

Alternating Current Type Trolley—The alternating current type trolley is similar in every respect to the direct current trolley, excepting that the hoisting mechanism is equipped with a mechanical load brake as described.

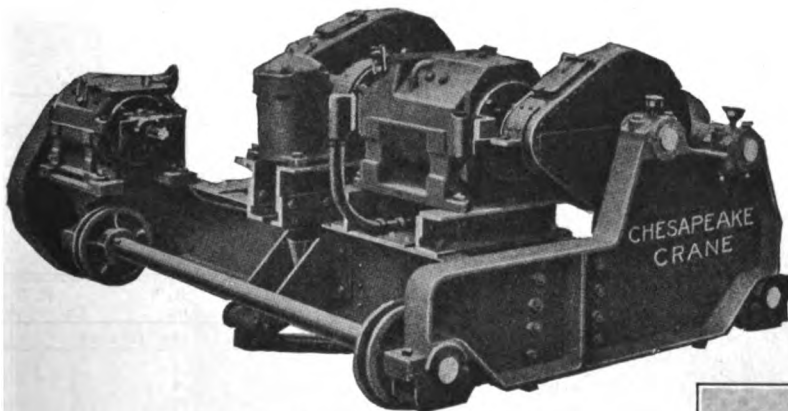


ALTERNATING CURRENT TYPE TROLLEY



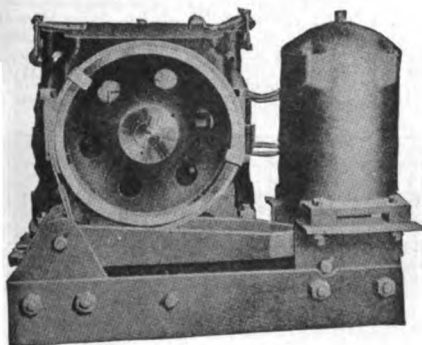
MECHANICAL LOAD BRAKE

Direct Current Type Trolley—Built to meet the most exacting requirements of heavy duty crane service, being extremely heavy in all details, and most accessible in all parts. Lowering of load is controlled by a dynamic braking system and in addition a powerful electric brake is applied to the motor to hold load when current is off.



DIRECT CURRENT TYPE TROLLEY

Electric Brake—Of the iron clad solenoid band type, has holding power equally effective in either direction, in stopping empty hook when hoisting at high speed or in stopping and holding full load when lowering. Brake is always on when current is off and is entirely released when motor is running in either direction.



ELECTRIC BRAKE

Mechanical Load Brake—The Chesapeake load brake, which is of the multiple disk type, is positive in its action, and has ample capacity to sustain the full load, without the use of the electric brake, and will not

allow the load to run down, except when operated by the hoist motor, in the lowering direction.

The load brake, with its gears, is enclosed in an oilproof case, forming a complete self-contained unit. It is simple in design and extremely heavy in all details.

Steel Structures.

Specialists in the design, fabrication and erection of steel structures, including office, factory and shop buildings, highway bridges, etc. A large stock of Bethlehem and standard shapes is carried for immediate shipment.

Chesapeake Iron Works Doubles Capacity of its Structural Steel Plant.

In the fall of 1920, the CHESAPEAKE IRON WORKS increased the capacity of its structural steel department 100%.



COAL HANDLING TOWER, BRIDGE AND AERIAL TOWER, WESTPORT POWER HOUSE, CONSOLIDATED GAS, ELECTRIC LIGHT AND POWER CO., BALTIMORE, MD.

Over 90% of all steel work in this power house was furnished by the CHESAPEAKE IRON WORKS

General Machine Work.

The CHESAPEAKE IRON WORKS is now utilizing a portion of its high efficiency machine shop facilities on general machine work for outside companies not organized as the CHESAPEAKE IRON WORKS is—on a "maximum production" basis.

THE CLEVELAND CRANE & ENGINEERING CO.

MAIN OFFICE AND WORKS
WICKLIFFE, OHIO
(NEAR CLEVELAND, OHIO)

NEW YORK OFFICE, 50 Church Street

PITTSBURGH OFFICE, First National Bank Building.

Products and Services.

ELECTRIC TRAVELING CRANES.

Also manufacturers of Hand Power Traveling Cranes; Special Gantry; Ore and Coal Handling Machinery.

Cranes for different purposes designed and constructed on order.

Cleveland Cranes.

This company manufactures electric cranes in all capacities from 1 ton to 300 tons for either direct or alternating current, and for inside or outside service.

Hand power cranes are also manufactured in capacities from 1 ton to 50 tons.

For crane clearance dimensions see opposite column.

Description—A general description may briefly include the following details of construction:

FACTOR OF SAFETY—At least 6, factor being larger according to conditions.

BRIDGE—Of double or single plate and angle, or a box girder, or a single I-beam or lattice truss type of girder, depending on span, capacity, speed, etc.

BRIDGE TRUCKS—Attached to girders with shoulder construction, which gives a large bearing surface for keeping crane in alignment.

BRIDGE GEARS—All gears and pinions have teeth cut from the solid.

CAB—Of ample size for all electric controlling mechanism, with floor space sufficient for complete operation.

TROLLEY—A casting of I section type, arranged to carry hoist and trolley traveling mechanism.

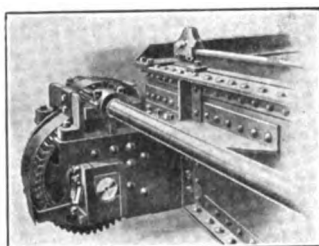
HOIST DRUM—Finished with right- and left-hand grooves, keeping load equally distributed on both girders.

TRACK WHEELS—For both bridge and trolley, are double flanged, rolled steel, cast iron with chilled tread or cast iron center with high carbon rolled steel tires shrunk on.

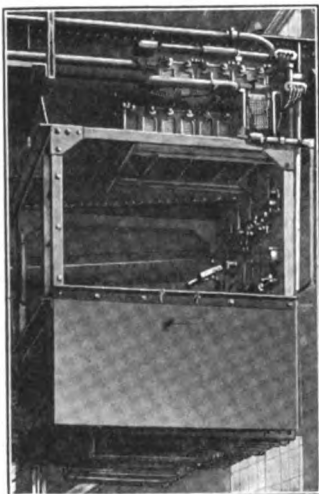
LOAD BRAKE—Double friction type, automatic running submerged in oil bath.

ELECTRIC BRAKE—Attached to hoisting motor, automatic, operated by a solenoid, and so connected as to apply instantly when current is interrupted.

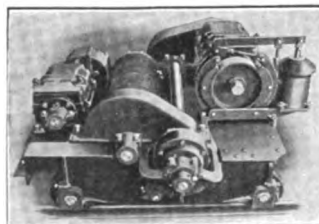
FOOT BRAKE—A powerful bridge brake stops bridge when traveling in either direction.



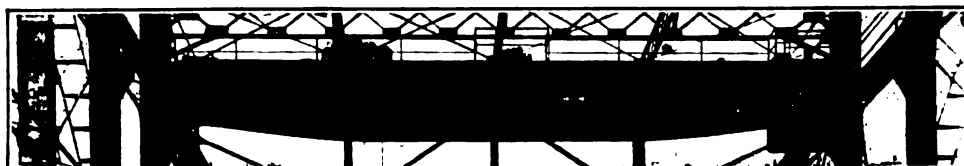
CORNER VIEW STRUCTURAL STEEL M.C.B. END TRUCK



CRANE CAB



FULLY ENCLOSED 2-MOTOR TROLLEY



25 TON, 3 MOTOR HIGH SPEED SKULL CRACKER CRANE, 65 FT. LIFT, INLAND STEEL CO., INDIANA HARBOR, INDIANA
85 ft. 9 in. span

LIMIT SWITCH—Automatic, attached to each hoist, which breaks current when hook is raised above or descends below a predetermined point.

Ruggedness, simplicity and the recognized ideal method of operation are combined in this limit stop. When the limit of travel of bottom block is reached, it operates the limit stop direct and not in connection with something else. To lower, it is only necessary to reverse controller, automatically resetting limit stop. The construction is very simple, no gears, sprockets, traveling nuts, cams, or other moving parts are employed and consequently there is nothing to wear out.

Specific Data Required.

All inquiries for traveling cranes should give the following particulars:

(1) Load: maximum load in net tons to be lifted.

(2) Speed: if special speed for any function is preferred.

(3) Style: type of crane desired.

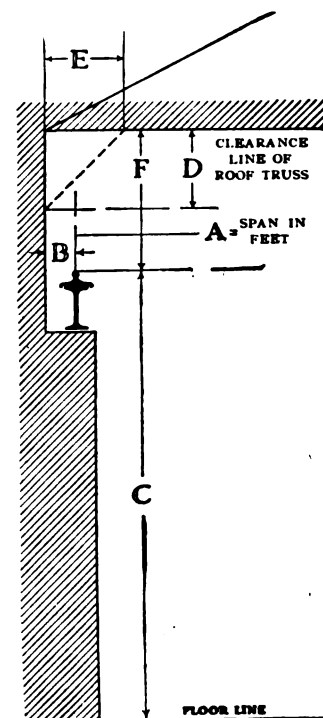
(4) Clearance dimensions as follows (see illustration):

A—span; B—end clearance; C—distance from top of runway rail to floor; F—overhead clearance; E and D—if there are roof braces interfering with end travel of trolley.

Upon receipt of above information, quotations will be promptly submitted.

Co-operative Service.

In case the styles of cranes shown here do not meet the requirements, the engineering department of this company will gladly submit individual prints and specifications on request.



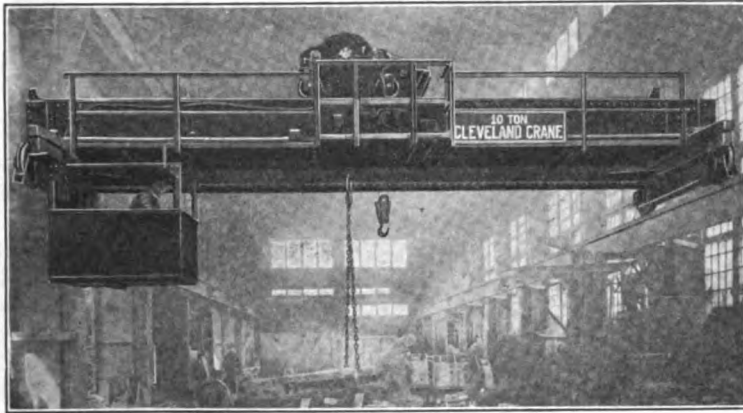
CROSS SECTION OF BUILDING SHOWING DIMENSIONS REQUIRED FOR CRANE CLEARANCE

CLEARANCES (IN FEET AND INCHES) FOR "B" AND "F" TO BE ALLOWED IN A NEW BUILDING

Capacity, tons	"B," in.	"F," ft. in.
ELECTRIC CRANES		
5	8	5 6
10	8	5 9
15	10	6 0
20	11	7 0
25	11	7 3
30	11	7 6
40	12	8 3
50	12	8 6
100	14	10 0

HAND POWER CRANES		
5	5	4 0
10	6	4 6
15	6	5 3
20	7	5 9
25	7	6 0
30	8	6 6
40	8	7 0
50	9	7 6

If you do not have above clearances, kindly advise, giving full particulars.



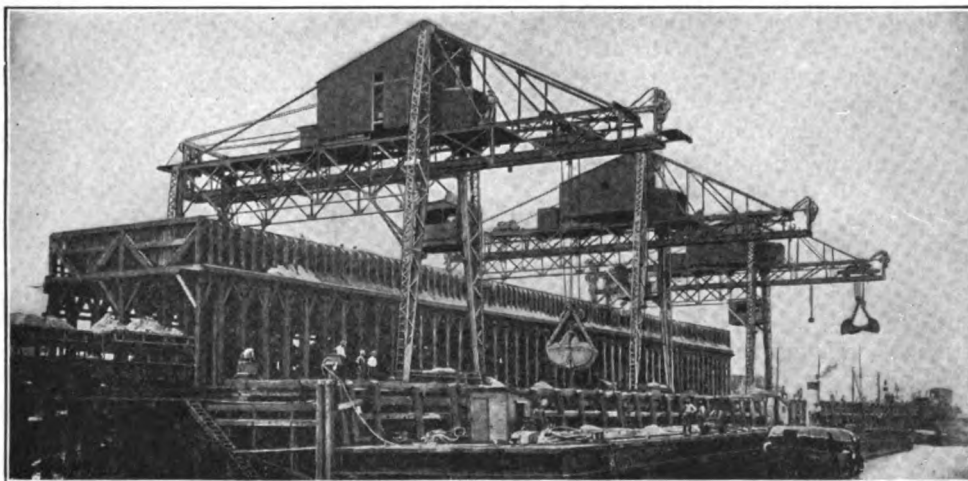
10-TON FOUNDRY CRANE
34-foot span



30-TON, 4-MOTOR GANTRY CRANE, PENNSYLVANIA R. R. LINES, CLEVELAND, OHIO
42-foot span

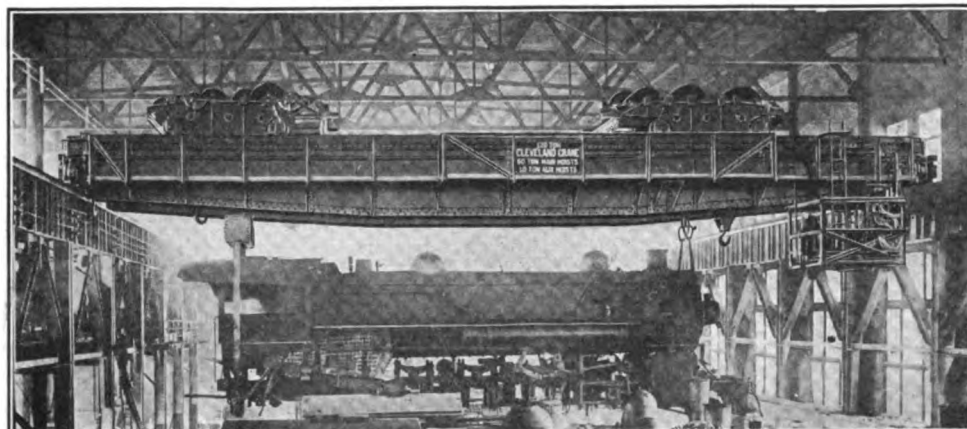


TWO 10-TON, 3-MOTOR, ELECTRIC TRAVELING CRANES, BLAW STEEL CONSTRUCTION CO., PITTSBURGH, PA.
68-foot span



THREE SAND UNLOADER CRANES, INSTALLED FOR THE U. S. GOVERNMENT FOR USE ON THE PANAMA CANAL
Equipped with 4-yard buckets.

This equipment handled all the sand used in building locks at the Pacific end of the Canal.
This type of crane is suitable for handling any material with grab bucket



120-TON DOUBLE TROLLEY CRANE, NEW YORK CENTRAL LINES, WEST ALBANY, N. Y.
60-ton main hoists, 10-ton auxiliary hoists, 70-ft. $\frac{3}{4}$ -in. span

ERIE STEEL CONSTRUCTION COMPANY

Manufacturers of Traveling Cranes and Steel Structures

ERIE, PA.

Products.

ERIE ELECTRIC TRAVELING CRANES.

Also manufacturers of Steel Structures of all descriptions.

Erie Cranes.

A satisfactory crane must be smooth in action and capable of accurate control, designed to facilitate inspection, lubrication and the renewal of worn parts, and liberally proportioned to eliminate unusual stresses and deep deflections and bearing pressures within moderate limits. These considerations govern the design of Erie cranes and skilled workmen build them from carefully selected materials. Erie cranes are simple in operation, accessible for maintenance and durable under most severe service.

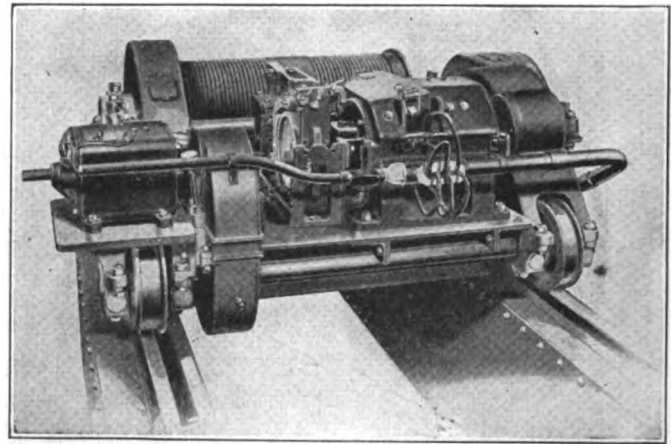
All gears are of cast steel and pinions of forged steel, with teeth cut from the solid stock. All gearing, except bridge wheel gears, runs in an oil bath, and is completely enclosed in a dustproof case. The gear covers are provided with easily opened inspection covers, which encourage frequent attention and oiling. All bushings are of high grade bronze. Through bolts are used for all connections and gear covers and bearing caps can be quickly removed. Any shaft, with its gears, can be moved without disturbing any other shaft.

Trolley—Of the entirely enclosed type, with gear cases cast integral with the frame. Frames are tied together by structural cross girt of heavy section, and such depth that the alignment does not depend on the shafting. Wheels are of chilled cast iron, ground to a uniform circumference. Drums and sheaves are thirty times the rope diameter, with deep machined grooves to receive the extra flexible plough steel cable. The axle boxes are of the MCB type, with oil waste pockets, and bronze boxes held by double flanges, affording easy means of shimming down to compensate for wear.

Dynamic braking lowering is recommended with direct current motors, because of the improved regulation and control, and the elimination of wear. The mechanical brake used with alternating current motors is of the multiple disk type, and runs in oil, enclosed in one of the gear cases. All hoist motors are equipped with full torque brake. Lower block is of plate construction, with a forged cross bar and hook, swiveling on ball bearings.

Bridge—Up to 15-ton cranes of 60-ft. span, a plate and channel box section, rigidly diaphragmed at short

intervals, is standard. The girders are fastened to the end trucks by notched construction. Alignment is preserved by heavy gusset plates connecting the two, fitted through bolts being used in both cases. End trucks are of beam or channel girders, heavily diaphragmed, with plates top and bottom. Wheels are of cast steel, with bronze bushings turning on fixed pins.



ERIE CRANE TROLLEY

Bridge Drive—The motor is located on horizontal bracket attached at center of one girder. There is one reduction of gearing to the cross shaft, which runs in split bronze bearings carried on horizontal brackets. The driving pinions mesh with gears pressed directly on the hubs of drive wheels. A foot brake operated from the cab acts on a wheel on the armature shaft to control the bridge movement. A platform, with standard hand rail and toe board, extends the full length of the bridge on the drive side. Beneath this is the operator's cab, rigidly braced to prevent vibration.

Electrical Equipment—Erie cranes can be equipped with any standard make of crane motor and control equipment. A large stock of direct current motors, controllers, solenoid brakes and limit switches is carried. The switchboard may be furnished with knife switch, fuses and pilot light; or overload relays may be substituted for fuses. Wiring throughout is in conduit. Bridge conductors may be of copper wire, or of soft steel angles or bars. The collectors are of an improved type, preventing arcing, and of low resistance.



INSTALLATION OF AN ERIE CRANE

LANE MANUFACTURING COMPANY

Electric Traveling Cranes

MONTPELIER, VT.

Products.

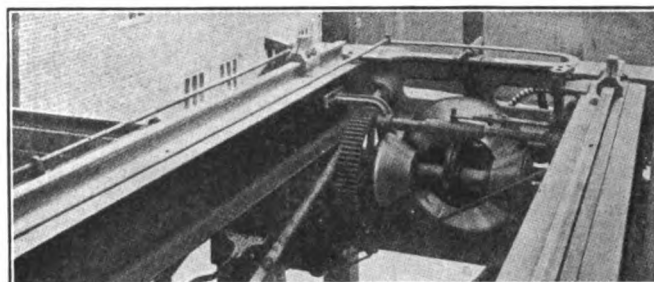
ELECTRIC TRAVELING CRANES.

Also manufacturers of Stone Working Machinery, including Radial Polishing Machines, Boom Derricks and equipment for the finishing of granite and other stone; Wood Working Machinery, including Saw Mills, Edgers, Planers, Trimmers, Swing Saws, Drag Saws, Automatic Novelty Turning Lathes, Universal Saw Benches, Lath, Shingle and Clapboard Machinery, etc.

Distinctive Features of Lane Electric Traveling Cranes.

A notable distinguishing feature of these cranes is the employment of two motors for the three movements. Both motors are the constant speed, non-reversing type which eliminates the use of controllers and complex wiring. Control of all movements, including that of direction by means of a series of friction cones, is mechanical.

Other commendable features inherent in Lane electric traveling cranes are the capacity for large overloads



LANE ELECTRIC CRANE FOR SHORT SPACES, ROLLED STEEL I-BEAM BRIDGE

Bridge girders are supported by cast iron end trucks provided with cast iron double flange chilled wheels which have steel axles running in renewable bearings. The trolley is cast iron, designed for rigidity, compactness, accessibility of all parts and is amply reinforced with steel tension rods. The sides are securely joined together by several large steel shafts.

Power for hoist and trolley movements is transmitted by friction cones through steel worms engaging bronze gears running in oil. Worm gear drive is a simple and effective load brake being controlled by convenient hand wheel. Two speeds of the hook are furnished with one part of rope. A luff block is provided with a hook and hinged house sheave so that by running the line through this sheave and attaching the single rope hook to a girt on the underside of the trolley a two-part reaving of the rope is effected, thereby dividing the first two speeds by two and doubling the power, supplying four hoist speeds.

Through the same power cones, the hoist motor operates the trolley motion on the bridge at approximately 100 ft. per minute. The reverse is obtained in the same manner as with the hoist movement. The movements are controlled by hand wheels. There is no complicated wiring system, no large controllers and no hot resistance. Therefore no ability to handle delicate electrical apparatus is required of the operator.

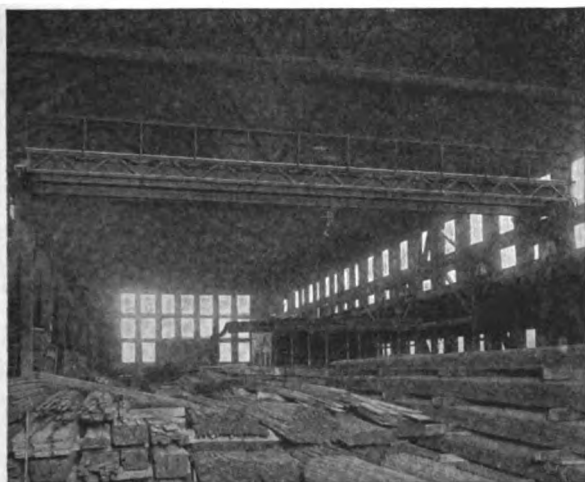
Bridge motor drives a friction disk by transmission through a pair of opposed cones, alternately contacting therewith. Control of bridge travel movement in either direction is effected by shifting the cones by means of a lever connected to a rod running the full length of the bridge convenient to operator's left hand.

Floor control can be furnished at extra cost.

CAPACITY, DIMENSIONS AND SPEED OF LANE ELECTRIC TRAVELING CRANES

Capacity of crane in tons	5	10	20	40
Speed, feet per minute:				
1st hoist full load	10	5	4	3
2nd hoist half load	20	10	8	6
3rd hoist quarter load	40	20	16	12
4th hoist no load	80	40	32	24
Bridge travel full load	250	200	180	170
Trolley travel full load	125	100	100	100
Horsepower of each motor	10	10	15	20
Actual height over all from top of runway rail	5'	5'	5'2"	5'8"
Vertical distance from rail to bearing point of single line hook	even	even	even	6'
Ditto with luff block and double line	17"	17"	28"	38"
End projection of bridge beyond center of rail:				
At gear end	10 1/4"	10 1/4"	12 3/4"	14 5/8"
At opposite end	9 1/2"	9 1/2"	11 3/4"	13 3/8"
Gage of trolley, or, center to center bridge girders	4'7"	4'7"	5'3"	5'11"
Diameter "chilled" bridge and trolley truck wheels	15"	15"	16 1/2"	18"
Wheel base of bridge trucks	7'4"	7'4"	8'4"	9'2"

All wheels on bridges and trolleys grooved for 60 lb. A. S. C. E. standard rail. Speeds may be changed to meet requirements. Dimensions may be reduced by employing reversing motor bridge drive when required.



LANE ELECTRIC CRANE FOR LONG SPANS, BRIDGE OF STEEL GIRDER, LATTICE BOX TYPE

and the unhampered control of all movements by the operator. Seated comfortably on the trolley, he always has a clear view over the hook as well as of all the other points below the crane.

Construction and Operation.

Originally, Lane cranes were furnished with timber bridge girders, stayed with steel truss rods fastened to cast iron bridge trucks and having a safety factor of about 7. This construction has the advantage of being exceptionally light for a given capacity. Where desired, we still furnish timber bridge girders of long leaf yellow pine reinforced to give strength and rigidity. The two other types of bridges for Lane cranes are (1) Rolled steel I-beams reinforced with inverted channels riveted to the top flanges when necessary, adapted for short spans. (2) Steel girders of the lattice box section type especially designed for long spans.



MECHANISM OF LANE ELECTRIC CRANE

Showing accessibility and ease of operation

MANNING, MAXWELL & MOORE, INC.

SHAW CRANE WORKS

119 West 40th Street
NEW YORK, N. Y.

Products.

ELECTRIC TRAVELING CRANES.

Also manufacturers of Electric Traveling Monorail Hoists.

The Main Points.

When you buy a crane, there are two factors to be considered; one, the design and construction of the crane itself, and the other and equally important, the application of the crane to specific requirements and conditions.

Every Shaw crane installation is with us an individual project, and in fact we are really engaged in an Engineering-Contracting business. We have an engineering service to offer which is backed by the accumulated experience of 30 years in the application of Shaw cranes to various industrial purposes.

The Application.

As a case in point, consider the exacting requirements and responsibilities of foundry service. Handling and pouring hot metal requires a sturdy crane and the utmost assurance of reliability and safety; while handling cores and drawing patterns (heavy and light) requires a steady crane and accurate and dependable control.

In forge shop service, the crane must stand up successfully under the stress and shocks of the hammer or press, and the control of all motions must be steady, accurate and immediately responsive. It is indeed fascinating to watch the extreme facility with which red hot forgings are handled by a Shaw crane and the remarkable unison between the operator of the forging press and the man in the crane cage.

In locomotive shop service, the heaviest locomotives are lifted and lowered, and here again there is the big element of responsibility, as for example in the operation of "wheeling" a locomotive, when the engine must be lowered on to the boxes with extreme precision.

Many other applications might be cited, but these few references will serve to indicate that certain essential qualities must be embodied in the original conception of



the crane for the job in order to assure the maximum degree of satisfactory service, and further to suggest the element of insurance that underlies the purchase of a Shaw crane.

Design and Construction.

While this is an engineering catalogue, it is quite impracticable in the available space adequately to describe and illustrate the design and construction of Shaw cranes. This subject is thoroughly covered by our descriptive bulletins, which will be sent on request.

The Shaw Crane a Pioneer.

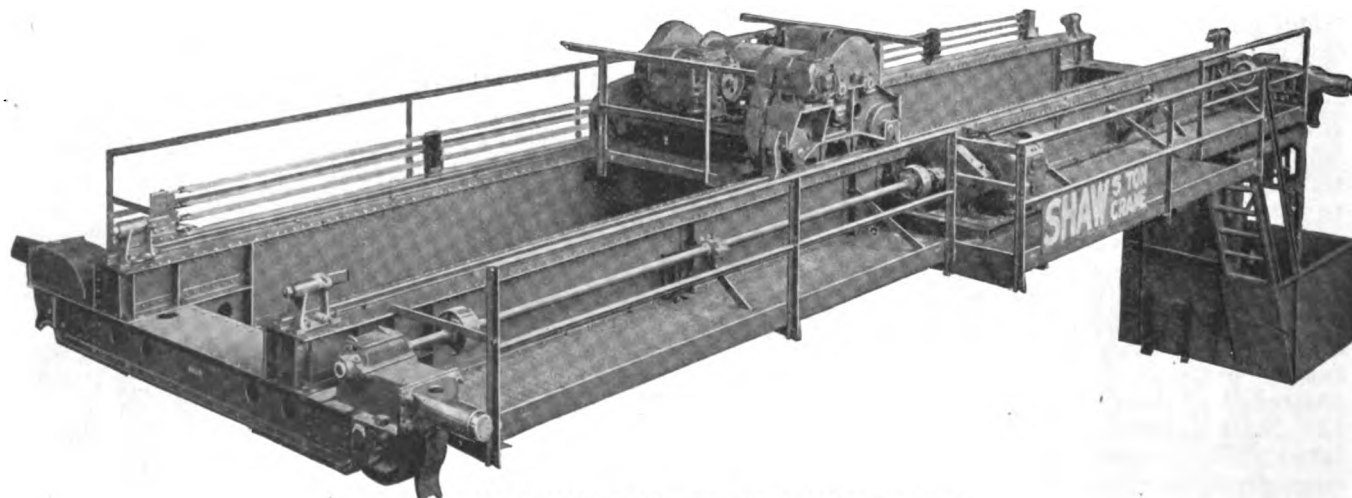
The Shaw Crane Works was established in 1890 and in fact Shaw built the first 3-motor electric traveling crane—with a separate motor and individual control for each motion. We want to make it clear, however, that while practically all of our early Shaw cranes (built 20 to 30 years ago) are still in regular service, we are not disposed to over-capitalize our age, and we want you to consider Shaw cranes on their present-day merits, on the merits of our service and on the reputation of MANNING, MAXWELL & MOORE, INC.—Machinery Headquarters.

Estimates and Preliminary Information.

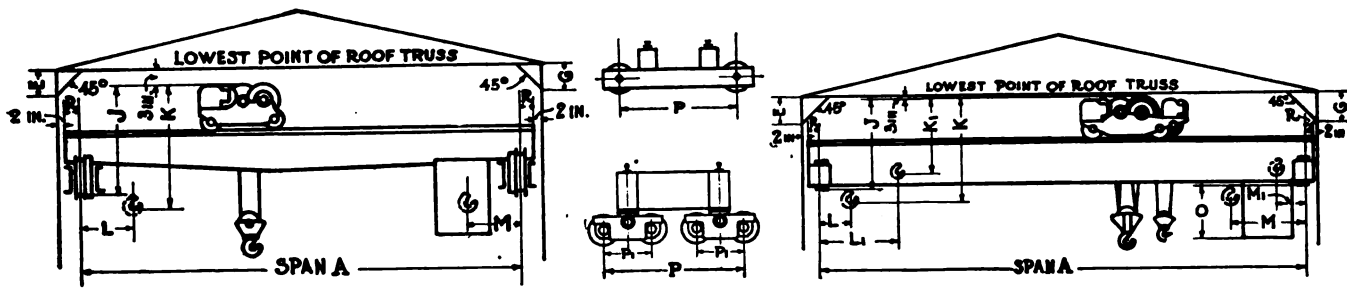
Bearing in mind that the requirements vary widely and that with us every crane is an individual project, please feel free to call on us at any time for preliminary cost estimates, clearance diagrams, or any other information we can supply. This sort of service we are keen to perform as good business and without any obligations on your part.

Clearance Dimensions.

The succeeding page is devoted to a tabulation of clearance dimensions and wheel loads for various capacities and spans. This data is conservative and reliable, but for actual construction purposes, we would rather send you a layout more specifically applying to your individual requirements. The wheel loads are the maximum reaction per wheel with full load on the hook and with the trolley at the extreme end of the cross travel.



STANDARD SHAW CRANE FOR STEEL MILL SERVICE



DIMENSIONS OF STANDARD 4-WHEEL SHAW CRANES

DIMENSIONS OF STANDARD 8-WHEEL SHAW CRANES

DIMENSIONS OF STANDARD CRANES, 30-FT. HOIST

A	R	J	K	L	M	P	Runway rail A. S. C. E., lbs. per yd.	Max. load on each wheel, lbs.					
5-TON													
30	8	4'	8"	4'	6"	3'	3"	2'	2"	9'	0"	40	11000
40	8	5'	2"	4'	6"	3'	3"	2'	6"	10'	0"	40	13000
50	8	5'	2"	4'	6"	3'	3"	2'	6"	10'	0"	40	14600
60	8	5'	6"	4'	6"	3'	3"	2'	6"	10'	0"	40	16000
80	8	5'	6"	4'	6"	3'	3"	2'	6"	13'	0"	40	20000
10-TON													
40	8	5'	6"	5'	0"	3'	7"	2'	7"	11'	0"	40	20000
50	8	5'	8"	5'	0"	3'	7"	2'	7"	11'	2"	40	21000
60	8	5'	8"	5'	0"	3'	7"	2'	7"	11'	4"	40	22000
80	10	6'	3"	5'	0"	3'	7"	2'	7"	13'	0"	50	27000
100	10	6'	3"	5'	0"	3'	7"	2'	7"	16'	0"	50	34000

A	R	J	K	L	M	P	Runway Rail A. S. C. E., lbs. per yd.	Max. load on each wheel, lbs.
15-TON								
50	10	6' 2"	7' 9"	3' 9"	3' 0"	11' 8"	50	28000
60	10	6' 2"	7' 9"	3' 9"	3' 0"	11' 10"	50	30000
70	10	6' 6"	7' 9"	3' 9"	3' 0"	12' 0"	50	32000
80	10	6' 6"	7' 9"	3' 9"	3' 0"	13' 0"	50	34000
100	10	6' 8"	7' 9"	3' 9"	3' 0"	16' 0"	60	42000
20-TON								
50	10	6' 8"	7' 9"	3' 9"	3' 6"	12' 2"	60	35400
60	10	6' 8"	7' 9"	3' 9"	3' 6"	12' 4"	60	38000
70	10	7' 0"	7' 9"	3' 9"	3' 6"	12' 6"	60	40800
80	10	7' 0"	7' 9"	3' 9"	3' 6"	13' 0"	60	44000
100	12	7' 6"	7' 9"	3' 9"	3' 6"	16' 0"	70	54000

A	R	J	K	K ₁	L	L ₁	M	M ₁	P	P ₁ *	Runway Rail A. S. C. E., lbs. per yd.	Max. load on each wheel, lbs.
30-TON, 5-TON AUXILIARY												
50	12	7' 6"	9' 0"	6' 6"	4' 0"	7' 2"	6' 0"	2' 10"	13' 0"	.....	70	52000
60	12	7' 8"	9' 0"	6' 6"	4' 0"	7' 2"	6' 0"	2' 10"	13' 2"	.....	70	55000
70	12	7' 8"	9' 0"	6' 6"	4' 0"	7' 2"	6' 0"	2' 10"	13' 4"	.....	70	58400
80	12	8' 0"	9' 0"	6' 6"	4' 0"	7' 2"	6' 0"	2' 10"	13' 8"	.....	80	62600
100	12	8' 0"	9' 0"	6' 6"	4' 0"	7' 2"	6' 0"	2' 10"	16' 0"	.....	80	74000
40-TON, 5-TON AUXILIARY												
50	12	8' 0"	10' 4"	7' 0"	4' 6"	8' 0"	6' 8"	3' 2"	13' 0"	.....	80	65000
60	12	8' 3"	10' 4"	7' 0"	4' 6"	8' 0"	6' 8"	3' 2"	13' 2"	.....	80	69000
70	12	8' 3"	10' 4"	7' 0"	4' 6"	8' 0"	6' 8"	3' 2"	13' 6"	.....	90	74000
80	12	8' 8"	10' 4"	7' 0"	4' 6"	8' 0"	6' 8"	3' 2"	13' 6"	.....	90	80000
100	12	9' 4"	10' 4"	7' 0"	4' 6"	8' 0"	6' 8"	3' 2"	16' 0"	.....	90	92000
50-TON, 10-TON AUXILIARY												
50	12	8' 9"	11' 6"	7' 9"	4' 8"	8' 6"	7' 2"	3' 3"	13' 6"	.....	90	80000
60	12	9' 0"	11' 6"	7' 9"	4' 8"	8' 6"	7' 2"	3' 3"	13' 6"	.....	90	84000
70	12	9' 0"	11' 6"	7' 9"	4' 8"	8' 6"	7' 2"	3' 3"	14' 9"	.....	90	89000
80	18	10' 4"	11' 6"	7' 9"	4' 8"	8' 6"	7' 2"	3' 3"	13' 6"	4' 6"	70	50000
100	18	11' 0"	11' 6"	7' 9"	4' 8"	8' 6"	7' 2"	3' 3"	14' 6"	4' 8"	70	58000
75-TON, 10-TON AUXILIARY												
50	18	10' 10"	12' 6"	8' 6"	4' 6"	9' 0"	7' 6"	3' 0"	13' 6"	4' 6"	70	56000
60	18	11' 2"	12' 6"	8' 6"	4' 6"	9' 0"	7' 6"	3' 0"	13' 6"	4' 6"	80	60000
70	18	11' 6"	12' 6"	8' 6"	4' 6"	9' 0"	7' 6"	3' 0"	13' 6"	4' 6"	80	66000
80	18	12' 0"	12' 6"	8' 6"	4' 6"	9' 0"	7' 6"	3' 0"	13' 6"	4' 6"	90	74000
100	18	12' 9"	12' 6"	8' 6"	4' 6"	9' 0"	7' 6"	3' 0"	15' 0"	5' 0"	90	80000
100-TON, 15-TON AUXILIARY												
60	18	11' 4"	12' 9"	9' 0"	4' 6"	9' 0"	7' 6"	3' 0"	13' 6"	4' 6"	90	76000
80	18	12' 6"	12' 9"	9' 0"	4' 6"	9' 0"	7' 6"	3' 0"	13' 6"	4' 6"	90	86000
100	18	13' 0"	12' 9"	9' 0"	4' 6"	9' 0"	7' 6"	3' 0"	15' 0"	5' 0"	100	96000
125-TON, 15-TON AUXILIARY												
60	18	12' 0"	13' 8"	10' 6"	4' 9"	9' 9"	8' 6"	3' 6"	13' 6"	4' 6"	100	92000
80	18	13' 0"	13' 8"	10' 6"	4' 9"	9' 9"	8' 6"	3' 6"	13' 6"	4' 6"	100	100000
100	18	14' 0"	13' 8"	10' 6"	4' 9"	9' 9"	8' 6"	3' 6"	15' 0"	5' 0"	110	112000
150-TON, 15-TON AUXILIARY												
60	20	12' 6"	13' 8"	10' 6"	4' 9"	9' 9"	8' 6"	3' 6"	13' 6"	4' 6"	100	106000
80	20	13' 6"	13' 8"	10' 6"	4' 9"	9' 9"	8' 6"	3' 6"	14' 0"	5' 0"	150	118000
100	20	16' 0"	13' 8"	10' 6"	5' 0"	10' 0"	9' 0"	4' 0"	16' 0"	5' 0"	150	134000

*These dimensions apply to 8-wheel cranes, and are the wheel-bases of the equalizing trucks.

NEW JERSEY FOUNDRY & MACHINE CO.

Manufacturers of Cranes, Trolleys and Hoists

90 West Street
NEW YORK, N. Y.

BRANCH OFFICE: 156 Second Street, SAN FRANCISCO, CAL.

Products.

CRANES: Hand and Electric Traveling, Wall, Jib and Gantry; TROLLEYS; PORTABLE ELEVATORS.

Also manufacturers of equipment incidental thereto; Monorails.

Portable Elevators.

Standard sizes are $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and 1 ton. The standard over all height is 12 ft. The standard size of platform is 2 ft. by 2 ft. by 7 in.

Special capacities, heights and platform sizes made to comply with special requirements.

Wall Cranes.

Manufactured in capacities up to 10 tons. Length of boom as desired.



PORTABLE
ELEVATOR



WALL CRANE

Hand Geared Cranes.

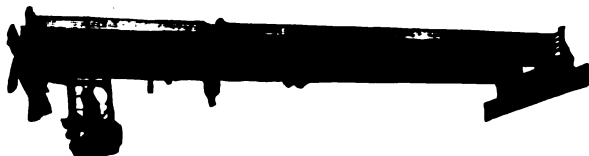
Suitable for spans up to 70 ft. and loads up to 10 tons.



HAND GEARED CRANE

Motor Driven Cranes.

Manufactured to suit practically every capacity and span.

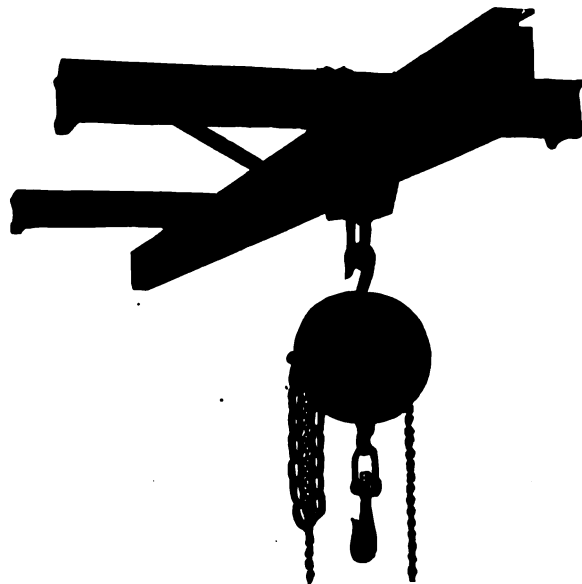


MOTOR DRIVEN CRANE

SWEET'S CATALOGUE

Underhung Cranes.

Made in hand push, hand geared and motor driven types.



UNDERHUNG CRANE

Hand Push Cranes.

Designed especially for loads up to 3 tons and to spans up to 30 ft.



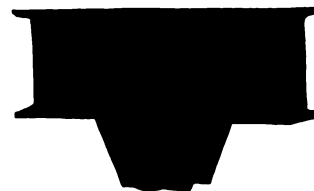
HAND PUSH CRANE

Beam Trolleys.

Manufactured in capacities from $\frac{1}{2}$ to 10 tons.



BEAM TROLLEYS



Catalogues.

The NEW JERSEY FOUNDRY & MACHINE Co.'s standard size catalogue, 7½ by 10½ in., containing complete information, will be sent on request.

WHITING CORPORATION

FORMERLY WHITING FOUNDRY EQUIPMENT CO.

Cranes of All Types

HARVEY, ILL.

For addresses of Branch Offices and Sales Agents, see page 1198

Products.

CRANES for every service: Electric Traveling, Gantry, Hand Power Traveling, Jib, Pillar and Bracket. For Foundry Equipment, see pages 1198-99.

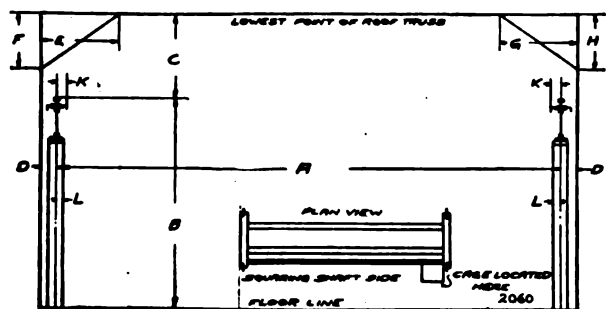
Electric Traveling Cranes.

From 1- to 250-ton capacity and for every class of service, inside and outside. Designs based on over 35 years' engineering and manufacturing experience, and cranes can be depended on for safe, reliable operation. Built for practically any span, alternating or direct current; cage or floor control. Trolley may be arranged for handling clamshell bucket or lifting magnet.

Main Features—No overhanging gears. All gears on trolley run in oil in dustproof cases. All gears of steel, cut teeth. Bearings on trolley all bronze bushed. Through bolts used throughout. Wiring in iron conduit. Dependable electric and mechanical brakes. Positive limit switch prevents overtravel of hook. Footwalk with hand rail full length of bridge. All wearing parts readily accessible. Substantial rigid construction throughout.

Data for Quotations—In requesting prices please give:

(1) Capacity in net tons. (2) Class of service and whether inside or outside. (3) Kind of electric current available. (4) Clearance dimensions (refer to diagram below): (a) span, center to center runway rails; (b) lift, floor to rails; (c) overhead clearance; (d) end clearance; (e, f, g, and h), if there are any braces.



CLEARANCE DIAGRAM, ELECTRIC TRAVELING CRANE

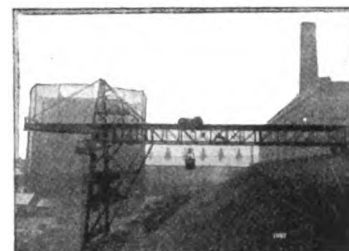
Gantry Cranes.

Numerous designs for varying capacities and spans.

Very useful for outdoor yard service.

Bucket-Handling Cranes.

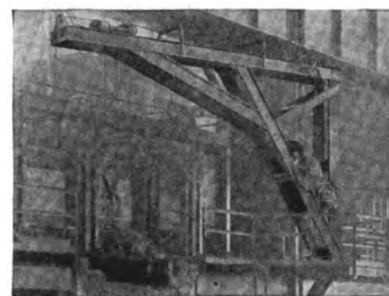
Both electric travelers and gantry cranes can be furnished with a bucket-handling trolley and used for handling coal, cinder, cement clinker or other loose material.



WHITING BUCKET-HANDLING GANTRY CRANE, UNION GAS & ELECTRIC CO., CINCINNATI, OHIO
138-ft. 9-in. span—43-ft. 9-in. cantilever

Hand Power Traveling Cranes.

Various types, 1- to 40-ton capacity, single or double I-beam bridges. Our standard rope drum trolley has two speeds and automatic brake. All movements operated by pendant hand chains from floor.



ELECTRIC JIB CRANE IN STEEL FOUNDRY

Jib Cranes.

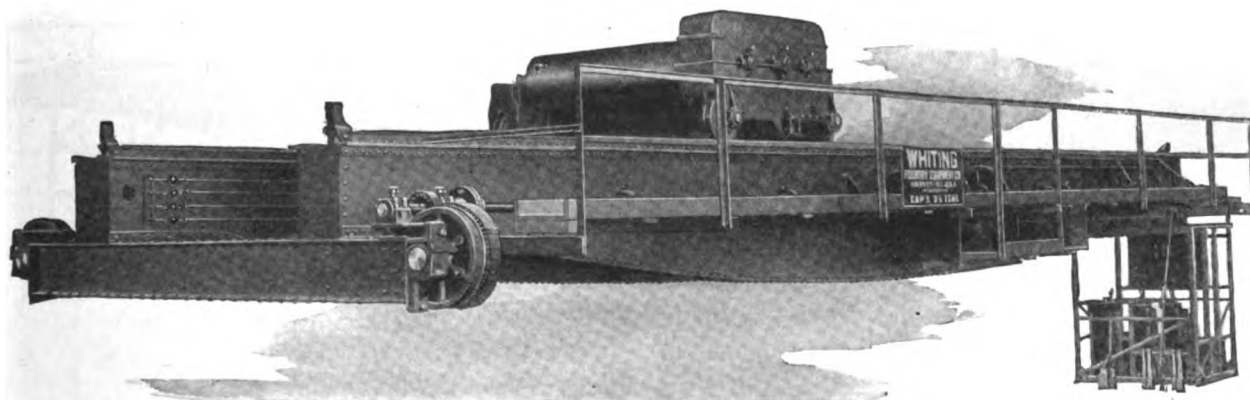
Various types: hand power, pneumatic and electric, both stationary and portable. In requesting price state capacity, height of lift, and radius desired. If electric, specify current.

Pillar Cranes.

Various designs for inside or outside service, electric, pneumatic or hand power. Swing complete circle. No overhead support required.



HAND POWER PILLAR CRANE
5-ton capacity



STANDARD 3-MOTOR ELECTRIC TRAVELING CRANE, BOX GIRDERS, M. C. B. TRUCK ENDS

NILES-BEMENT-POND COMPANY

Manufacturers of Electric Traveling Cranes, Machine Tools and Steam Hammers

111 Broadway
NEW YORK, N. Y.

BRANCH OFFICES AND AGENCIES

BOSTON, 93 Oliver Street
ROCHESTER, 116 South Avenue
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FOR CANADA: THE JOHN BERTRAM & SONS Co., LTD., Dundas, Toronto, Montreal, Winnipeg and Vancouver

Products.

NILES ELECTRIC TRAVELING CRANES, TROLLEYS and HOISTS; GRAB BUCKET TROLLEYS and CRANES.

Hand Cranes, Gantry Cranes, Jib Cranes, Wall Cranes; Machine Tools and Steam Hammers.

Electric Traveling Cranes.

The Niles cranes are built to operate continuously, and approved safety devices are incorporated in their design. All parts are accessible for examination or removal, and delays for repairs are reduced to a minimum.

The cage is built of heavy angles and plates and thoroughly braced to eliminate vibration and distortion. It is connected with a platform extending entirely across the crane, affording easy access to the bridge motor, gears and bearings.

The controllers, located in the cage, give perfect regulation and are equipped with liberal wearing parts, ventilated contacts, carbon brushes, powerful magnetic blow-outs—all accessible from the front.

The mechanical load brake is of the double disk type, automatic in action and self-contained; it will not chatter under any condition of service and will not permit the load to run down unless the motor is revolved by power in the lowering direction. The electric brake is of the ironclad solenoid type—safe, powerful and accessible.

The Niles dynamic braking system can be supplied when desired, eliminating the mechanical load brake

and at the same time insuring perfect regulation, safety and absolute control of the load.

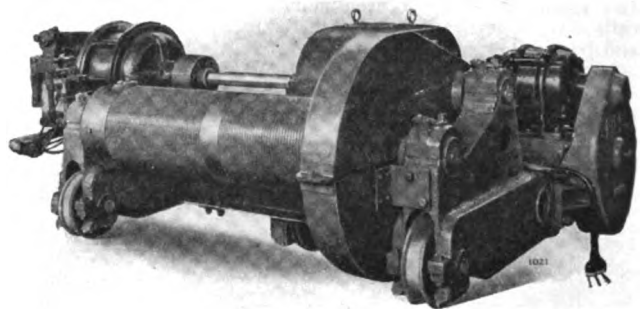
Bridge girders are made either of box section or I-beam with auxiliary braces, depending upon the capacity and the span. Both types have great lateral rigidity. Standard box section girders are built up of two web plates, four heavy angles and universal mill top and bottom cover plates. I-beam bridge girders are of heavy I-beam section with specially wide flanges with auxiliary brace composed of heavy channels and angles.

Standard Crane Trolley.

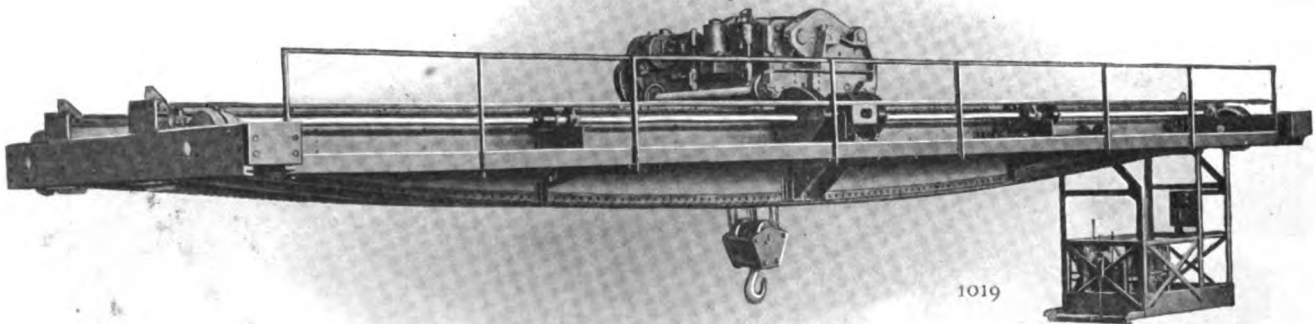
Framing consists of two double web sides connected by a built-up all-steel girt. Hoisting drum is finished all over and grooves cut right and left hand so as to always lift the load vertically, without twisting. All gears are enclosed in cast iron or welded steel cases, or carefully guarded.



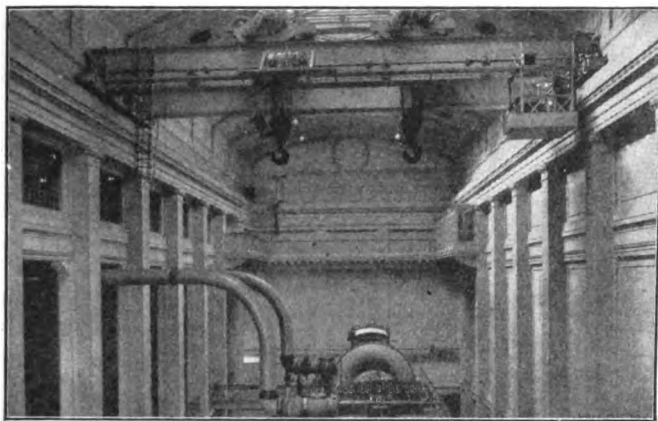
STANDARD CRANE
CONTROLLER
Face plate type



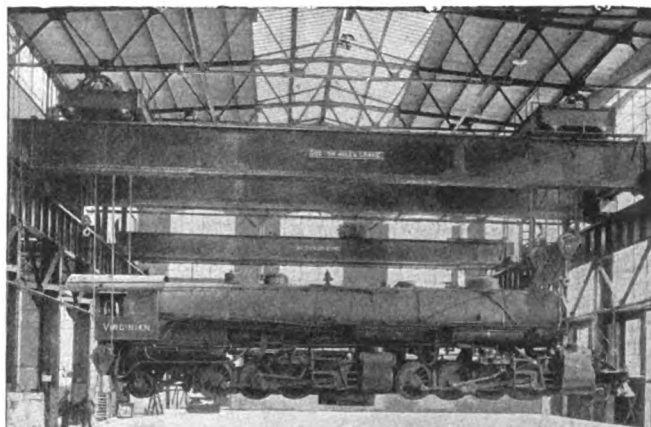
STANDARD CRANE TROLLEY
Without auxiliary hoist



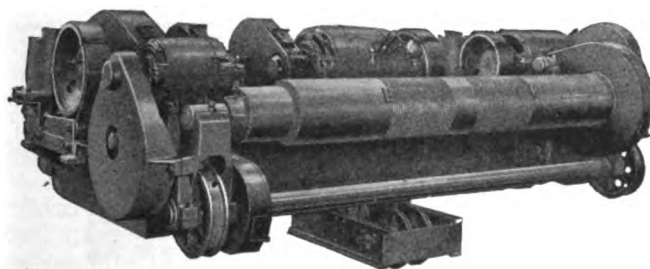
NILES ELECTRIC TRAVELING CRANE—STANDARD CONSTRUCTION THROUGHOUT



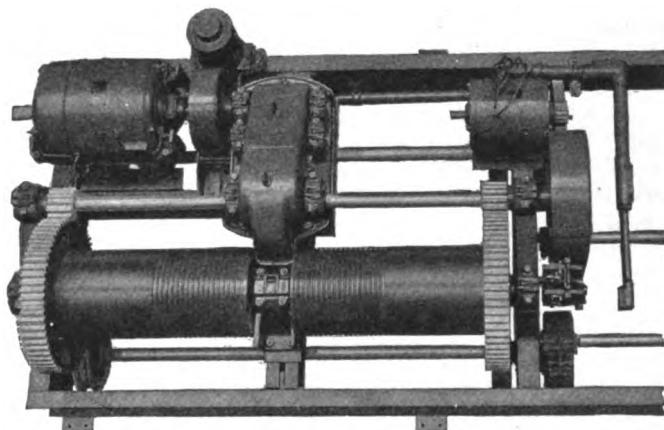
160-TON TRAVELING CRANE IN POWER PLANT OF PHILADELPHIA ELECTRIC CO.



200-TON ELECTRIC TRAVELING CRANE
75-ft. 6-in. span. Weight of suspended locomotive is 540,000 lbs. or 270 tons



STANDARD CRANE TROLLEY
With independent auxiliary hoist



STANDARD GRAB BUCKET CRANE TROLLEY

Designed for operation with a 2-rope grab bucket, one rope being attached to the bail of the bucket and the other to the closing mechanism. The entire trolley frame forms a rigid self-contained construction on which the hoisting mechanism is mounted; automatic in action, no slack ropes.

Directions for Inquiries.

When sending inquiries for cranes, the class of service for which they are to be used should be stated: whether for machinshop, boiler shop, foundry, stone-yard, power plant or whatever the case may be. If crane is for outdoor use, enclosed cage, if desired, should be mentioned. In addition to the above, we should have the following data, in order to properly make up a quotation:

(a) Capacity of crane in tons of 2000 lbs. (b) Span from center to center of runway rails. (c) Either the distance from top of runway rails to ground, or the maximum lift desired.

(d) Distance from top of runway rails to lowest point of roof truss or other obstruction. (e) Distance from center of runway rails to side walls of building. (f) Capacity of auxiliary hoist, if one is required. (g) Voltage and type of current. (If alternating current is to be used, advise number of cycles and the phase.) (h, i, j, k) If building contains wind braces. (l) Size of runway rail.

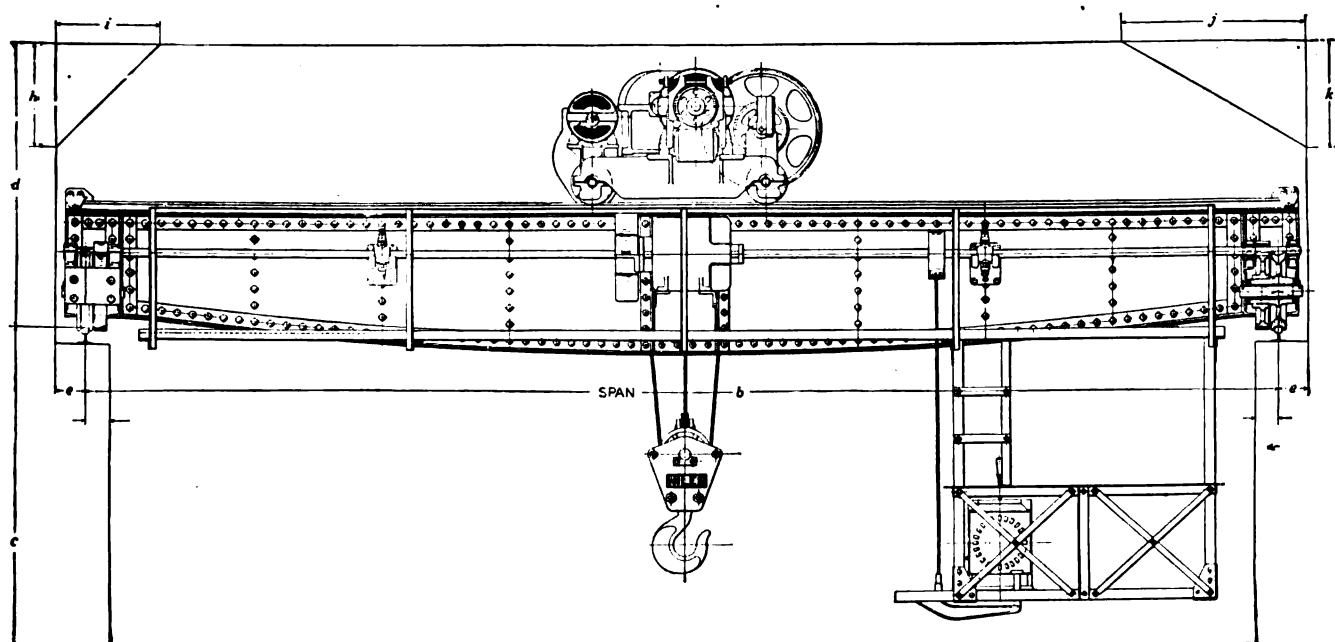


DIAGRAM NILES ELECTRIC TRAVELING CRANE

PAWLING & HARNISCHFEGER CO.

Manufacturers of Traveling Cranes and Hoists

MILWAUKEE, WIS.

BRANCH OFFICES

PHILADELPHIA, PA., WALTER PRICE, Stephen Girard Building
 NEW YORK, N. Y., WALTER PRICE, 50 Church Street
 PITTSBURGH, PA., GEO. L. MEAD, Fidelity Building
 CHICAGO, ILL., R. A. S. JOHNSON, Monadnock Building
 PORTLAND, ORE., S. W. SELFRIDGE, Yeon Building
 NEW ORLEANS, LA., T. W. WADDELL, Whitney Central Building
 SEATTLE, WASH., S. H. NEWELL, L. C. Smith Building
 SAN FRANCISCO, CAL., R. M. TAYLOR, Monadnock Block
 LOS ANGELES, CAL., ROY S. YOUNGLOVE, Central Building

Products.

TRAVELING CRANES and HOISTS.

For Excavating Machinery, see page 58.

Type "H" Cranes.

In designing the new type "H" crane particular attention has been paid to the installation of proper safeguards for protection of machinery as well as workmen.

Rugged construction, and entirely enclosed gears, none of which are overhung, and the most approved design of all wearing parts, are among the most important points.

P & H Features.

Each shaft lifting out independently.

All gears of cast steel.

All pinions of forged steel.

All trolley bearings bronze bushed.

M.C.B. type bearing on both trolley and bridge.

All gears running submerged in grease and enclosed in oiltight cases, thus insuring constant lubrication, except bridge truck gears which are provided with guards only.

Drum and running sheaves are not less than thirty times diameter of rope.

Dynamic braking for direct current cranes.

Motor and bridge brakes of heavy clamshell type.

Trolley sides and bridge trucks of box section.

Fully enclosed cut steel gears throughout.

No overhanging gears or pinions.

Safety clips on trolley collector shoes prevents wires from getting out of shoes.

Sheave and hoist cable guards.

All important bolts provided with lock washers.

No projecting bolts in collars or couplings.

Main switch can be locked in open position.

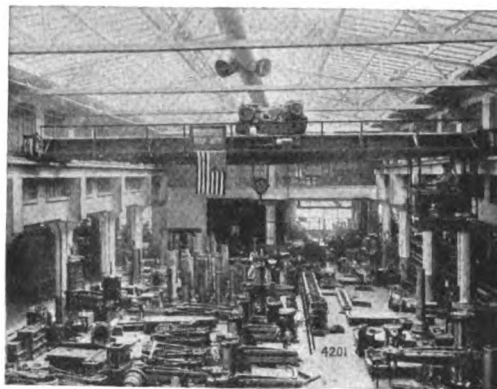
Complete accessibility of all parts.

Bridge End Trucks.

Built from structural steel of a box section, at each end is a single casting riveted to both webs which carries the axle bearings, also the end bearings for the cross shaft. Machined lugs on the truck castings against the structural end trucks relieve the rivets almost entirely of vertical shear.

Truck bearings consist of heavy flanged bronze bearings of semi-octagon shape held in place by oil waste boxes of ample size to insure perfect lubrication at all times.

Truck gear is keyed to axle and is located between main bearings. Pinion is located on cross



TYPE "H" CRANE, 15-TON HOIST, 3-TON AUXILIARY, SPAN 47 FT. 10 IN.

shaft between two bearings, caps of which are joined by a housing which encloses the pinion. Extension of truck gear outside of truck is enclosed in a sheet steel casing.

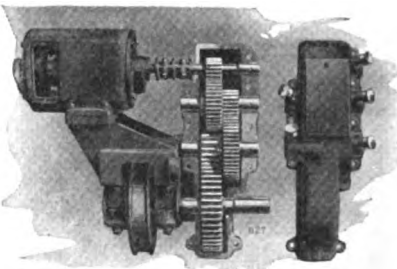
Bridge Motor.

Located near center of bridge and is bolted to horizontal structural bracket extending from girder. Bridge brake is of clamshell type with removable asbestos lined shoe, mounted on armature shaft, and is operated through tension rods by a foot lever in operator's cage.

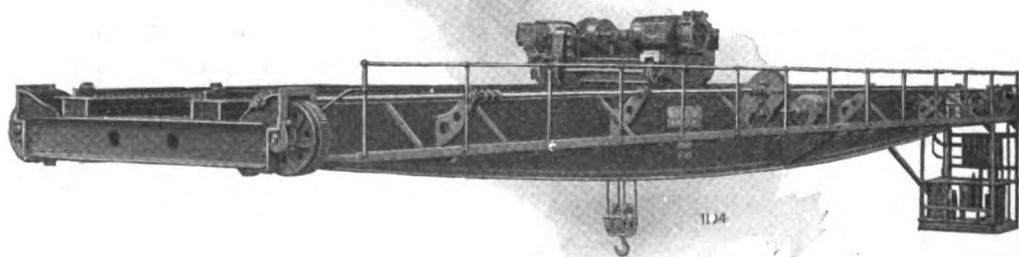
Motor gears are enclosed in oiltight casing which excludes dust and grit.

Trolley.

This modern enclosed type of trolley was designed to meet the most exacting requirements of crane service, and it is of rugged construction, approved design and very accessible.



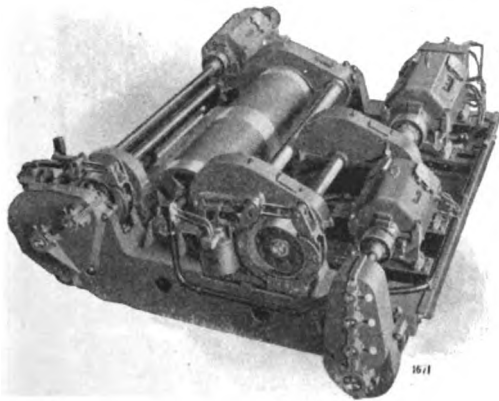
TROLLEY DRIVE WITH GEAR CASE OPEN TO SHOW POSITION OF GEARS



TYPE "H" CRANE COMPLETE

Built in sizes ranging from 5 to 100 tons.

All gears are enclosed in oiltight cast iron cases which exclude dust and grit and enable gears to operate



TYPE "H" MILL TROLLEY, 75-TON CAPACITY WITH 15-TON AUXILIARY

in lubricant bath of oil or soft grease. All cases are provided with large covers that can be easily and quickly removed.

Drum—Hoisting drum is of cast iron, drum and sheaves are not less than thirty times the diameter of rope, and are of sufficient size to take full run of ropes for specified lift without overlapping.

All shafting is of steel turned and ground at bearings, with forced fit wherever gears, truck wheels, etc., are placed.

Each shaft is accessible, lifting out separately with gears mounted on them.

Bearings—All bearings are of phosphor bronze, those for the truck axles are flanged semioctagon type and held in place with oil waste boxes of sufficient size to secure ample lubrication.

All other caps are of cast iron, machined to fit between planed lugs on frame. They are supplied with compression grease caps.

Brakes—Both main and auxiliary hoists are provided with powerful automatic electric brake of clamshell type.

In addition to this, dynamic braking is furnished on all direct current cranes, or if alternating current a mechanical load is supplied.

Load brake is of disc type with automatic retaining band; it is located on the trolley side between two bearings which are integral with trolley side.

Motors.

Direct Current Motors—Designed electrically and mechanically for these cranes only. Have large starting torque, and speeds are lower than those of other crane motors, so that a minimum of time is lost in starting and stopping.

Rated on basis of 40° C. rise in 30 minutes, and will withstand 100% overload without undue heating or sparking.

Alternating Current Motors—Standard slip ring type, of same excellent design as direct current motors and rated on same temperature basis.

Squirrel cage type of motor is not recommended as speed control is unsatisfactory.

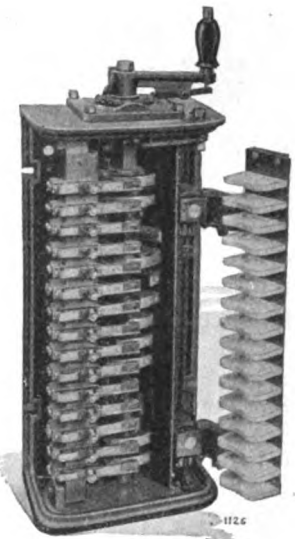
Controllers—Each motor has its own reversible controller of drum type. This type has proved superior to face plate type.

Limit Switch.

Each hoisting mechanism is provided with a limit switch which interrupts current if bottom block is raised too high. Limit switch is operated directly by the bottom block, and therefore is positive and reliable in action.

Switchboard.

A neat substantial switchboard is mounted in rear of the operator's cage. It consists of slate panels, mounted on an angle iron frame and contains a fused knife switch and fuses for the individual motor circuits.



DRUM TYPE CONTROLLER

Dynamic Braking.

On direct current cranes dynamic braking has been adopted as standard, the load brake being omitted and the motor being provided with a large capacity clamshell brake fully ample to sustain full load with safety. This system of dynamic braking will therefore give reliable speed control, offer a high degree of safety and eliminate completely all load brake difficulties.

Tests.

Every motor and controller is subjected to a rigid factory test, comprising speed torque, temperature, insulation and high voltage tests, as recommended by the Institute of Electrical Engineers. After crane is completely assembled and wired up it is tested once more, and speeds of different motions are ascertained to insure its coming up to specifications in every respect.

Ordering Information.

The following data will greatly facilitate the work of our engineers in submitting complete specification:

Capacities (in tons of 2000 lbs.): main hoist; auxiliary hoist; auxiliary trolley.

Number of and movements to be operated by electric motors, and what movements to be operated by hand power.

Span, center to center of runway rails.

Weight of runway rails per yard and method of fastening to girders.

Maximum lift from floor line to hook in highest position.

Distance from top of runway rails to lowest point of roof truss.

Distance from center of runway rail to wall or face of column. Dimensions of wind braces if any. Distance from floor line to top of runway rail.

Distance from floor line to top of any obstruction which might interfere with bottom of cage or crane.

Service indoors or out. Intermittent (powerhouse). Moderate (machineshop, foundry, erecting shop). Heavy (steel foundry, mill, magnet, ladle).

Control from cage, floor or pulpit.

Cage located at end of bridge, center of bridge or trolley. Direct or alternating current. Voltage or cycles and phases.

If magnet is to be used give size and character of material to be handled.

If two or more points of lift are desired, distance center to center should be given, and whether at right angles or parallel with crane bridge.

Gantry crane: single or double leg; single or double cantilever. Distance from top of runway rail to lowest point of bridge. If cantilever type, give distance of center of hook beyond center of runway rail at each end.

SHEPARD ELECTRIC CRANE & HOIST CO.

MONTOUR FALLS, N. Y.

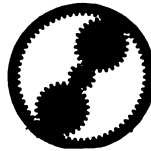
BRANCH OFFICES

NEW YORK, N. Y.	PHILADELPHIA, PA.	CHICAGO, ILL.	BALTIMORE, MD.	SAN FRANCISCO, CAL.
BOSTON, MASS.	CLEVELAND, OHIO	PITTSBURGH, PA.	SEATTLE, WASH.	CINCINNATI, OHIO
DETROIT, MICH.	MONTREAL, CAN.	LONDON, ENGLAND	CHRISTIANIA, NORWAY	
	MELBOURNE, AUSTRALIA	BARCELONA, SPAIN		

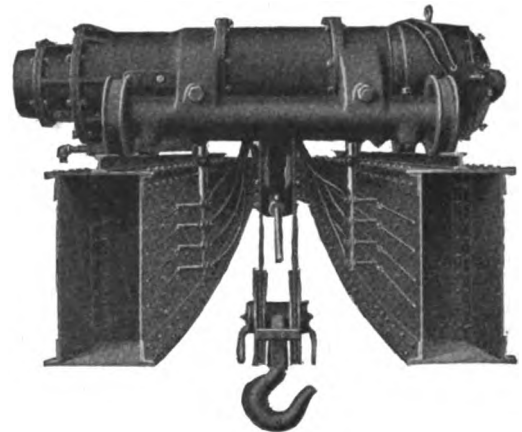
Products.

ELECTRIC CRANES and HOISTS for every lifting service; DOUBLE MONORAIL TRACK; TROLLEYS; ELECTRIC BACK GEARED WINCHES; ELECTRIC DOCK WINCHES; ELECTRIC SHIP WINCHES.

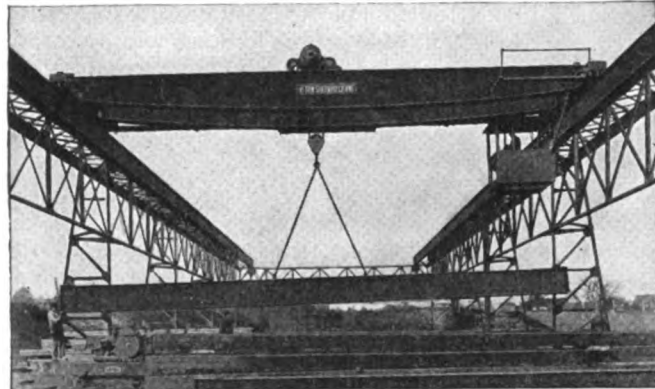
Also manufacturers of Electric Cargo Cranes; Electric Capstans.



TRADE-MARK

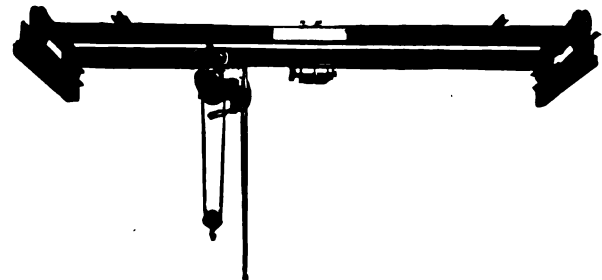


STANDARD TYPE CRANE TROLLEY
Provides bath lubrication, complete dirt exclusion, and permanent alignment for gearing, brakes and motor



SHEPARD ELECTRIC TRAVELING CRANE

With one hoisting trolley; cranes also equipped with two trolleys working together or as separate units



SINGLE I-BEAM WITH FORM 1X HOIST

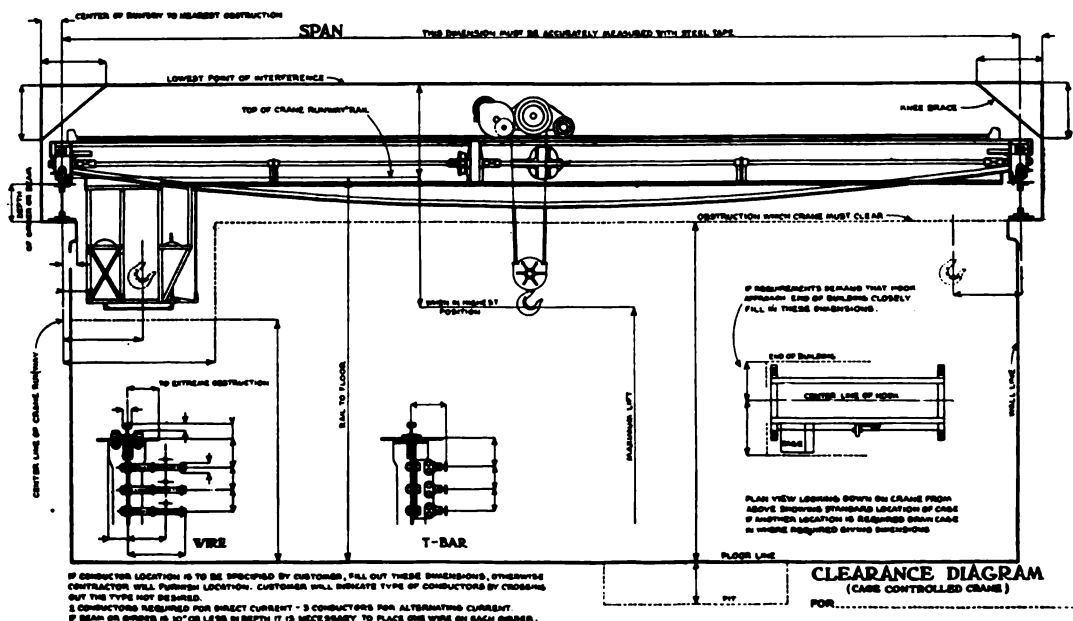
Shepard single I-beam cranes with latticed outrigger construction combine double girder rigidity with single I-beam lightness. Widely used over foundry and machinshop side floors for capacities of 1 to 5 tons, and for medium and short spans

Electric Cranes.

During the 17 years of crane building, no fundamental changes have been made in the original Shepard design which has proved so satisfactory.

This design provides complete dirt exclusion, thorough automatic lubrication and permanence of alignment, secured by locating steel gearing and multiple disc type brakes within cylindrical frames, completely protected, and protecting operators and workmen.

The Shepard line specializes on fully developed cranes of the highest quality in capacities of from



CLEARANCE DIAGRAM OF CAGE-CONTROLLED CRANE

Time may be saved in making quotations if the above indicated dimensions are given, together with available electric current (voltage), phase, and cycles if alternating

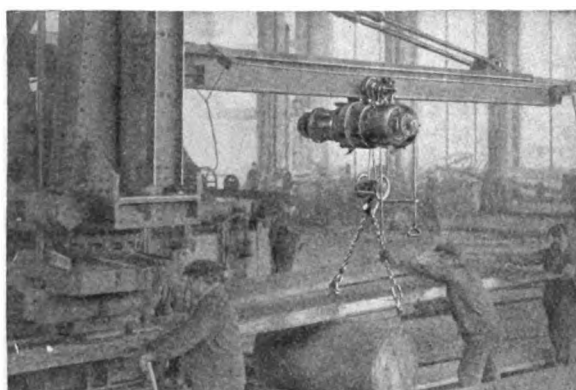
1 to 50 tons. The 1-ton capacity is as complete in every detail as any heavier crane; groups of small units can be handled as profitably as heavy single units.

Styles—Standard 3-motor cage-controlled and double hook traveling cranes; grab bucket, single I-beam, jib, bracket and transfer cranes, and a variety of special types.



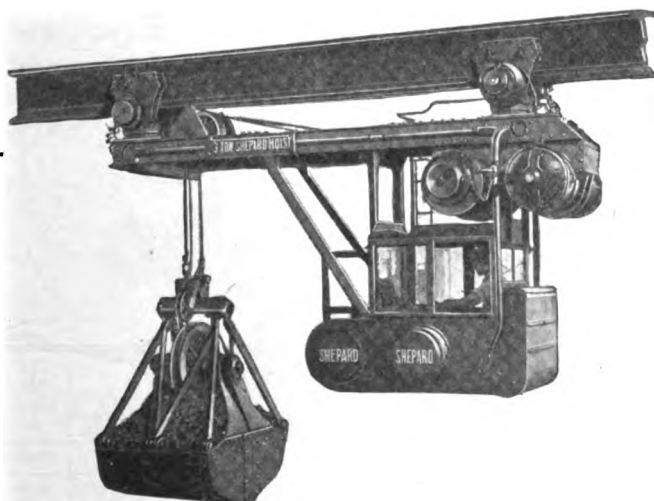
FORM 18 HOIST

This type of hoist has two hooks. Illustration shows hoist carrying automobile cased for export shipment, and a section of monorail runway

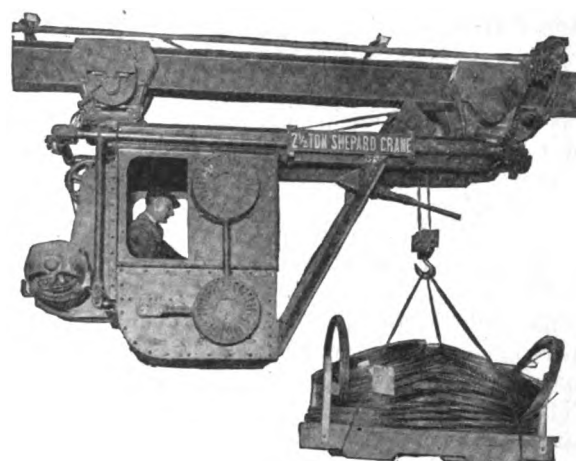


TOP BRACED BRACKET CRANE WITH FORM 1 HOIST

Provides simple, efficient apparatus for many foundry and machine shop locations and ably assists main crane. Aids in supplying a machine with work. For transferring work from one to another, and for jobs which tie up a crane for long periods, this is a most profitable piece of apparatus

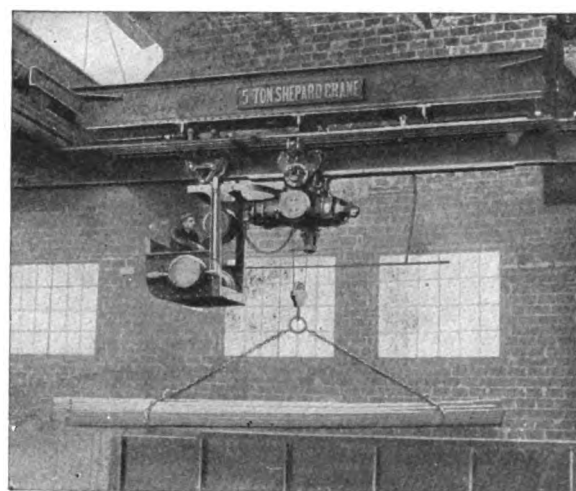


GRAB BUCKET MONORAIL HOIST, FORM 19-13



FORM 24 CAGE-CONTROLLED HOIST

This type of hoist is adapted to general material handling where heavy monorail service is required. Furnished also with two hooks making it adaptable for handling long flexible loads



FORM 25 HOIST OPERATING ON TRANSFER CRANE

Form 25 hoist used in conjunction with a Shepard transfer crane. This combination is wide in its range of operation and may be worked out to touch any point in or out of the plant



TWO FORM 19-13 MONORAIL HOISTS OPERATING ON TRANSFER CRANES

This type of hoist provides a flexible, efficient and labor saving means of unloading, storing and carrying coal into powerhouses

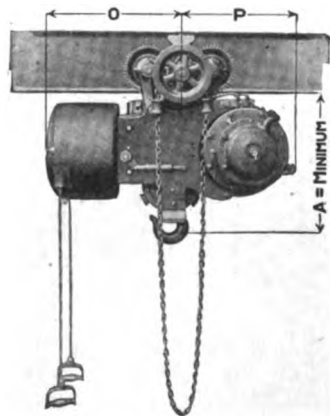
Electric Hoists.

To meet the various handling requirements of many and varied industries, many types and capacities have been developed during the past 17 years, including 1-motor and 2-motor floor controlled hoists, and 2-, 3- and 4-motor cage-controlled hoists, ranging in capacities from $\frac{1}{2}$ to 10 tons.

Hoists for stationary service, and for electrifying the hoist motion of hand cranes, are built in capacities up to 20 tons.

Thorough automatic lubrication, dirt exclusion, and permanence of alignment, all so necessary in hoisting apparatus, are provided.

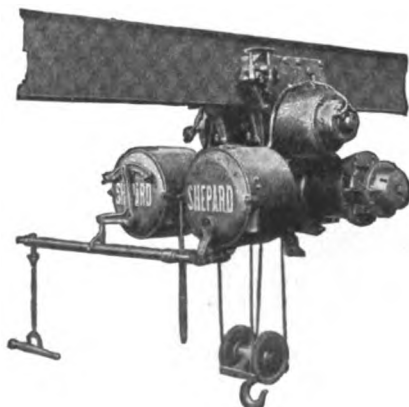
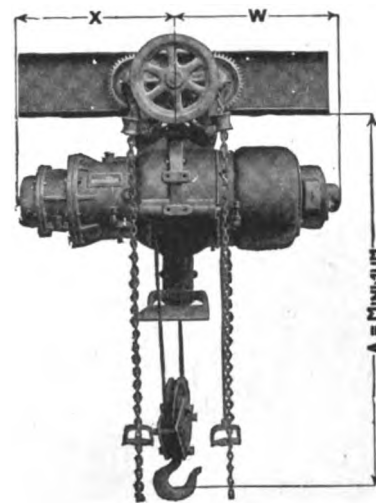
The compact construction of Shepard apparatus permits the use of crane gearing and brakes in electric hoists, and back geared motors, providing a great variety of types and wide interchangeability with a minimum number of parts.

**FORM 23 HOIST WITH GEARED TROLLEY**

A special combination of hoisting unit, controller and trolley, which permits maximum lift; cuts in half normal distance from hook in its highest position to runway beam

CAPACITIES AND DIMENSIONS

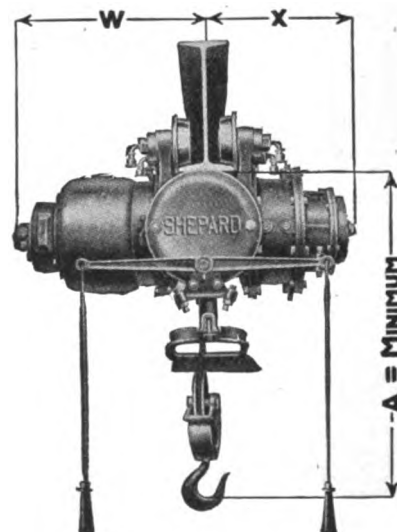
Class or frame, size	Capacity, tons	Hoisting speed, f.p.m.	No. of ropes	Hgt. of lift	Dimensions				Wgt., lbs.
					A	O	P	Extreme width	
A2	$\frac{1}{2}$, 1, 2	40, 20, 10	2	20'	2' 7"	1' 8 $\frac{3}{4}$ "	1' 6 $\frac{1}{4}$ "	3' 10"	1170
A4	1, 2, 3	40, 20, 13	2	20'	2' 7"	1' 8 $\frac{3}{4}$ "	1' 6 $\frac{1}{4}$ "	3' 10"	1220
B6	3, 4, 5	20, 15, 12	2	28'	3'	2' 4 $\frac{3}{4}$ "	1' 11"	5' 4"	2470
B10	4, 5, 6	25, 20, 17	2	28'	3'	2' 8 $\frac{3}{4}$ "	1' 11"	5' 4"	2770

**FORM 23 HOIST WITH MOTOR DRIVEN TROLLEY**
Can be equipped with outrigger control**FORM 1 HOIST WITH GEARED TROLLEY**

Built in capacities of from 1 to 20 tons and furnished with plain, geared, or motor driven trolley. Most frequently used type for runway and single I-beam crane service

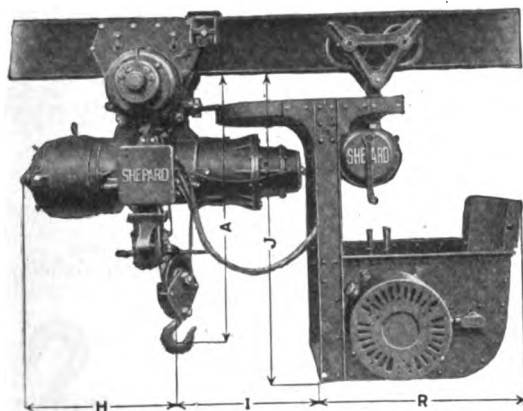
CAPACITIES AND DIMENSIONS

Class or frame, size	Capacity, tons	Hoisting speed, f.p.m.	No. of ropes	Hgt. of lift	Dimensions				Wgt., lbs.
					A	X	W	Extreme width	
A2	$\frac{1}{2}$, 1, 2	40, 20, 10	2	20'	3' 4 $\frac{1}{2}$ "	1' 9 $\frac{3}{4}$ "	1' 7 $\frac{1}{4}$ "	3' 1 $\frac{1}{2}$ "	1090
A4	1, 2, 3	40, 20, 13	2	20'	3' 4 $\frac{1}{2}$ "	1' 9 $\frac{3}{4}$ "	1' 10"	3' 1 $\frac{1}{2}$ "	1140
B6	3, 4, 5	20, 15, 12	2	22'	4' 2 $\frac{1}{2}$ "	2' 5 $\frac{1}{8}$ "	2' 1"	1' 11 $\frac{1}{2}$ "	2350
B10	4, 5, 6	25, 20, 17	2	22'	4' 3 $\frac{3}{4}$ "	2' 5 $\frac{1}{4}$ "	2' 2 $\frac{1}{4}$ "	2' 3 $\frac{1}{2}$ "	2650
C12	5, 7 $\frac{1}{2}$, 10	26, 17, 13	2	23'	5' 5 $\frac{3}{4}$ "	3' 2"	2' 5 $\frac{3}{4}$ "	2' 6 $\frac{1}{4}$ "	4220
C20	7 $\frac{1}{2}$, 10, 12 $\frac{1}{2}$	30, 24, 20	2	23'	5' 5 $\frac{3}{4}$ "	3' 2"	2' 7 $\frac{3}{4}$ "	2' 6 $\frac{1}{4}$ "	4470

**FORM 2 X S HOIST****CAPACITIES AND DIMENSIONS**

Class or frame, size	Capacity, tons	Hoisting speed, f.p.m.	No. of ropes	Hgt. of lift	Dimensions				Wgt., lbs.
					A	X	W	Extreme width	
H $\frac{1}{2}$	$\frac{1}{4}$	25	2	14'	2' 1"	1' 3"	1' 6"	2' 6"	520
H1	$\frac{1}{2}$	28	2	14'	2' 1"	1' 3"	1' 7"	2' 6"	520
I2	1	20	2	18'	2' 5 $\frac{1}{2}$ "	1' 5"	1' 8"	2' 8"	580

Continued on next page

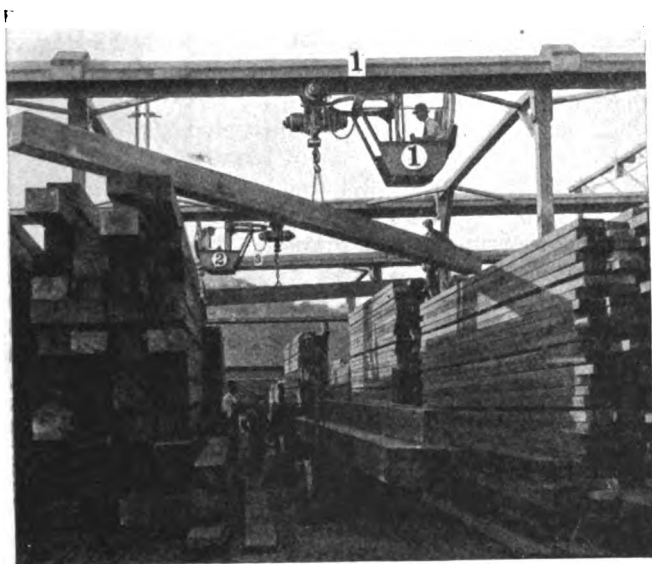


FORM 25-1 D. C. MONORAIL HOIST

For light and normal monorail duty; cage can be enclosed where necessary
Short over all length of distinct advantage on short transfer cranes

CAPACITIES AND DIMENSIONS

Class or frame size	Capacity, tons	Hoisting speed, f.p.m.	Trolley speed, f.p.m.	Hgt. of lift	No. of ropes	Dimensions						Wgt., lbs.
						A	J	H	I	R	Extreme width	
A2	1/2	240, 20, 10	225, 350	20'	2	3'8 1/2"	5'	1'5 1/4"	2'2"	3'	3' 6"	2580
B6	3, 5	20, 15, 12	225, 350	22'	2	4'8 1/2"	5' 6"	1'10 1/4"	3'3"	3'6"	5'	4550
C12	5, 10	26, 17, 13	225, 350	23'	2	5'11 1/2"	6'	2'2 1/2"	4'3"	3'9"	6'	7580

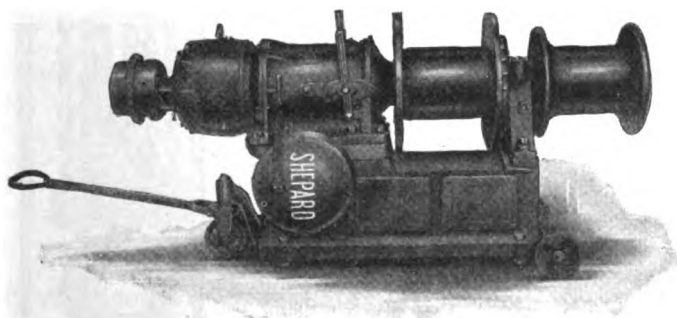


FORM 25 HOIST HANDLING HEAVY TIMBERS

Extra controllers can be mounted on special orders for magnets and buckets

Electric Cargo Winches.

The electric cargo winch is a recent development for use on ships and piers. Because of its closed-in



ELECTRIC CARGO WINCH

construction, it is especially desirable for this purpose, and no further waterproofing is necessary. The mechanical features of the Shepard hoist are embodied in this winch which is equipped with the Shepard mechanical load brake.

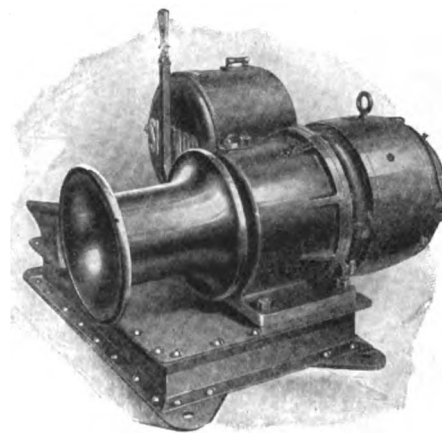
As shown in the illustration, the pier winches are mounted on wheels so as to make them portable.

These winches can be furnished for both alternating and direct current.

Dimensions and complete information will be furnished on request.

Electric Back Geared Winch.

A compact weatherproof winch, with running parts completely enclosed. Its uses are manifold in and about industrial plants.



ELECTRIC BACK GEARED WINCH

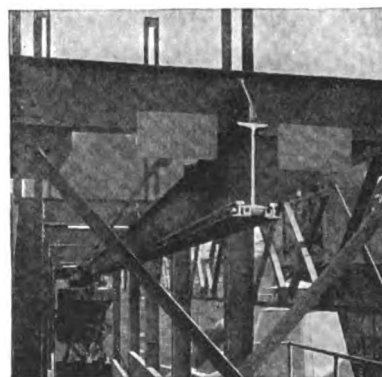
CAPACITIES AND DIMENSIONS

Class or frame size	Pull on single line, lbs.	Speed of overhaul, f.p.m.	Proper size manila rope	Shipping wgt., lbs.	
				With base	Without base
A4	800	125	3/4"	820	650
B10	1800	140	1 1/4"	1890	1630
C20	3500	140	1 5/8"	3360	3010

Shepard Double Monorail Track.

T-rails may be provided for the hoist to run upon, thus giving a hard steel wearing surface, rather than the soft steel, the kind from which I-beams are made.

The track is attached to the I-beams by means of bolts and spreader castings, which make it unnecessary to drill the beam for the reception of this track. It also permits of using larger area bearings in the trolley wheels, thus insuring greater durability and longer life.



SHEPARD DOUBLE MONORAIL TRACK

THE CHISHOLM-MOORE MFG. CO.

Manufacturers of Chain Hoists, Traveling Cranes, and Monorail Trolley Systems
CLEVELAND, OHIO

NEW YORK, N. Y., 30 Church Street
PITTSBURGH, PA., Oliver Building

BRANCH OFFICES

CHICAGO, ILL., Peoples Gas Building
DETROIT, MICH., David Whitney Building

Products.

"CYCLONE" CHAIN HOISTS; "MOORE" ANTIFRICTION HOISTS; "STANDARD" SCREW HOISTS; "DIRECT" DIFFERENTIAL PULLEY BLOCKS.

"MATCHLESS" ADJUSTABLE MALLEABLE FRAME TROLLEYS; "C-M" PLAIN TROLLEYS; "C-M" 2- and 3-WAY MOVABLE SWITCHES.

"C-M" SINGLE and DOUBLE I-BEAM HAND POWER TRAVELING CRANES; MAST and JIB CRANES.

Also manufacturers of "Cyclone" Twin Hoists and Shock Absorber Hoists; "C-M" Geared Yoke Trolleys; Trolley Hoists; Malleable Iron Frogs; Hand and Power Winches; Malleable Castings.

"Cyclone" High Speed Chain Hoist.

Speed, ease of operation, safety, and durability: these are the four points of service on which a chain hoist must be judged. The following description shows how these are built into "Cyclone" hoists:

Gyrating Yoke—"Cyclone" hoists operate by means of a gyrating yoke, an invention, which can be found in no other hoist. This mechanism has three effects. First, it produces a high gear ratio in less space. Second, it supports the load on two-thirds of all the teeth and not on one tooth alone. Third, the presence of two yokes means that the pull is always carried at two points directly opposed; thus pressure is reduced to a minimum.

Chain—Made by chain specialists in the same plant with the rest of the hoist. The material is steel of special analysis. Each link is made shorter than gauge, and stretched and formed to exact gauge under 50% overload strain.

Hooks—Specially designed and carefully forged and heat treated; they have a large factor of safety.

Similar Construction in All Sizes—"Cyclone" hoists are made in all sizes from 1/4 ton to 40 tons. All increases in size result from enlarging each part, thus adding to the strength and power, but at the same time retaining the simplicity of design. These are the only hoists made in the single unit type in sizes larger than 3 tons. The simple construction of the "Cyclone"

gives a hoist with no small, delicate parts to break or to require frequent adjustment. It results also in a powerful drive with remarkably little frictional loss, and in high speed with smooth, positive action.

Multiple Disk Brake—Each "Cyclone" hoist is equipped with a multiple disk brake which automatically holds the load in any position. It is released without jerk or jar, permits the free lowering of the load by a very slight reverse pull on the hand chain, and yet allows the spinning of the hand wheel in either direction when there is no load.

Machine Cut Gears—Every gear in a "Cyclone" hoist is machine cut, insuring smooth operation.

Bearings—The three main bearings are steel roller-bushed, the minor bearings having graphite bronze bearings.

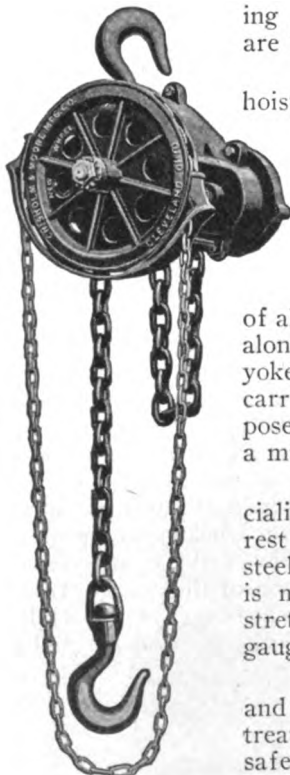
Frame—Malleable iron. Amply protects all working parts from hard knocks.

Hand-chain Guide—The "C-M" patent anti-gagging hand-chain guide has been tried under all kinds of use and has proved exceptionally effective.

In Summing Up—Everything about a "Cyclone" hoist is of strong, rugged construction. It has no small or delicate parts to break or get out of order. It does not require an expert to operate it or to keep it in order. No matter where it is used, who uses it, or what it is used for, a "Cyclone" hoist will give satisfaction.

"Moore" Antifricion Chain Hoist.

In speed and efficiency this hoist occupies a place between the "Cyclone" high speed hoist and the "Standard" screw chain hoist. Excellent for all around work. It is a spur gear hoist, with all parts protected from dust and weather. Equipped with an automatic brake which absolutely locks the load at any point, and



1/4 TO 3-TON
STYLE



GYRATING YOKE



4 TO 12-TON STYLE



16 TO 40-TON STYLE

which is instantly released by a reverse pull on the hand chain.

"Standard" Screw Chain Hoist.

A powerful and easy working block, made on the well-known principle of the worm and gear. Where a high speed hoist like the "Cyclone" is not needed, this type is suitable.

All working parts are protected from weather and dust. The hoist is readily adapted to horizontal work, for pulling heavy loads on skids and rollers.

"Direct" Differential Pulley Block.

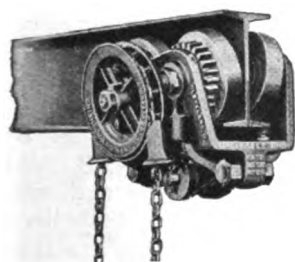
This is a cheap, safe, and simple type of chain hoist. Being very light in weight, it is especially adapted for use on outdoor jobs. The hoist has remarkably few parts and costs less than other types. The chain is endless, passing around one lower and two upper sheaves. It is made to fit gauge, and tested to a large overload, insuring smooth action and safety.

"Matchless" Adjustable Malleable Frame Trolleys.

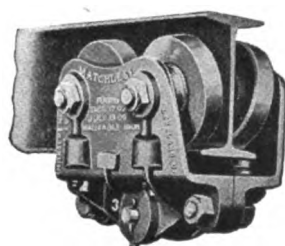
"Matchless" trolleys are made in many capacities up to and including 40 tons. They possess the following points of superiority:

Frame—Malleable iron, carefully proportioned to provide great strength, and to insure a large factor of safety. Designed so that the load is carried on all four wheels. Adjustable to I-beams of varied sizes by means of small vertical guide rollers mounted on an eccentric shaft opposite each track wheel.

Track Wheels—Flangeless, so trolley may pass freely on track curved to an 18-in. radius. Axles of hardened steel; roller-bushed bearings, rollers of case hardened steel.



Geared, Fig. 122



Plain, Fig. 123

"MATCHLESS" ADJUSTABLE MALLEABLE FRAME TROLLEYS

Cut Gears—On the geared type all gears are machine cut. This type travels with very light pull on the hand chain.

Headroom—The top of the hoist hook is only 1½ in. from the bottom of the track.

Adjustable—The fact that these trolleys are adjustable admits of their being carried in stock by dealers. Prices on application.

"C-M" Plain Trolley No. 120.

An extremely serviceable trolley. It has 4 track wheels with case hardened axle studs and plain roller bearings. The frame is of malleable iron, and is built in two parts so that it may be taken apart and mounted on tracks with closed ends. The hoist hook is close to the track.

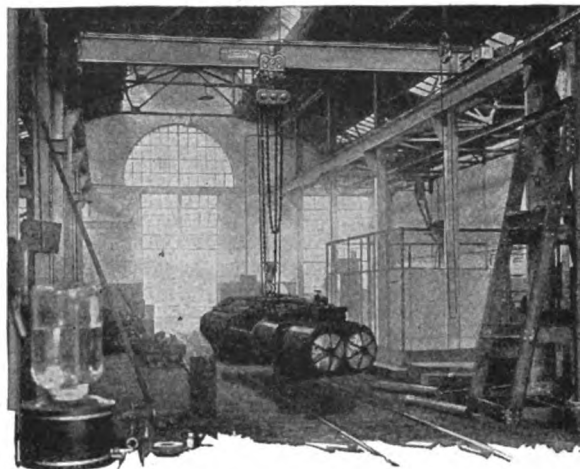
"C-M" Hand Power Traveling Cranes.

These cranes are furnished in many standard and special types to meet the demands of the purchaser.

They are built in single and double beam, overhead, transfer, and underhung types.

When Ordering—Give particulars as to length of span, maximum load to be handled, and distance from track rail to floor, and we will send blue prints showing construction and clearance, together with prices for the complete crane.

Other Cranes—The line also includes a wide range of wall bracket, jib, and swinging mast cranes for every purpose. Prices on application.

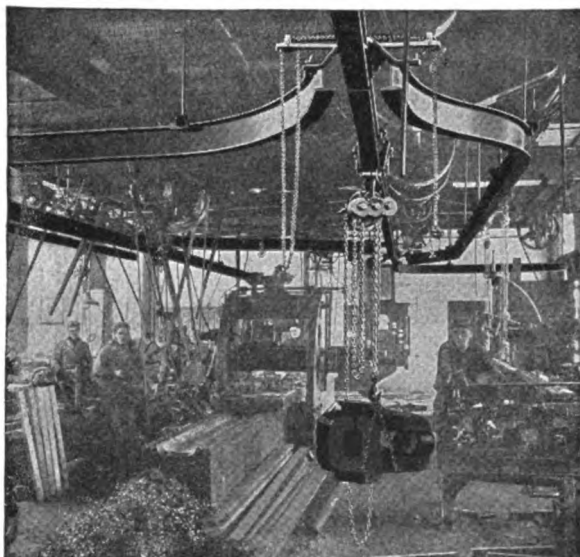


INSTALLATION OF "C-M" HAND POWER TRAVELING CRANE

Complete Hoisting and Conveying Systems.

The installation shown below consists of several hundred feet of overhead track equipped with "C-M" 2- and 3-way switches, "Matchless" malleable frame trolleys, and "Cyclone" hoists. It is so arranged that materials may be handled to and from every machine, and direct to two receiving and shipping platforms.

Such systems may be profitably installed not only in machineries and foundries, but also in stone cutting yards and quarries, stockyards and warehouses, and in fact wherever heavy weights must be lifted and moved. Prices and specifications for a similar installation, or any part thereof, suitable for any plant, mailed on request.



COMPLETE HOISTING AND CONVEYING SYSTEM

THE EUCLID CRANE & HOIST CO.

EUCLID, OHIO

Products.

ELECTRIC HOISTS for all services; ELECTRIC and HAND POWER MONORAIL TROLLEYS; TROLLEYS for DOUBLE TRACK; ELECTRIC TRAVELING CRANES for all services.

Also manufacturers of Electric Wall and Jib Cranes.

Design of Electric Hoists.

Euclid cranes and hoists are of exceptionally liberal design throughout for hard, continuous service. Gears and bearings are of ample size and so arranged as to be easily accessible. There are no complicated parts to cause trouble.

Euclid Hoists.

Euclid Hoist Specifications—

FRAME—A single casting, containing all the shaft bearings, insuring permanent alignment of the shafts, as there are no loose bearings bolted on.

GEARS—Large and substantial, all of steel with machine cut teeth. There are three reductions of gears, all being entirely enclosed with oil bath lubrication.

BEARINGS—Ample size to prevent heating or rapid wear under hardest service. Bushed with renewable phosphor bronze.

BRAKE—Disk type, and so arranged that no motor brake is required on the smaller sizes. Pawls or retaining bands are not required as the center plate is stationary during hoisting and lowering movements. A patented arrangement of gear and cam plate causes motor gear to drive intermediate gearing direct with brake released while hoisting. Intermediate pinion acting on cam automatically sets brake immediately, when hoisting movement ceases. The load brake is entirely enclosed and runs in an oil bath.

HOISTING DRUM—Heavy iron casting, machine cut grooves, of sufficient size to take all hoist cable without overwinding.

LIMIT ATTACHMENT—Of the lever type, furnished on all floor controlled hoists. Acts on controller, returning to neutral position, or automatically reversing before hook block can run high enough to do any damage.

CONTROLLER—This is of the drum type which has proved most satisfactory for hoist work. The drum is mounted on a square shaft furnished with phosphor bronze bushings at each end. The contact segments are extra large and heavy and are reversible end for end, giving double life. These segments are made of pure copper and are thoroughly insulated to prevent any possibility of shorts or grounds.

Finger tips are heavy copper castings so placed in the fingers proper that they can be quickly turned when one side is worn, thus giving double life. The fingers are of the non-stubbing type actuated by compression springs, pig tails of ample carrying capacity convey-

ing the current to each finger. All controller parts are accurately jigged and absolutely interchangeable.

With variable speed controllers, resistance made up of individual coils in cartridge form is furnished. A special high resistance non-corroding wire is used, wound on heavy, hard asbestos tubes. No inflammable material used in either controller or rheostat.

Guarantee—The purchaser of a Euclid hoist has the assurance that he is buying the most modern type of hoisting equipment, backed by a sound, permanent organization that is in a position to render the service demanded by progressive manufacturers.

THE EUCLID CRANE & HOIST CO. agree to replace without charge f.o.b. their plant Euclid, Ohio, any part of a Euclid hoist or crane that proves defective in material or workmanship within one year from date of putting machine in operation.

Information Required for Estimates—When writing for quotations, give as complete information as is possible. The following data is essential:

Maximum load and usual working load. Current to be used—if direct, state the voltage; if alternating, the voltage, phase and cycles. Capacity, maximum height of lift. Size of I-beams comprising the monorail track. State whether there are curves, switches, or turntables in the monorail track. Whether single speed or variable speed control of the hoist motor is needed. Style of hoist wanted and service required of same.

Euclid Cranes.

This company also manufactures electric traveling cranes from ½ ton to 15 tons capacity, in spans not exceeding 70 ft. This line comprises 1-, 2-, and 3-motor cranes, single and double girder types, and both floor and cab control.

High grade material, sturdy, rugged design, simplicity, accessibility and elimination of all complicated and unnecessary parts are features of Euclid cranes.

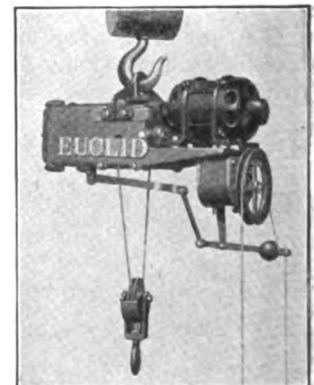
Crane literature will be mailed on application.

Standard Type "A" Hoist.

This is the Euclid simplest and most inexpensive form of hoist. It can be installed wherever an ordinary chain block can be used. Hangs level at all times. Furnished with single speed or variable speed controller as desired.

DATA, TYPE "A" HOIST

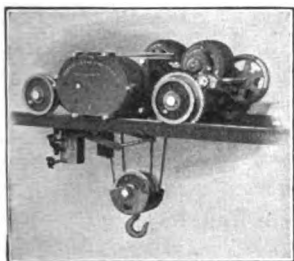
Capacity tons	Lift, ft.	Speed, f. p. m.	Motor h. p.
½ - 1	18 - 9	25-15	1 4-2
1 - 2	15	22-12	2 4
3 - 5	20-18	12-12	3 ½ - 5 ½
7 ½ - 10	24-16	10-10	7 ½ - 10



EUCLID STANDARD TYPE "A" ELECTRIC HOIST

Standard Type "C" Hoist or Crane Trolley.

Type "C" two-motor traveling hoist, or crane trolley is adapted for use on a double track or on a double girder crane bridge. The hoist mechanism is entirely enclosed, and the brake and main hoist gears are contained in an oiltight casing and run in an oil bath.



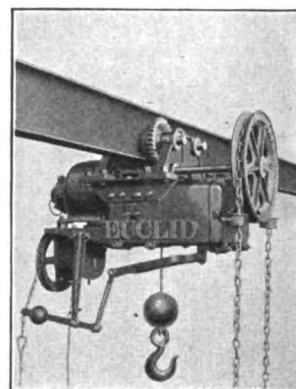
EUCLID STANDARD TYPE "C" HOIST OR CRANE TROLLEY

DATA, TYPE "C" HOIST

Cap., tons	Lift, ft.	Hoist speed, f.p.m.	Trolley speed, f.p.m.	Hoist motor h.p.	Trolley motor h.p.
1 - 2	15	22-12	100 to 150	2.4	2.4
3 - 5	20-18	12-12	100 to 150	3½-5½	2.4
7½-10	24-16	10-10	100 to 150	7½-10	3.5
10	25	20	100 to 150	20	3.5
15	16	15	100 to 150	20	5

Standard Type "E" Geared Trolley Hoist.

Type "E" geared trolley hoist is for loads heavier than can be easily pushed by hand. This style is racked along the monorail track by means of pendent hand chain. Larger loads can be handled than with the plain trolley, but the speed is less.



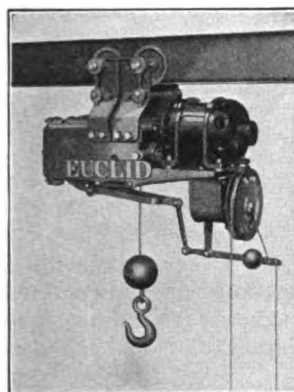
EUCLID STANDARD TYPE "E" GEARED TROLLEY HOIST

DATA, TYPE "E" GEARED HOIST

Capacity, tons	Lift, ft.	Speed, f.p.m.	Motor h.p.
½-1	18-9	25-15	1.4-2
1 - 2	15	22-12	2.4
3 - 5	20-18	12-12	3½-5½

Standard Type "D" Plain Trolley Hoist.

Type "D" plain trolley hoist is propelled along the monorail track by pushing the load. The hoist hangs parallel with the monorail track making it particularly adapted for use where side clearance is limited.



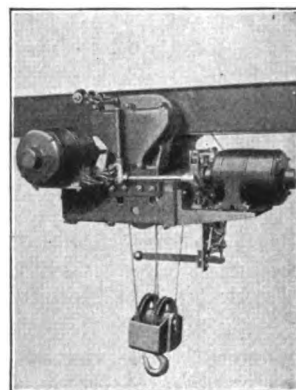
EUCLID STANDARD TYPE "D" PLAIN TROLLEY HOIST

DATA, TYPE "D" PLAIN HOIST

Capacity, tons	Lift, ft.	Speed, f.p.m.	Motor h.p.
½-1	18-9	25-15	1.4-2
1 - 2	15	22-12	2.4
3 - 5	20-18	12-12	3½-5½

Standard Type "H" Trolley Hoist.

Type "H" trolley hoist is suitable for use where rapid conveying is essential. All travel gears as well as hoisting gears are fully enclosed. Can be built for control from floor by pendent cords or from remote point. Can also be furnished with operator's cab.



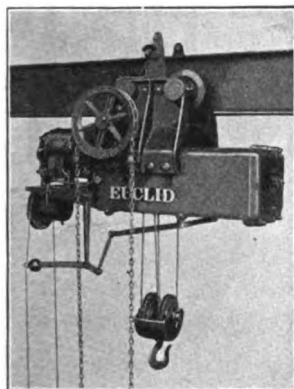
EUCLID STANDARD TYPE "H" TROLLEY HOIST

DATA, TYPE "H" TROLLEY HOIST

Cap., tons	Lift, ft.	Hoist speed, f.p.m.	Trolley speed, f.p.m.	Hoist motor h.p.	Trolley motor h.p.
1 - 2	15	22-12	100 to 250	2.4	2.4
3 - 5	20-18	12-12	100 to 250	3½-5½	2.4-3½
7½-10	24-16	10-10	100 to 250	7½-10	5 - 7½
10	25	20	100 to 250	20	7½
15	16	15	100 to 250	20	10

Standard Type "D" Geared Trolley Hoist.

Similar to type "D" plain, with the additional that two of the track wheels are geared and driven by chain wheel and hand chain. Especially adaptable for high lifts on a single line, as there is no tendency for the machine to tip sidewise.



EUCLID STANDARD TYPE "D" GEARED TROLLEY HOIST

DATA, TYPE "D" GEARED HOIST

Capacity, tons	Lift, ft.	Speed, f.p.m.	Motor h.p.
½-1	18-9	25-15	1.4-2
1 - 2	15	22-12	2.4
3 - 5	20-18	12-12	3½-5½
7½-10	24-16	10-10	7½-10

Standard Type "G" Double Truck Monorail Hoist.

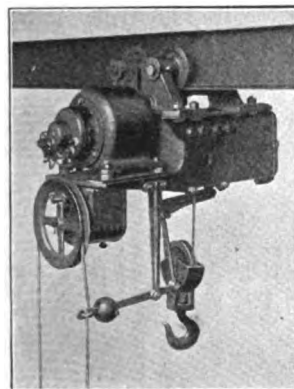
Type "G" is a cab operated, double truck, monorail hoist. This consists of a structural steel frame which carries our standard hoist mechanism; the whole being suspended by swiveling connections from two four-wheel trolley carriages or trucks. The swiveling of the trolley carriages permits of traveling around very sharp curves.

DATA, TYPE "G" TROLLEY HOIST

Capacity, tons	Lift, ft.	Hoist speed, f.p.m.	Trolley speed, f.p.m.	Hoist motor h.p.	Trolley motor h.p.
1 - 2	15	22-12	100 to 250	2.4	2.4
3 - 5	20-18	12-12	100 to 250	3½-5½	2.4-3½
7½-10	24-16	10-10	100 to 250	7½-10	5 - 7½
10	25	20	100 to 250	20	7½
15	16	16	100 to 250	20	10

Standard Type "E" Plain Trolley Hoist.

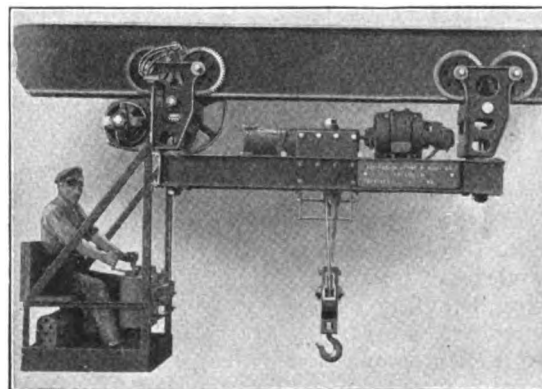
Type "E" plain trolley hoist is propelled along the monorail track by pushing the load. For comparatively light loads where speed is unnecessary. One man can easily push the hoist with 2 tons or less.



EUCLID STANDARD TYPE "E" PLAIN TROLLEY HOIST

DATA, TYPE "E" PLAIN HOIST

Capacity, tons	Lift, ft.	Speed, f.p.m.	Motor h.p.
½-1	18-9	25-15	1.4-2
1 - 2	15	22-12	2.4
3 - 5	20-18	12-12	3½-5½



STANDARD TYPE "G" DOUBLE TRUCK MONORAIL HOIST

SPRAGUE ELECTRIC WORKS

OF GENERAL ELECTRIC COMPANY

Electric Hoists and Monorails

TELEPHONE:
LONGACRE 0900

527-531 West Thirty-fourth Street
NEW YORK, N. Y.

BRANCH OFFICES

CHICAGO, ILL., Fisher Building
PHILADELPHIA, PA., Witherspoon Building
BOSTON, MASS., 84 State Street
BALTIMORE, MD., American Building
PITTSBURGH, PA., Oliver Building
CLEVELAND, OHIO, Illuminating Building
CINCINNATI, OHIO, Provident Bank Building
INDIANAPOLIS, IND., Traction Terminal Building

ATLANTA, GA., Citizens & Southern Bank Building
ST. LOUIS, MO., Pierce Building
MILWAUKEE, WIS., Public Service Building
KANSAS CITY, MO., Dwight Building
SAN FRANCISCO, CAL., Rialto Building
LOS ANGELES, CAL., Corporation Building
PORTLAND, ORE., Electric Building
SEATTLE, WASH., Colman Building

Products.

SPRAGUE ELECTRIC HOISTS and MONORAILS; ELECTRIC WINCHES; WINDING DRUMS.

Also manufacturers of Motors, Generators, Electric Dynamometers, Switchboards, Panelboards, Exhaust Fan Outfits, Electric Fans, Steel Armored Cable, Flexible Steel Conduit, Galvanized Rigid Conduit, Enameled Rigid Conduit, Outlet Boxes, Armored Hose, Electric Freight Handling Machinery.

Co-operative Service.

The SPRAGUE ELECTRIC WORKS of General Electric Company are prepared to furnish, through recognized trade channels, a complete line of apparatus and supplies for the electrical equipment of buildings, and offer the services of a specialized department to architects, consulting engineers, electrical contractors, plumbing contractors, heating and ventilating contractors, supply houses, and manufacturers of motor driven machinery used in the equipment for buildings.

General.

The SPRAGUE ELECTRIC WORKS for many years have manufactured a complete line of electric hoists and cranes in capacities from $\frac{1}{4}$ to 6 tons. They are designed to satisfy the demand for efficient lifting and carrying devices to fill the gap between the hand chain block and the large traveling cranes. The hoists and cranes are admirably suited for all industrial operations requiring the transportation of any class of material.

The hoists here described can all be equipped with cage for operator.

Complete information concerning any equipment described here will be gladly furnished on request to the nearest branch office.

S-1 Hoist.

This hoist is entirely enclosed and protected from dust and moisture. It is built both for direct current and polyphase alternating current circuits. Any one of a number of controllers and trolley carriages may be used in connection with it, so that a great variety of applications is possible. It is built for loads of $\frac{1}{2}$ and 1 ton.



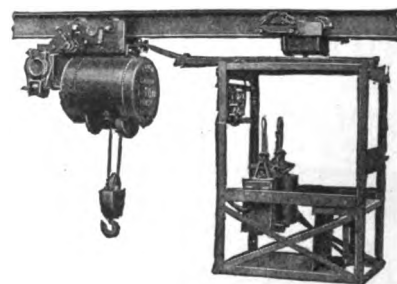
S-1 HOIST

This design is suitable for use out of doors, without additional protection.

The load brake with which this hoist is equipped in addition to the regular service brake, prevents excessive acceleration of the load in lowering.

Direct current machines may be equipped with a special controller to produce the slow speeds necessary for foundry service, or with ordinary rheostatic controller for moderate speed regulation.

For lifting small castings and forgings in a machinshop, an electric hoist with a plain or hand geared trolley is vastly superior to other methods. Also used for handling heavy stock, such as castings, bales and cases, which require some means of quick and economical handling.



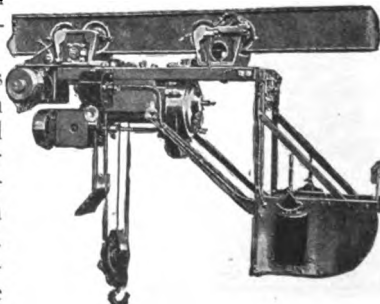
S-1 MONORAIL HOIST WITH OPEN TRAILING CAGE

S-2 and S-3 Hoists.

For loads of 2, 3, 4 or 6 tons. Both hoists are similar in design, the S-2 hoist having a maximum capacity of 8000 lbs., and the S-3 hoist a capacity of 12,000 lbs.

Motor is geared to drum through a triple reduction spur gearing, the gears being of cast steel, and pinions of steel forgings. The motor, gears, controller and resistance are entirely enclosed, and are protected from dust and moisture. Hoist can be used out of doors without being provided with housing or other protection.

S-2 and S-3 hoists can be supplied with any style of standard trolley carriage, either plain, hand geared or motor driven, with rigid or swivel trucks. They can also be furnished with separate controllers and magnetic brakes.



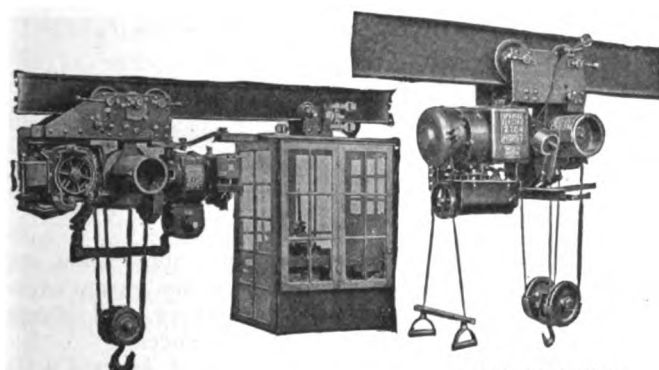
TYPE S-2 AND S-3 MONORAIL HOIST

W-1 and W-2 Hoists.

For loads of 1, 2, 3, 4 and 6 tons. Both hoists are similar in design, the W-1 built in capacities of from 2000 to 4000 lbs. and the W-2 in capacities of from 3000 to 12,000 lbs. They are worm geared, and can be attached to any style of standard trolley carriage, either plain, hand geared or motor driven. They can also be furnished with remote controllers and magnetic brakes.

Supplied with a traveling rope guide, designed to keep rope in drum grooves, regardless of side pull.

The gears are entirely enclosed, run in grease, and the machines are weatherproof. They can be used for hoisting work of any description within the limit of their capacity, and are especially applicable to foundry work and for use in exposed situations.



ALTERNATING CURRENT W-2 MONORAIL HOIST WITH ENCLOSED TRAILING CAGE

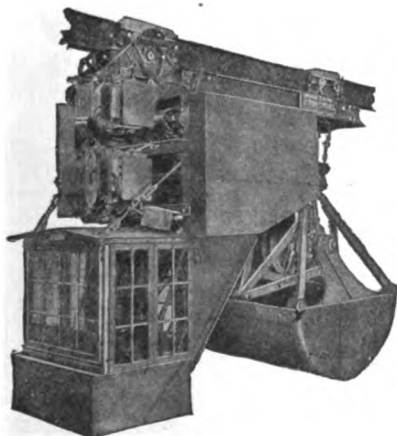
W-1 AND W-2 SPRAGUE ELECTRIC HOIST

Grab Bucket Monorail Hoists.

The illustration shows a type GB-7 standard grab bucket hoist. It is built for buckets up to 3 cu. yds. capacity. This machine has two functions: (1) to operate the bucket, i.e., to open, close, hoist and lower the bucket; (2) to carry the bucket between the loading and discharging points. Each function is entirely performed by a single controller actuated by a single handle, and the operator can give his entire attention to a single operation.

The machine has 2 cable drums supported in a frame containing motors, gears, brakes, etc., which is suspended from the trolley carriage.

The extreme simplicity of design allows this machine to be successfully operated by ordinary laborers who are unfamiliar with or unskilled in the use of machinery.



GB-7 GRAB BUCKET MONORAIL HOIST WITH ENCLOSED CAGE

RATINGS AND WEIGHTS, STANDARD MONORAIL HOISTS, CAGE CONTROLLED

Load, tons.	Hoist						Trolley				Weight of monorail hoist complete, lbs.	
	Speed, ft. per min.	Lift, ft.	No. of ropes	Hoist type	Motor		Speed, ft. per min.	Motor		Minimum radius of curve, ft.	With open cage	With enclosed cage
					Frame	H. p.		Frame	H. p.			
DIRECT CURRENT												
1 1/2	30	28	1	S1	H 1 1/2	1 1/2	350	M1	2	8	1835	1960
1	15	13	2	S1	H 1 1/2	1 1/2	350	M1	2	8	1865	1990
1	20	40	2	W1	M1	3	350	M1	2	8	1925	2050
1	40	40	2	W1	M2	6	350	M1	2	8	2045	2170
1 1/4	26	50	2	W2	M2	6	350	M2	4	8	2435	2560
2	10	20	4	W1	M1	3	350	M2	4	8	1975	2100
2	20	20	4	W1	M2	6	350	M2	4	8	2095	2220
2	30	50	2	W2	M3	9	350	M2	4	8	2535	2660
2	35	31	2	S2	M2	6	350	M2	4	6	2660	3370
2	50	31	2	S2	M3	9	350	M2	4	6	2760	3470
3	13	25	4	W2	M2	6	350	M2	4	8	2525	2650
3	23	21	3	S2	M2	6	350	M3	6	6	2670	3380
3	33	21	3	S2	M3	9	350	M3	6	6	2770	3480
3	50	48	2	S3	M4	12	350	M3	6	6	4640	5300
4	15	25	4	W2	M3	9	350	M3	6	8	2625	2750
4	17	15	4	S2	M2	6	350	M3	6	6	2710	3420
4	25	15	4	S2	M3	9	350	M3	6	6	2810	3520
4 1/2	33	31	3	S3	M4	12	350	M4	8	6	4660	5320
6	25	23	4	S3	M4	12	350	M5	10	6	4730	5390

ALTERNATING CURRENT

1	40	40	2	W1	5180	5	350	5160	2	8	2125	2250
2	20	20	4	W1	5180	5	350	5180	3	8	2175	2300
2	21	50	2	W2	5180	5	350	5180	3	8	2525	2650
2	35	31	2	S2	5180	5	350	5180	3	6	2840	3550
2	50	31	2	S2	5201	10	350	5180	3	6	2890	3600
3	14	25	4	W2	5180	5	350	5180	3	8	2595	2720
3	23	21	3	S2	5180	5	350	5200	5	6	2850	3560
3	33	21	3	S2	5201	10	350	5200	5	6	2900	3610
3	50	48	2	S3	5008	15	350	5201	6.5	6	4790	5450
4	10	25	4	W2	5180	5	350	5201	6.5	8	2635	2760
4	17	15	4	S2	5180	5	350	5201	6.5	6	2890	3600
4	25	15	4	S2	5201	10	350	5201	6.5	6	2940	3650
4 1/2	33	31	3	S3	5008	15	350	5008	10	6	5010	5670
6	25	23	4	S3	5008	15	350	5008	10	6	5080	5740

Vertical Electric Winch.

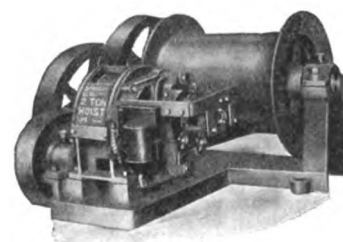
The entire mechanism is enclosed in the cast iron base, insuring complete protection from the elements or rough handling, but all parts are easily accessible for inspection by raising hinged covers on sides.

The motor is direct or alternating current, and is geared to winch head through a triple reduction gearing. The gears are steel castings, and pinions steel forgings, all teeth being cut from solid. All bearings are of best bearing bronze and are lubricated with grease by compression cups.

Built in capacities of from 2000 lbs. pull at 150 ft. per minute, to 12,000 lbs. pull at 25 ft. per minute. For pulling loads horizontally, a single speed cylinder type controller is used, which is operated by a foot lever. If the load has to be hauled up a grade, a rheostatic controller and a holding pawl are furnished, the latter for holding the load in case current is interrupted.



VERTICAL ELECTRIC WINCH



D-11 SPUR GEARED WINDING DRUM

Built in capacities from 1000 to 8000 lbs. pull, at speed of 100 ft. per minute. Motor is direct or alternating current, geared to drum through triple reduction gearing.

CURTIS PNEUMATIC MACHINERY CO.

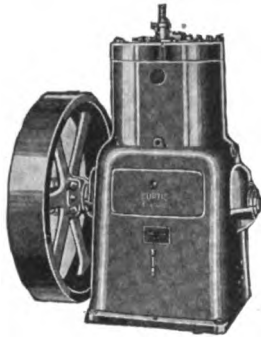
Pneumatic Appliances

1551 Kienlen Avenue
ST. LOUIS, MO.

NEW YORK, N. Y., 533-A Hudson Terminal Building

Products.

AIR COMPRESSORS; AIR HOISTS; TRAVELING BRIDGE CRANES; I-BEAM TROLLEYS.



CURTIS MODEL "A"
TWO-CYLINDER,
SINGLE-STAGE, WATER-
COOLED AIR COMPRES-
SOR WITHOUT LOOSE
PULLEY

Air Compressors.

Curtis air compressors are simple in design, have large port areas, light valves and small clearances. Oiling system automatic splash, with adjustable sight feed; high and low level filling gage. Cylinders and heads water cooled. Fully enclosed; dust-proof; removable valve assemblies and heads.

Automatic unloader can be furnished.

DATA, CURTIS MODEL "A" AIR COMPRESSORS

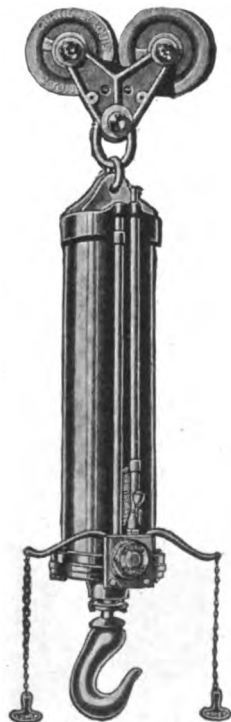
Bore and stroke, in.	Single or double cylinder	R. p. m.		Cu. ft. capcy.		Horsepowers	
		St'd	Max.	St'd speed	Max. speed	80-lb. pressure	100-lb. pressure
4½ x 4½	Single	200	400	8.3	16.6	1.58-3.16	1.67-3.36
6 x 6	"	175	300	17.2	29.5	3.28-5.60	3.45-5.90
6 x 6	Double	175	300	34.4	59.0	6.55-11.2	6.92-11.9
7 x 7	"	160	250	49.9	78.0	9.5-14.9	10.0-15.7
8 x 8	"	160	225	74.4	104.5	14.2-19.9	15.0-21.0
9 x 9	"	160	210	106.0	139.	20.2-26.5	21.3-28.3
10 x 10	"	160	200	145.5	182.	27.7-34.6	29.3-36.6
12 x 12	"	150	190	236.	298.	45.-57.	47.4-60.

Air Hoists.

Curtis all-steel air hoists combine strength, durability, lightness and safety. Dead weight reduced to a minimum. Either single or double acting types also furnished in bracketed designs, direct lift or rope compounded. In either case efficiency, strength and durability are the same.

Special designs furnished where lifting clearance is limited.

Nominal inside diam. of hoist, in.	Capacity in lbs. at 80 lbs. air pressure, 10% friction loss	Cubic ft. free air to lift full load 1 ft. at 80 lbs. air
4	861	.54
5	1356	.85
6	2050	1.22
7	2791	1.73
8	3616	2.24
9	4592	2.85
10	5636	3.29
12	8154	5.06
14	11270	7.13
17	16500	10.10
19	20900	12.50



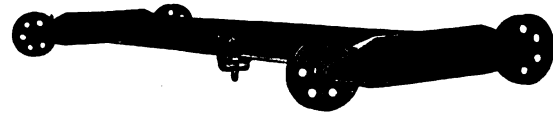
CURTIS PENDANT
HOIST SUSPENDED
FROM STANDARD
CURTIS I-BEAM TROL-
LEY WITH FLEXIBLE
ROLLER BEARINGS

Cranes.

Curtis traveling bridge cranes are built in either single or double

I-beam types with a factor of safety never less than *five*. End trucks are single piece (cast steel for 4000-lb. capacities and larger) with web depth and thickness that assure maximum strength from minimum weight of metal.

Truck wheels are large, faces carefully machined, and are bushed with flexible roller bearings.



CURTIS SINGLE I-BEAM TRAVELING BRIDGE CRANE

On loads over 4000 lbs., or where more accuracy is required to place the load, this company recommends Curtis geared cranes—action is positive and direct through a hand-operated chain sheave wheel.

Curtis air hoists can be suspended from Curtis single or double I-beam cranes, converting them into power cranes at a very slight cost.

DATA, SINGLE AND DOUBLE I-BEAM CRANES

Single I-beam	1000 to 10,000 lbs. capacity	Spans up to 35 ft.
Double I-beam	1000 to 20,000 lbs. capacity	Spans up to 40 ft.

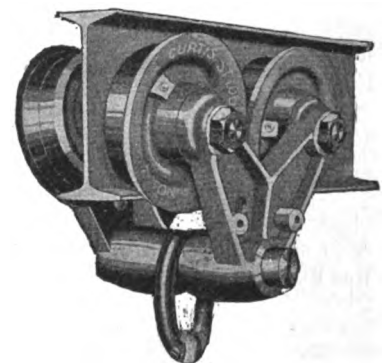
Trolleys.

Curtis trolley shafts are set parallel with the beam flange on which the wheels travel. This provides a uniform bearing over the entire wheel-tread surface.

The cast steel frames are self-equalizing, distributing the load evenly over all four wheels.

Curtis trolleys are bushed with flexible roller bearings. A 1000-lb. load requires but a 30-lb. pull against 65 lbs. where ordinary trolley bearings are used.

Furnished either geared or plain.



CURTIS TROLLEY (UNGEARED)
FULLY ASSEMBLED AND MOUNTED
ON STANDARD I-BEAM

Safe load, lbs.	I-beam track			Net weight, lbs.	
	Min. beam, in.	Max. beam, in.	Least radius, ft.	Non-gear	Gear-ed
2000	6	15	3	50	80
4000	8	18	4	100	150
6000	10	24	6	140	200
12000	12	24	8	270	330
20000	15	24	10	500	560



CROSS SECTION OF
CURTIS TROLLEY SHOW-
ING FLEXIBLE ROLLER
BEARING MOUNTING

D. PERCY KARCHER

Manufacturer of Whip Hoists

76 Summer Street
BOSTON, MASS

Product.

IMPROVED SINGLE or DOUBLE DRUM WHIP HOISTS,
Gear or Belt Drive.

Uses.

Whip hoists are made for the purpose of hoisting bales of wool, cotton, silk; barrels, cases, etc., either from trucks or through hatchways. They are used chiefly in warehouses, freight terminals, mills, docks, etc.

Advantages.

A whip hoist can do at least twice the work of an elevator, and at the same time costs only about one-third as much to install.

Many plants now using elevators could also install whip hoists to handle work where speed is essential.

Karcher Hoists.

Karcher machines all have heavy frames, roller and bronze bearings, eccentrics, fabroil gear for the motor, and a cut iron gear on the friction roll shaft for power transmission. Where belt drive is used a pulley will be furnished in place of the gears.

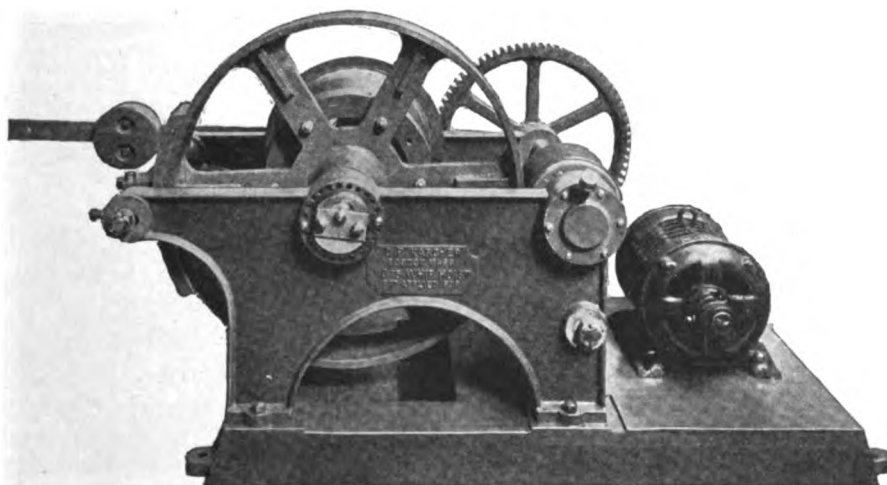
Operation.

By simply pulling down about 30 in. on a $\frac{5}{8}$ -in. manila hand rope which passes down through the floors, the hoist will raise the load. If the rope is released the load will be brought to rest.

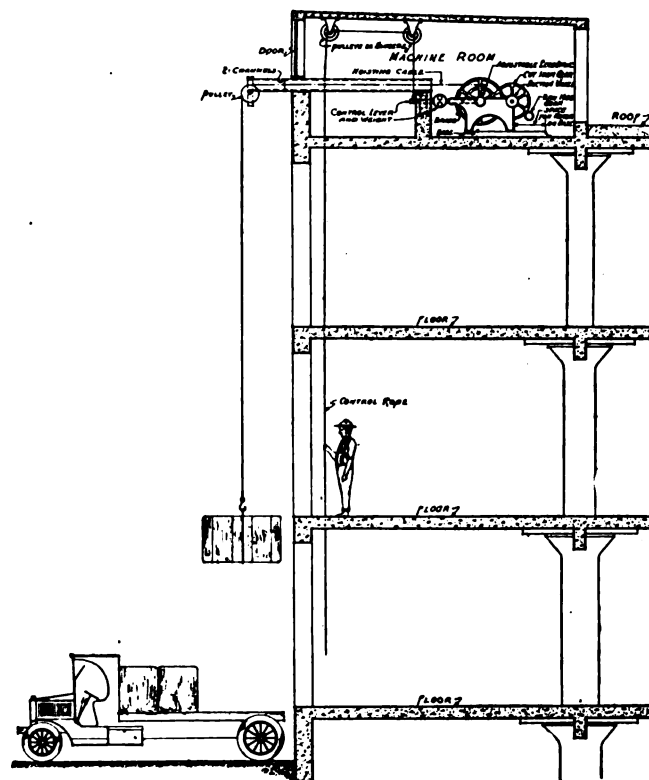
If the rope is pulled down about 8 in., the brake is released and the load coasts down by gravity.

If it is necessary for the load to be lowered slowly, it can be done by pulling the rope down about 3 or 4 in., as this will keep the brake on slightly.

It can be instantly started or stopped from any floor by operating a switch.



KARCHER WHIP HOIST



KARCHER WHIP HOIST IN USE

Speed.

Speed usually required is 350 ft. per minute. Can be furnished in any speed from 100 to 400 ft. per minute.

Installation.

Whip hoists can be installed either on the floor or set in a cradle suspended from any floor or roof, or in a penthouse.

DATA, KARCHER WHIP HOISTS

Size	Capacity, lbs.	Size of drum, in. diam. face	Horse-power required
5	1 to 700	14 x 9	5
15	1 to 1700	18 x 14	15
25*	1 to 1700	18 x 14	20

*This machine has 2 hoisting drums and could be used to hoist from both sides of a narrow building or terminal.

Further Information.

Prices will be given on type hoist to fulfill required conditions. Blue prints will be sent free to all who are interested.

THE LOUDEN MACHINERY CO.

Manufacturers of Overhead Carrying Systems

72 Court Street
FAIRFIELD, IOWA

Products.

OVERHEAD CARRYING SYSTEMS for foundries, factories, machinshops, garages, warehouses, etc., Coal Carriers, Chain Hoists, Traveling Cranes, Swinging Cranes, Ladle Carriers.

Also manufacturers of Overhead Track Elevators.

Advantages of Louden Overhead Systems.

Time and Labor Saving—One man can push one or more loaded carriers with a ton load as easily as 4 or 5 men could handle the same load on a floor truck. One man easily picks up, transports and deposits any size or shape of material weighing 1 ton in less time than a gang of men could do the same work without the Louden overhead system. Re-handling is brought down to a practically irreducible minimum.

Space Saving—As compared to any type of floor movement, materials are brought to and removed from machines in less time. This easier service to and from machines enables the same machines to produce more. There is no congestion of aisles. Routing of material made both simple and certain.

Money Saving—The cost of merely transferring materials is reduced 50% to 60%.

Upkeep of floors due to trucking is eliminated.

Production of all departments served is increased.

Accidents to both men and products are reduced.

Description of Louden System.

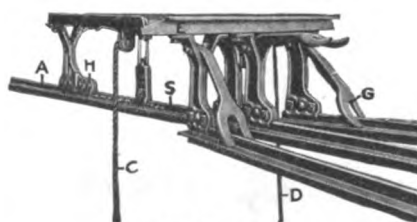
Track and Fittings—The track is of the finest and strongest carbon steel, especially adapted for carrying loads up to 2000 lbs., and can be curved to fit all requirements. The shape is such that all unnecessary friction is eliminated.



ADJUSTABLE LINK
TRACK HANGER
Odd inch-lengths up to
61 in.



TRACK



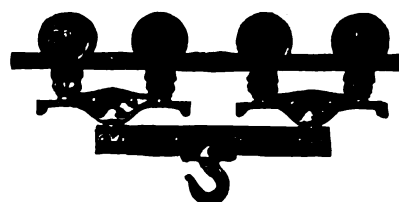
3-WAY SWITCH

placed, it is easily operated by two cords which are let down to a height convenient to reach. Switches reversible, right or left, and made to serve 2, 3, 4, 5 or 6 side tracks. All open ends of tracks protected by automatic safety guards, making it impossible to run a carrier off the track. Crossover switches and turntables enable the Louden overhead system to meet any possible service requirements in the way of routing material.

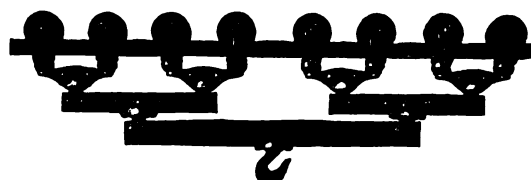
Carriers—Made in 2-, 4-, 8-, and 16-wheel sizes with bumpers to permit pushing any number or all sizes of carriers at one time without "climbing." All carriers roller bearing. Strong truck swivel castings give even the 16-wheel carrier perfect freedom in taking the sharpest curve.



4-WHEEL MERCHANDISE CARRIER



8-WHEEL CARRIER



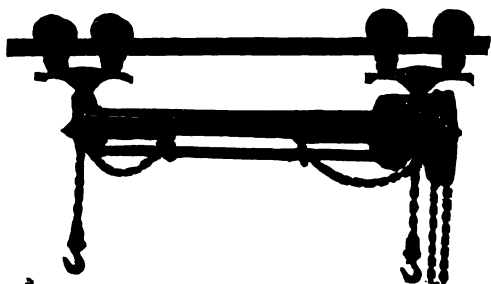
16-WHEEL, 1-TON CARRIER

High Speed Twin Chain Hoist and Carrier.

A planetary gear hoist of 35 to 1 ratio. Capacity when equipped with 8 wheels, 1000 lbs.; when equipped with 16 wheels, 2000 lbs. Can be furnished in any length required to satisfactorily handle any long awkward material, such as bundles of pipe, lumber, or any

Switches—No matter how high the switch may be

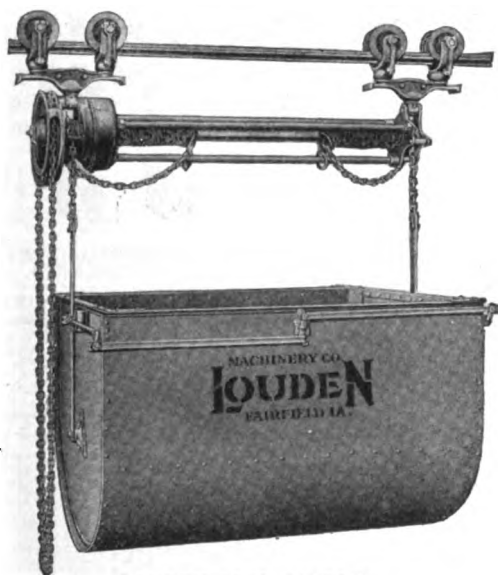
other kind of load requiring a lift from two points. Furnished with hoisting chain to lift 6 to 16 ft.



HIGH SPEED TWIN CHAIN HOIST AND CARRIER

Coal and Ash Carrier.

Capacity equal to 7 large wheelbarrows. When fully loaded is more easily moved than a wheelbarrow. Regularly equipped with 8 or 16 wheels. A push on

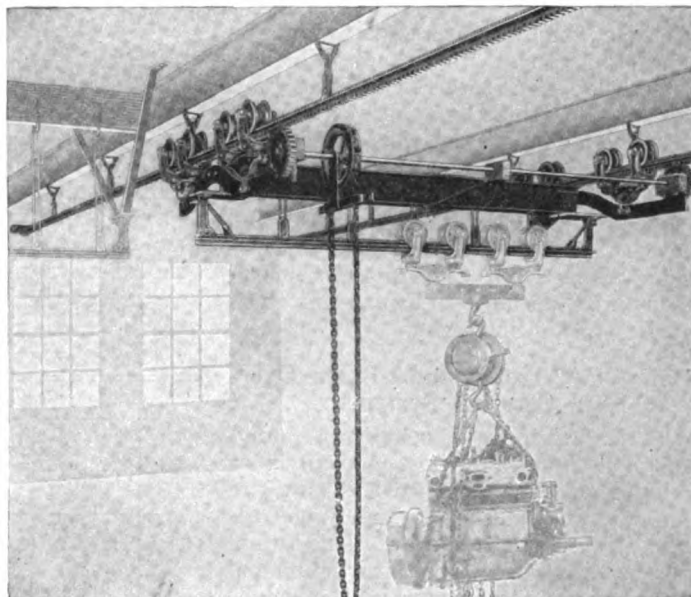


LOUDEN COAL CARRIER

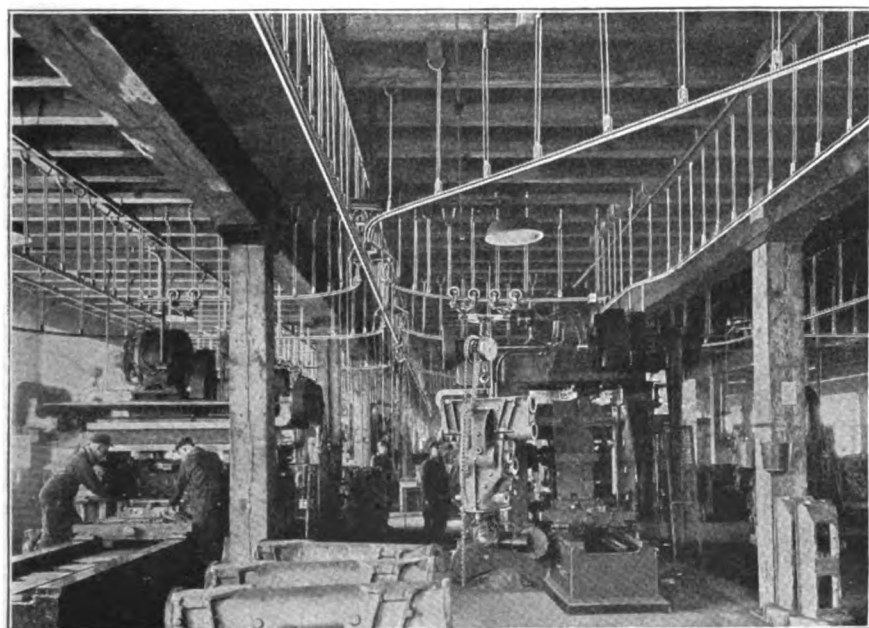
the trigger is all that is needed to dump it. Hoist consists of planetary gear of 35 to 1 ratio. Regularly equipped to lift 6 ft. Can be furnished to lift up to 16 ft. Capacity 1 ton.

Traveling Cranes.

Capacity, 1 ton. Span, any width up to 30 ft. Can be installed so that cross track comes within 20½ in. of ceiling. Span of crane made of two standard channels placed back to back with the track hangers rigidly held between them. Each end of crane suspended from two sets of swiveled roller bearing 4-wheel trucks. Two spur gears mounted on the same shaft mesh into spur gear racks on the underside of the two parallel tracks supporting the crane. This insures positive control of movement and no binding. Crane is moved by hand chain extending to floor.



TRAVELING CRANE



PART OF ALLIS CHALMERS INSTALLATION, MILWAUKEE, WIS.

Co-operative Service.

Our engineers are at the service of customers to help plan an installation to fit the special requirements.

These men come in contact with many different classes of installations where various kinds of work and materials are handled and extensive systems of track arrangements are necessary.

As a result, this department is a clearing house for ideas on this line of work.

Send for illustrated catalogue showing installations for almost every conceivable class of conveying work.

RICHARDS-WILCOX MANUFACTURING CO.

INCORPORATED

Overhead Carrying Systems and Warehouse Door Hardware

CABLE ADDRESS:
"RICHWILCO"

AURORA, ILL.

CANADIAN FACTORY
LONDON, ONTARIO

BRANCH OFFICES

NEW YORK, N. Y., 85 Walker Street
BOSTON, MASS., 132 Pearl Street
LOS ANGELES, CAL., 503 Equitable Building
ST. LOUIS, MO., 1735 Boatmen's Bank Building
CLEVELAND, OHIO, 459 Hippodrome Annex

PHILADELPHIA, PA., 507 Arch Street
CHICAGO, ILL., 166-168 West Lake Street
SAN FRANCISCO, CAL., 626 Underwood Building
MINNEAPOLIS, MINN., 321 Plymouth Building
INDIANAPOLIS, IND., 608-609 Occidental Building

Products.

R-W "OVER-WAY" Trolley and I-BEAM OVERHEAD CARRYING SYSTEMS; LIFT WAREHOUSE DOOR HARDWARE; FIRE DOORS, SHUTTERS, and FIXTURES.

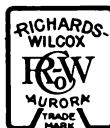
Also manufacturers of Manually Operated Cranes; Jib Cranes; Portable Cranes; Hoists; Store Shelves and Ladders; Angle Iron Door Frames; Warehouse Door Hangers; Door Hangers and Track for Sliding Doors of all kinds and weights; Garage Door Outfits; Elevator Door Hangers; Elevator Door Closer and Check; Sliding Partition Door Hardware; Swing Door Closers and Checks; Hardware Specialties; Expansion Bolts and Expansion Shields.

"Over-Way" Trolley and I-Beam Overhead Carrying Systems.

The "Over-way" conveying equipment constitutes the most efficient labor saving devices manufactured for any size factory or machineshop for handling loads up to 4 tons. The tracks are in a position where they are free from obstruction and always ready for instant use. Factory handling costs are reduced to a minimum, and available floor space increased by hundreds of square feet. Equipment includes overhead tracks, brackets, trolleys, carriers, hangers, switches, cross-overs, turntables and hoists.

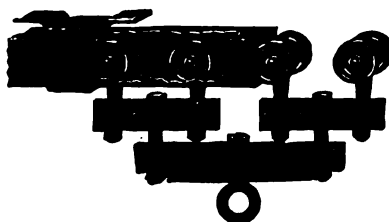
To insure proper erection, blue prints are furnished in detail and all material marked to correspond.

Information Required—Always send sketch giving correct dimensions and proposed layout of tracks. State weight and size of maximum load, whether for constant or occasional use, and whether track will be

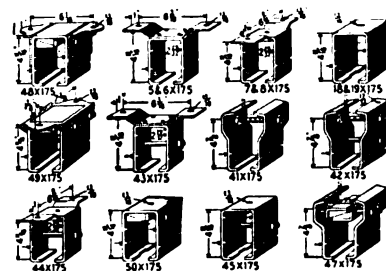


used for storage purposes. Send detail of overhead construction, so proper brackets will be furnished.

Co-operative Service—On receipt of requisite information, detailed drawing of equipment to meet requirements will be submitted for approval.



TROLLEY OVERHEAD ROLLER BEARING SWIVEL CARRIER
Nos. 100-11 and 100-13. For curved track.
Made for 4 sizes of track and 6 capacities



TROLLEY OVERHEAD CARRYING TRACK BRACKETS

TRACK, SPACING OF BRACKETS, SIZES AND CAPACITIES OF CARRIERS

Size of carrier						Track		Load on carrier, lbs.																			
No.	No. of wheels	Diam. wheel, in.	Length over all, in.	Bottom of track to bottom of eye, in.	Eye bolt			125	250	500	750	1000	1250	1500	2000	2500	3000										
						Diam. stem, in.	Diam. eye, in.	No.	Ga.	Spacing of brackets according to load																	
100-10	16	3	44	13¼	¾	1¾	175	13	36"	30"	18"	12"	30"	27"	21"	18"	15"	12"									
							275	12																			
							375	10																			
100-11	8	3	21	9¼	¾	1¾	175	13											27"	21"	17"	15"	12"	18"	15"	12"	
							275	12											32"	24"	20"	17"	15"				
							375	10											48"	32"	24"	21"	18"				
100-12	16	2¼	31	10	¾	1¾	75	14											36"	30"	18"	12"	36"	21"	15"	30"	18"
100-13	8	2¼	14	6¾	¾	1¾	75	14																			
100-14	4	2½	7	4½	¾	1¾	75	14																			
100-15	4	3	9	5½	¾	1¾	175	13																			
							275	12	42"																		
							375	10	54"																		

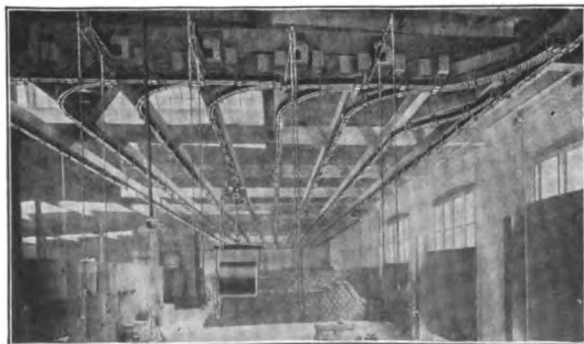


OVER-WAY STANDARD I-BEAM TROLLEYS
Axles operate on ball bearings



OVER-WAY UNIVERSAL CLAMP

For attaching supporting brackets to I-beams. Not necessary to drill holes in I-beam. Can be attached at any point



PARALLEL TRACKS WITH CURVES AND SWITCHES USED BY BARRETT COMPANY, CHICAGO, ILL., FOR HANDLING ROOFING PAPER

DATA, OVER-WAY STANDARD I-BEAM TROLLEYS

No. and size of I-beam	Capacity, lbs.	Diam. wheels on tread, in.	Smallest radius of curve, in.	Diam. center pin, in.	Distance top of center pin to bottom of beam, in.	Width over all, in.	Length of switch tongue, ft.
925-5"	1000	3 7/8	21	3/4	1 1/4	6 1/2	6
925-6"	2000	4 7/8	21	7/8	2 1/4	7 1/2	6
925-7"	3000	5 3/8	34	1 1/8	2 1/2	8 1/2	6
925-8"	4000	6 3/8	36	1 1/4	2 7/8	9 1/2	6
925-9"	6000	7 1/2	42	1 1/2	3	10 1/2	6
925-10"	8000	8 3/8	48	1 3/4	3 1/4	11	6

Always specify by number, stating size and weight of I-beam.

Fire Doors, Shutters, and Fixtures.

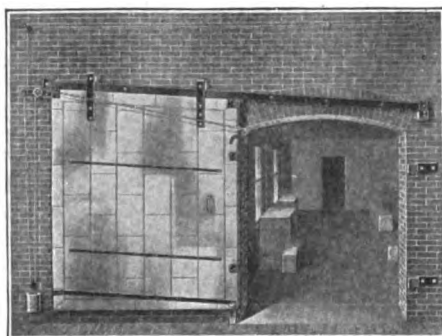
We manufacture a complete line of fire doors and fire door equipment, including: inclined and level track, flat or round, vertical and horizontal sliding doors; swinging doors, single and double. Also fire shutters and trap fire door fixtures.

Fixtures marked with * in table are approved by the Underwriters' Laboratories, Inc. Hardware furnished to meet special requirements.

Corrugated sheet metal fire doors lined with asbestos, approved and labeled under the direction of National Board of Fire Underwriters.

Tin clad fire doors, approved and labeled under the direction of National Board of Fire Underwriters.

For more detailed data, ask for fire door hardware catalogue. Blue prints sent on request.



NO. 102 MONARCH FIRE DOOR FIXTURES
Recommended where headroom exceeds 3 ft. Two fusible links, one in opening and one near ceiling. Door closes by gravity.

DATA, FIRE DOOR FIXTURES

Type of door	Fix- ture num- ber	Round or flat track	Clearance above top of opening, in.	Clearance required at side of opening	
				Where doors slide or swing, in.	Opposite side, in.
Incline track sliding door	102*	Flat	14†	Width of opening + 22	13½
	201*	Flat	14†	Width of opening + 19	13½
	645*	Round	12†	Width of opening + 18	13½
	646*	Round	12†	Width of opening + 15	13½
Level track sliding door	303	Flat	14†	Width of opening + 19	19
	304	Flat	9†	Width of opening + 19	19
Sliding doors in pairs	204*	Flat	14†	Width of opening + 19	
	604*	Round	12†	Width of opening + 15	
Single swing doors	206		9	10	3½
	406*		9	11	3½
	606		none	3½	3½
Swing doors in pairs	306		10	10	10
	506*		10	11	11
	706		3½	3½	3½
Side wall required					
				Doors under 300 lbs.	Doors over 300 lbs.
Vertical slid- ing doors	203	Flat	Height of opening + 19	15 and 21	21 and 28
	603	Round		16 and 22	22 and 29

Adjustable hanger can be furnished with Nos. 102, 201, 204, 303, 645, 646 and 604 fixtures, and requires 3 in. more headroom above top of opening than rigid hangers.

*Approved and labeled under direction of National Board of Fire Underwriters.

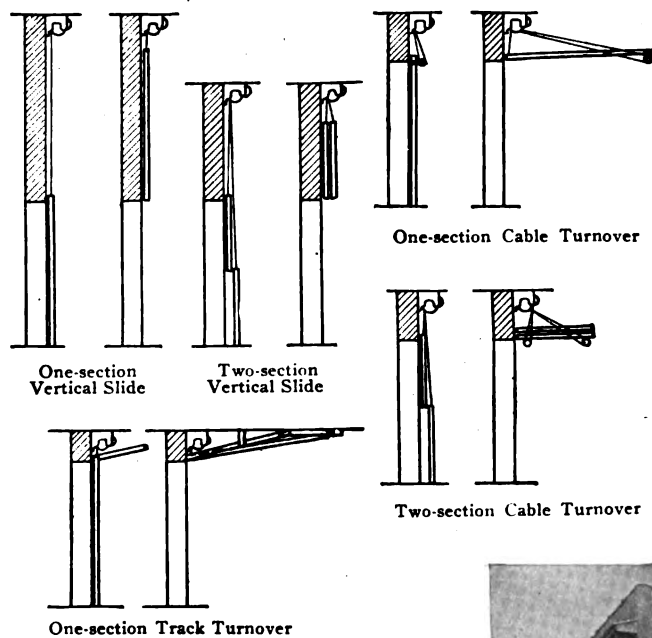
†For arched top openings add ¼ in. for each foot of track back of the center of the opening, to the dimension given. For square top opening add ¼ in. for each foot of track back of edge of opening towards which the door slides in closing, to the dimension given.

Lift Warehouse Door Hardware.

Kinds of Doors—One-section turnover door with track supporting top of doors; one-section turnover door, top of door supported by cables, suitable for doors not over 8-ft. high; one-section vertical door; two-section vertical door as illustrated; two-section turnover door.

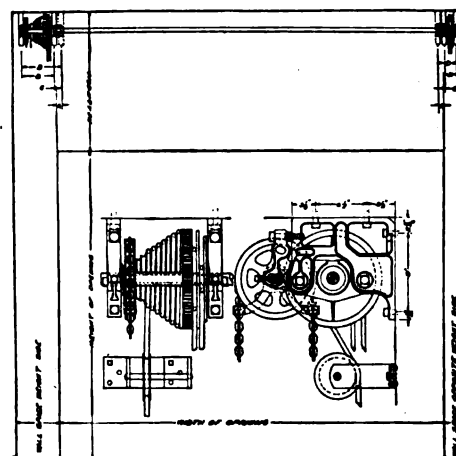
All of these doors are counterbalanced and operated with geared hand chain hoist. Openings should be fitted with steel channel or angle jambs to provide place for attaching hardware.

Used for factories, warehouses, car shops, piers and similar structures having high doorways which require ponderous doors.



**VERTICAL SECTIONS OF VARIOUS STYLES
OF LIFT WAREHOUSE DOORS**

How to Order—Furnish width, height, thickness and weight of doors; space between jamb and side walls or nearest obstruction on each side; and space above opening.



**DIMENSION DIAGRAM LIFT WAREHOUSE
DOOR**



**TWO-SECTION
R.W. LIFT DOOR
AT THE UNI-
VERSAL TRACT-
OR WORKS,
MOLINE, ILL.**

DATA, LIFT WAREHOUSE DOOR

Type of door	Catalogue number	Max. height of opening, ft.	Lap of door over opening, in.	Min. side wall space required, in.		Min. space above opening, in.	A in.	B in.	C in.	D in.
				Weight side	Opposite side					
One-section vertical slide	403	16	2	13	4	Height of opening plus 20	0	12½		
Two-section vertical slide	503 standard	16	2	13	4	Half height of opening plus 20	1	13½		
	503 special	Over 16	2	13	4		0	12½		3½
One-section cable turnover door	349	8	2	13	4½	30		9½		¾
Two-section cable turnover door	449	16	2	17	8	30		15	1	6¾
One-section track turnover door	249	16	2	13	5½	20		7½	2½	

PHILADELPHIA TRAMRAIL CO.

Manufacturers of Overhead Carrying Systems

Front Street and Indiana Avenue
PHILADELPHIA, PA.

Product.

(OVERHEAD CARRYING SYSTEMS.

Engineering Service.

As a result of many years' experience, this company has come in contact with a large variety of overhead carrier systems and the services of its engineers are at the disposal of prospective purchasers for the design of a system to suit any requirement. This service is rendered without obligation.

Upon receipt of the following information, with any other data that can be furnished, the engineering department will submit an estimate, together with plans and specifications.

If possible, send ground plan or sketch showing points desired to be covered and present method of operation; also an idea of a system of overhead tramrail to cover the ground, stating maximum load to be carried, also size and kind of material. Give distance from floor to underside of overhead supports, stating whether wood, steel or concrete construction, also size, and if possible, show position of supports on drawing.

Philadelphia Tramrail System.

The Philadelphia tramrail system meets the very urgent demand for overhead carrying systems suitable for conveying loads up to 10,000 lbs.

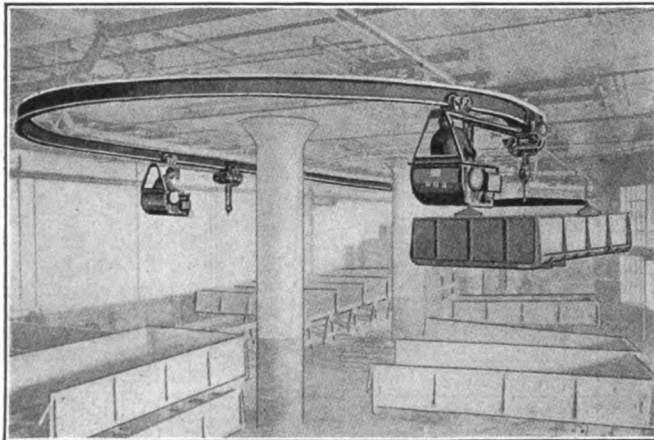
This system provides the greatest economy in first cost, and the greatest saving of time in conveying or routing, in the industrial field.

The Philadelphia system is simple, yet thoroughly practical and efficient. Maintenance is nominal, due to extreme simplicity and practical freedom from attention.

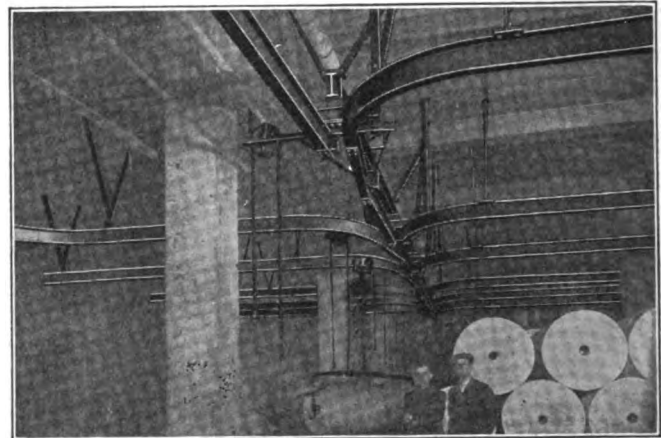
Component parts of the system are made of the best quality materials obtainable for the purpose; workmanship is of the highest class.

When a power actuated system is desired, this company is prepared to furnish and install cage- or floor-operated electric monorail systems.

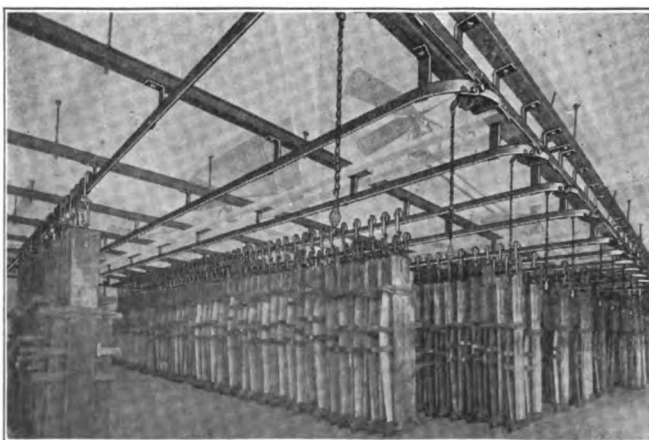
Where the Philadelphia overhead system is installed, there is no danger to workmen or loads, no wear and tear on floors caused by heavy trucking and no trucks to wear out and repair.



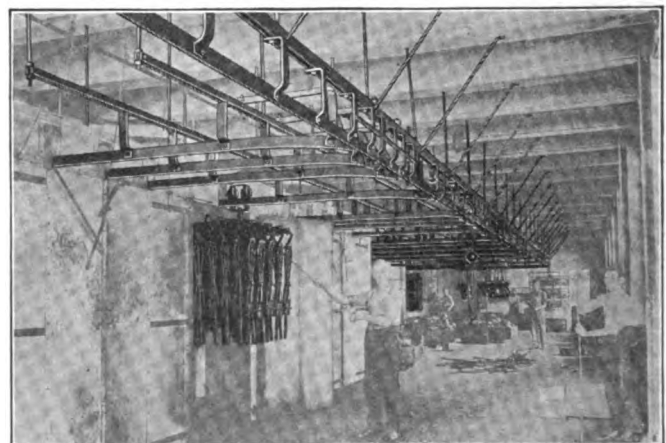
CAGE-OPERATED MONORAIL SYSTEM



OVERHEAD SYSTEM IN PAPER WAREHOUSE



OVERHEAD TRACK SYSTEM FOR STORING AND DRYING
LEATHER



SYSTEM OF TRACKING FOR DRYING OVENS

THE C. O. BARTLETT & SNOW CO.

Equipment for the Handling and Preparation of Material

MAIN OFFICE AND WORKS
CLEVELAND, OHIO

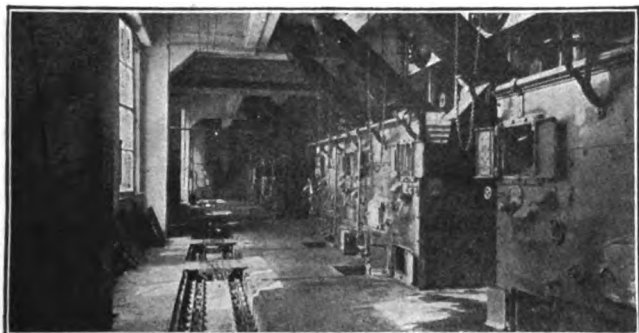
Products.

ELEVATING and CONVEYING MACHINERY; DRYERS;
SKIP HOISTS; CRUSHERS; PULVERIZERS.

Also manufacturers of Feeders, Screens, Mixers, Sintering Plants, Oil and Grease Extraction Equipment, Garbage Reduction Plants, Paint Making Machinery, Car Hauls, Special Cars.

Elevating and Conveying Machinery.

Bartlett & Snow elevating and conveying machinery



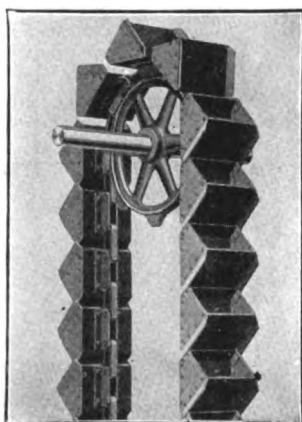
BOILER ROOM OF EASTMAN KODAK CO. EQUIPPED WITH
BARTLETT & SNOW CONVEYORS

is well fitted for all conditions which demand economy and dependability.

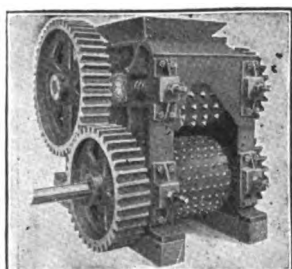
We build bucket elevators and conveyors, flight conveyors, and apron, belt and screw conveyors.



FLIGHT CONVEYOR



BUCKET ELEVATOR



FOUR-ROLL COAL CRUSHER

Coal Crushers.

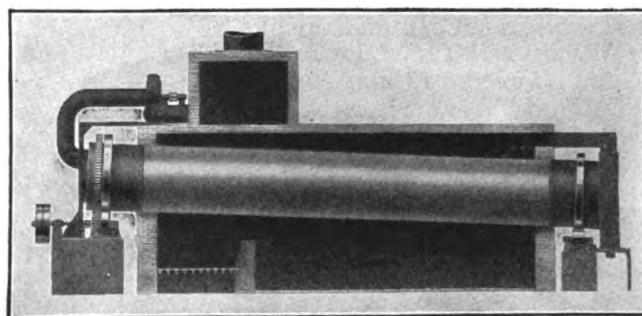
Bartlett & Snow coal crushers include single-roll crushers, two-roll crushers, and four-roll crushers. Wherever you find Bartlett & Snow coal crushers used, you will also find low crushing costs, uniformly crushed coal, few replacements, and absolutely no breakdowns.

Bartlett & Snow coal crushers are described in Bulletin 42.

Dryers.

Bartlett & Snow dryers comprise 13 distinctly different types, each one of which has been developed for the proper and economical drying of a certain class of materials.

Among these 13 types there are direct fired direct heat dryers, direct fired indirect heat dryers, direct fired single pass dryers, direct fired double pass dryers, steam heated dryers and hot air dryers.

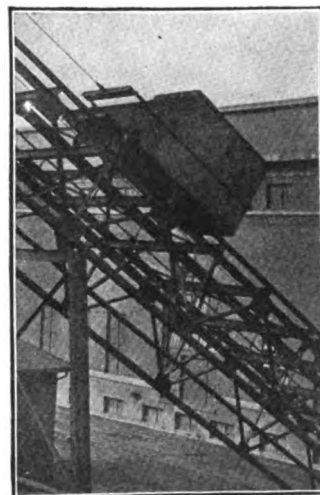


STYLE D DRYER, ONE OF THE 13 TYPES

Skip Hoists.

When conditions are severe, and bucket elevators may be subject to excessive wear and to breakdowns, or where lifts are high or capacities large, skip hoists, because of their ruggedness, simplicity, and low power consumption, will be found remarkably economical and dependable.

Power plants, steel mills, sintering plants, mines, and chemical plants can use Bartlett & Snow skip hoists to advantage for elevating coal, coke, ashes, limestone, flue dust, slag, ores, and other gritty material.

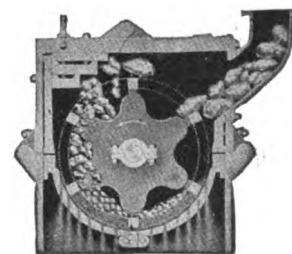


INCLINED SKIP HOIST

Gardner Crusher Pulverizers.

These pulverizers are built for crushing materials of medium hardness. They take relatively little power, most of the crushing being done by the impact of the material against the crusher blocks.

Gardner crusher pulverizers are built in 4 sizes and are fully described in Bulletin 42.



GARDNER CRUSHER
PULVERIZER

ESTABLISHED 1814

GIFFORD-WOOD CO.**Manufacturers of General Elevating and Conveying Machinery and Ice Tools**

MAIN OFFICE AND WORKS

HUDSON, N. Y.

OFFICES AND STOCK ROOMS

BOSTON, MASS., 51 North Market Street

CHICAGO, ILL., 565 West Washington Street

SALES OFFICES

NEW YORK, N. Y., 50 Church Street

BUFFALO, N. Y., Electric Building

Products.

ELEVATING and CONVEYING MACHINERY for industrial plants: Apron, Belt, Flight, Gravity Roller, Hold Bar, Platform and Slat Conveyors; Freight and Package Elevators.

POWER PLANT COAL and ASH HANDLING MACHINERY: Pivoted Bucket Carriers and Continuous Bucket Elevators; Apron, Belt, Flight and Screw Conveyors; Screening Machinery.

COAL POCKETS.

LOCOMOTIVE COALING STATIONS.

WAGON and TRUCK LOADERS.

ICE HANDLING EQUIPMENT.

Also manufacturers of Grain Elevator Machinery, Car Unloaders, Bagging Machines for Coal and Coke, Friction Clutches and Friction Hoists.

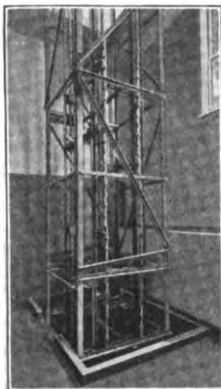
Labor Saving Elevating and Conveying Machinery for Industrial Plants.

The labor saving line of Gifford-Wood elevating and conveying machinery for factories, warehouses, etc., includes apron, belt, flight, gravity roller, hold bar, platform and slat conveyors; also elevators for handling boxes, barrels, bags, trucks and materials of every description for any desired capacity.

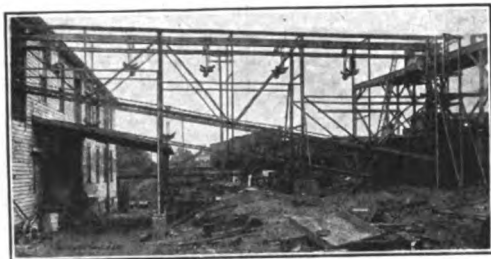
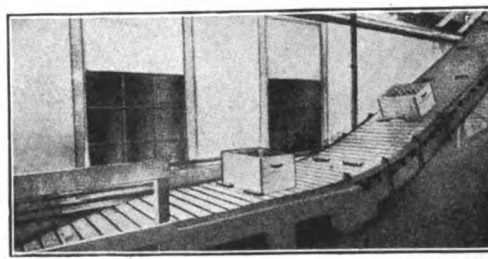
Simplicity and durability, dependability, low operating and maintenance charges, and low ratio of first cost to capacity are salient features of Gifford-Wood equipment.

Consult Gifford-Wood engineers for a satisfactory solution of all elevating and conveying problems in the industrial plant.

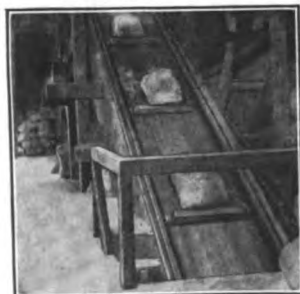
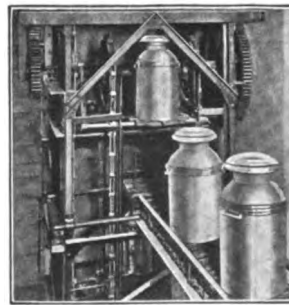
Write for catalogues.

PACKAGE
ELEVATORINCLINED ELEVATOR IN
TUNNEL CONNECTING
SHOP WITH FREIGHT
HOUSEBUCKET
ELEVATOR FOR
HANDLING
POWDER AND
OTHER MATE-
RIALSINCLINED CONVEYOR
FROM FIRST TO THIRD
FLOORS WITH HORI-
ZONTAL LOADING SEC-
TION AT SECOND
FLOOR

BARREL ELEVATOR

TWO-CHAIN PACKAGE CONVEYOR HANDLING VARIOUS
MATERIALS TO AND FROM BUILDING AND CARS

INCLINED CONVEYOR HANDLING CASED BOTTLED GOODS

HOLD BAR CONVEYOR
HANDLING BAGSHOLD BAR CONVEYOR
HANDLING BOXESMILK CAN ELEVATOR
AND CONVEYORHOLD BAR CONVEYOR FOR
HANDLING MISCELLANE-
OUS PACKAGES

Power Plant Coal and Ash Handling Machinery.

Gifford-Wood coal and ash handling machinery is generally recognized as the standard, and is being widely used wherever coal, coke, and ashes are handled. It is equally adaptable to handling crushed stone, sand, gravel, clay, grain and many other materials.

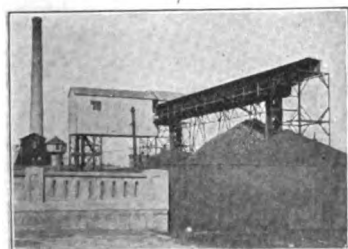
Designed to meet any condition. Minimum power required for operating.

The line includes pivoted bucket carriers, continuous bucket elevators, apron, belt, flight and screw conveyors, and screening machinery.

The services of Gifford-Wood engineers are at the disposal of those desiring advice or recommendations as to the most economical handling of coal, ashes, etc.



PIVOTED BUCKET CARRIER FOR HANDLING COAL, ASHES, ETC.



GRAVITY DISCHARGE ELEVATOR-CONVEYOR FEEDING FLIGHT CONVEYOR FOR A LARGE GROUND STORAGE PLANT



CONCRETE BIN WITH CHUTE TO CARS; TRACK HOPPER, APRON CONVEYOR AND VERTICAL LEG OF ELEVATOR-CONVEYOR



CYLINDRICAL COAL STORAGE BIN FOR GROUND STORAGE PLANT



ASH ELEVATOR DELIVERING FROM BOILERS TO CARTS



ASH ELEVATOR AND STORAGE TANK, SHOWING APRON CONVEYOR DELIVERING FROM HOPPER TO ELEVATOR-CONVEYOR WHICH IN TURN DELIVERS TO STORAGE BUNKER AND STOKER SPOUTS



INTERIOR OF BOILER ROOM SHOWING CHUTES FROM BUNKER TO STOKER MAGAZINES

Coal Pockets.

Designed to secure maximum results at minimum expenditure—to automatically clean the coal without hand labor while passing from pocket to truck; to greatly reduce or eliminate the demurrage item; to reduce the cost of deliveries by much quicker loading of trucks; to insure longer life to the equipment, and a smaller percentage of depreciation.

The experience of Gifford-Wood engineers makes their services of value in systematically considering the many points at issue, and in adapting conveying machinery and screening apparatus which will prove to the best interests of prospective customers.

Write for Bulletin No. 19.



COAL POCKET

Locomotive Coaling Stations.

An exhaustive study of the various types and makes of locomotive coaling station equipment was made by railroad engineers in order to insure maximum dependability and service. The result was the adoption of Gifford-Wood equipment by the following railroads: New York Central, Canadian Pacific, Boston & Albany, Boston & Maine, Rutland, Ottawa & New York, Chicago, West Pullman & Southern.

Write for Bulletin No. 31.



LOCOMOTIVE COALING STATION BUILT FOR BOSTON & MAINE R. R.

Wagon and Truck Loaders.

Reducing the cost of handling anthracite and bituminous coal, crushed stone, gravel, sand, clinker, lime, coke, ashes, fertilizer, etc. is accomplished by the use of Gifford-Wood wagon loaders. Their successful performance is evidence of their efficiency, serviceability and popularity.

Gifford-Wood engineers study every individual case, and will recommend a loader best suited for all the conditions. Write for Bulletin No. 40.



WAGON LOADER WITH FEEDER

Ice Handling Equipment.

This company has had over 100 years' experience in the design and manufacture of ice handling machinery and tools—generally known as the world's standard. Designs and recommendations for this class of equipment will be made by Gifford-Wood engineers on receipt of detailed information.

Write for catalogues.



ICE ELEVATOR-CONVEYOR

ESTABLISHED 1866

GILLIS & GEOGHEGAN

Manufacturers of G&G Telescopic Hoists

TELEPHONE:
SPRING 6140

553 West Broadway
NEW YORK, N. Y.

PARTIAL LIST OF AGENCIES IN THE UNITED STATES

ATLANTA, GA., HILL R. HUFFMAN, INC., Healey Building
BALTIMORE, MD., EASTERN SALES Co., 600 E. Chase Street
BOSTON, MASS., see New Haven, Conn.
BIRMINGHAM, ALA., JOHN D. TURNER Co., Jefferson Bank Building
BUFFALO, N. Y., BUFFALO BUILDERS SUPPLY Co., 1336 Genesee Street
CHICAGO, ILL., S. I. KAUFMAN, 455 Peoples Gas Building
CHARLOTTE, N. C., GENERAL MILL SUPPLY Co., Latta Arcade Building
CLEVELAND, OHIO, R. L. QUEISSER Co., Schofield Building
COLUMBUS, OHIO, R. L. WATSON, 51 Columbia Building
DALLAS, TEX., SOUTHERN WIRE & IRON Co.
DENVER, COLO., HOWARD H. FIELDING, 815 Boston Building
DES MOINES, IOWA, PRESTON DANIELS, Hubbell Building
DETROIT, MICH., KENNEDY & DAWSON, 816 Penobscot Building

INDIANAPOLIS, IND., VONNEGUT HARDWARE Co.
KANSAS CITY, MO., ROBERT O. SMITH, 214 Massachusetts Building
MILWAUKEE, WIS., PHILIP GROSS HARDWARE Co., 218-22 3rd Street
MINNEAPOLIS, MINN., MORGAN-GERRISH Co., 501 South 6th Street
NEW HAVEN, CONN., WARNER-MILLER Co., Railroad Avenue and St. John Street—Represents all New England
OMAHA, NEBR., F. H. TURNEY Co., Geflang Building
PHILADELPHIA, PA., W. G. CULBERT, 1503 Sansom Street
PITTSBURGH, PA., J. R. PITCAIRN, 413 Fourth Avenue
RICHMOND, VA., J. S. ARCHER, Real Estate Exchange Building
SEATTLE, WASH., S. W. R. DALLY, 332 Pioneer Building
ST. LOUIS, MO., CONCRETE STEEL FIREPROOFING COMPANY, Syndicate Trust Building

Products.

G&G TELESCOPIC HOIST.

Also G&G Sidewalk Doors with Automatic Opening and Closing Device; G&G Automatic Spring Guard Gates; G&G Swing Bail Hoisting Cans; G&G Side Handle Cans; G&G Ash Can Trucks and G&G Iron Ladders.

Types of G&G Telescopic Hoists.

Made in five standard models.

Model E hoist operated electrically; with automatic stop and gravity lowering device.

Model C hoist operated electrically.

Model D hoist operated electrically.

Model A hoist operated manually, with automatic gear shifting brake device and silencer.

Model B hoist operated manually, with automatic gear shifting brake device and silencer.

Note: Above models are made *non-telescopic* when desired.

Patents.

G&G telescopic hoists and hoisting equipment are protected by United States, Canadian and foreign patents.

Uses.

The G&G telescopic hoist is designed for raising and lowering light loads (under 1000 lbs.) at industrial plants, and for the removal of ashes and rubbish from all types of buildings. Especially valuable for quickly and economically raising and lowering ashes, bags, bales, barrels, baskets, boxes, cans, carboys, ice, parts of unfinished and finished machinery, rolls, rubbish, tires, trays, etc., and other loads within its scope.

Model E, Electrically Operated, Telescopic Hoist.

Model E, electrically operated, G&G telescopic hoist is especially adapted for use in industrial plants. The regular Model E hoist raises loads of 500 lbs. to grade level at a speed of 60 ft. per minute. A specially designed Model E hoist can be had with a maximum capacity of 1000 lbs.



Equipped with a 1½ h.p. motor, totally enclosed (series wound for direct current; squirrel cage for alternating current), and has graphite-filled oilless bronze bearings.

It has an automatic upper limit and *lowers by gravity*, thus consuming only *half* the usual amount of current and permitting a very rapid lowering speed.

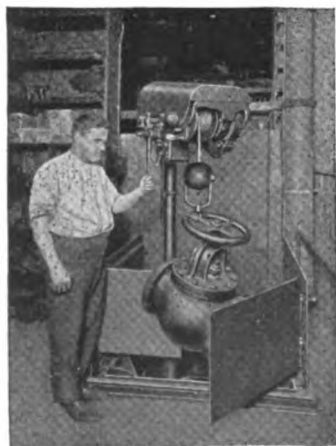
A single handle controls lowering and raising operations, and, should the operator's hand be removed from the lever, the brake is automatically applied and the load comes to an *instant stop*.

Upper part of hoist telescopes below grade when not in use. A few turns of the telescoping handle raises hoisting head into working position—opening and locking sidewalk doors.

Model D, Electrically Operated, Telescopic Hoist.

Model D, electrically operated, overhead crane, G&G telescopic hoist, is especially adapted for the removal of ashes, rubbish, etc., where the daily removal involves a considerable number of cans and where the grade level approaches are constructed so as to permit ash wagons to drive close to hoistway leading from boiler room. The regular Model D hoist raises loads of 300 lbs. at a speed of 60 ft. per minute. A specially designed Model D hoist can be had with a maximum capacity of 1000 lbs. Distance between hoistway and wagon can be as great as 36 in. Hoist raises load 6 or 7 ft. above grade for deposit directly into wagon without re-handling the cans at grade level. A few turns of the telescoping handle raises hoisting head into working position—opening and locking sidewalk doors.

Equipped with a 1½-h.p. motor, totally enclosed (series wound for direct current; squirrel cage for alternating current), with a mechanical load brake, automatic upper and lower limit, and single speed controller giving one hoisting and lowering speed. Cast iron base provided for motor.



INSTALLATION OF MODEL E HOIST IN A MACHINESHOP

Raises load electrically and lowers by gravity. If operator's hand be removed from lever, load will come to an instant stop



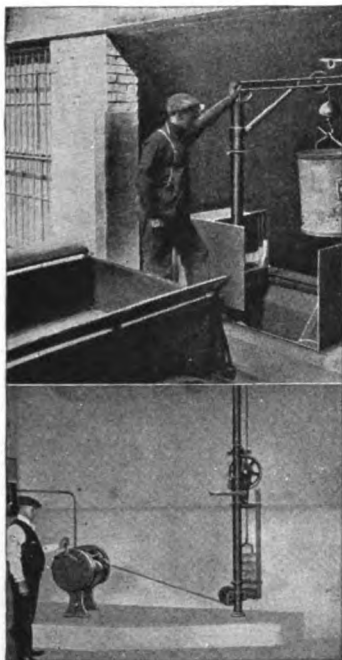
ONE OF FOUR MODEL A, MANUALLY OPERATED, NON-TELESCOPIC HOISTS IN USE AT PACKARD MOTOR CAR PLANT, DETROIT, MICH.

Model C, Electrically Operated, Telescopic Hoist.

Model C, electrically operated, G&G telescopic hoist is identical with Model D, except that Model C raises loads to grade level only.

Model A, Manually Operated, Telescopic Hoist.

Model A, manually operated, G&G telescopic hoist is so designed that it is entirely practical for *one man*—



MODEL C, ELECTRICALLY OPERATED TELESCOPIC HOIST IN USE AT THE 53RD STREET FREIGHT STATION, ILLINOIS CENTRAL R. R., CHICAGO

Right-hand gate removed to show door opening and closing device

protects the operator from possible injury. A few turns of the telescoping handle raises hoisting head into working position—opening and locking sidewalk doors.

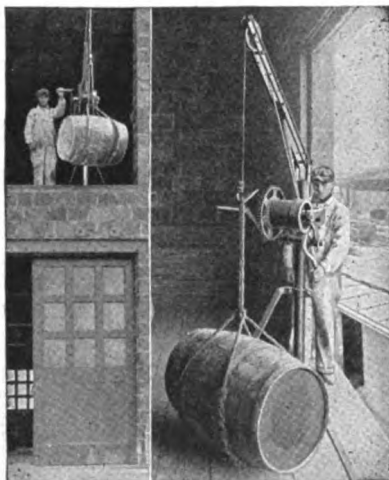
Model B, Manually Operated, Telescopic Hoist.

Regular Model B, manually operated, overhead crane, G&G telescopic hoist is built to raise loads of 300 lbs. at a speed of 30 ft. per minute. A specially designed Model B hoist can be had with a maximum capacity of 1000 lbs. Both the telescoping and the hoisting handle act upon compound gears and the pressure exerted upon the hoisting handle in raising load is only 7 lbs. for 100 lbs. of weight.

As in the case of the Model A hoist, the hoisting handle of Model B does not revolve when brake is used to lower load. A few turns of the telescoping handle raises hoisting head into working position—opening and locking sidewalk doors.

Telescopic Feature of G&G Hoists.

No part of hoisting apparatus shows above grade when hoist is not in use. A few turns of the telescoping handle



MODEL B, MANUALLY OPERATED NON-TELESCOPIC HOIST AT THE RICHES-PIVER CO. CHEMICAL PLANT AT LYON'S FARMS, N. J.

The
G&G
Telescopic Hoist
with Automatic Gear Shifting Brake Device and Silencer
TRADE-MARK
(Reg. U. S. Pat. Off.)



MODEL D, ELECTRICALLY OPERATED TELESCOPIC HOIST AT THE CONLEY TINFOIL CO., NEW YORK CITY

Upper part of hoist telescopes below grade when not in use

with a maximum rated capacity of 1000 lbs.

Installation.

All necessary clamps and bolts are furnished with each hoist, together with detailed blue print showing how to erect, and set of instructions covering operation.

G&G Literature.

All factory executives, and others interested, should write for copy of our latest pamphlet "*The Man Saving Load Lifter.*" For the convenience of the consulting engineer and specification writer, we have prepared a pamphlet "*How to Specify*" which we will be glad to send on request.

An Approved Product.

The G&G telescopic hoist was investigated and approved March 24, 1915, and June 10, 1920, by Investigating Committee of Architects and Engineers.

raises hoisting head into working position—opening and locking sidewalk doors.

Non-rotating Cable.

The steel cable used on G&G hoists is "non-rotating" which eliminates the twisting and additional stress common to the ordinary type of cable. Cable drum is grooved and gears are machine cut throughout.

Silencer.

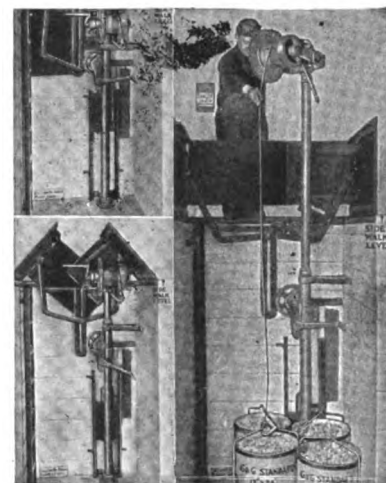
All manually operated G&G hoists are equipped with a patented "silencer" which makes them practically noiseless in operation. Lubrication is effected by a simple but efficient method.

Non-freezing Feature.

G&G hoists can be used during the coldest weather as no parts are susceptible to freezing.

Factor of Safety.

No part of a G&G hoist has a factor of safety less than 8, based on its maximum rated capacity shown on the nameplate. Gearing has a very high factor of safety of about 30, and all running parts have a factor of safety far beyond what is ordinarily considered necessary. On special orders we can arrange to build our hoists



OPERATION OF G&G DOOR OPENING AND CLOSING DEVICE

In this case adapted to a Model A hoist but can be used with all models of G&G hoists. Operates automatically when telescoping handle is revolved. Checkered steel or vault light doors open and close and lock as hoisting head is raised or lowered. Spring guard gates, which swing outward only, automatically close up opening at grade level between open doors

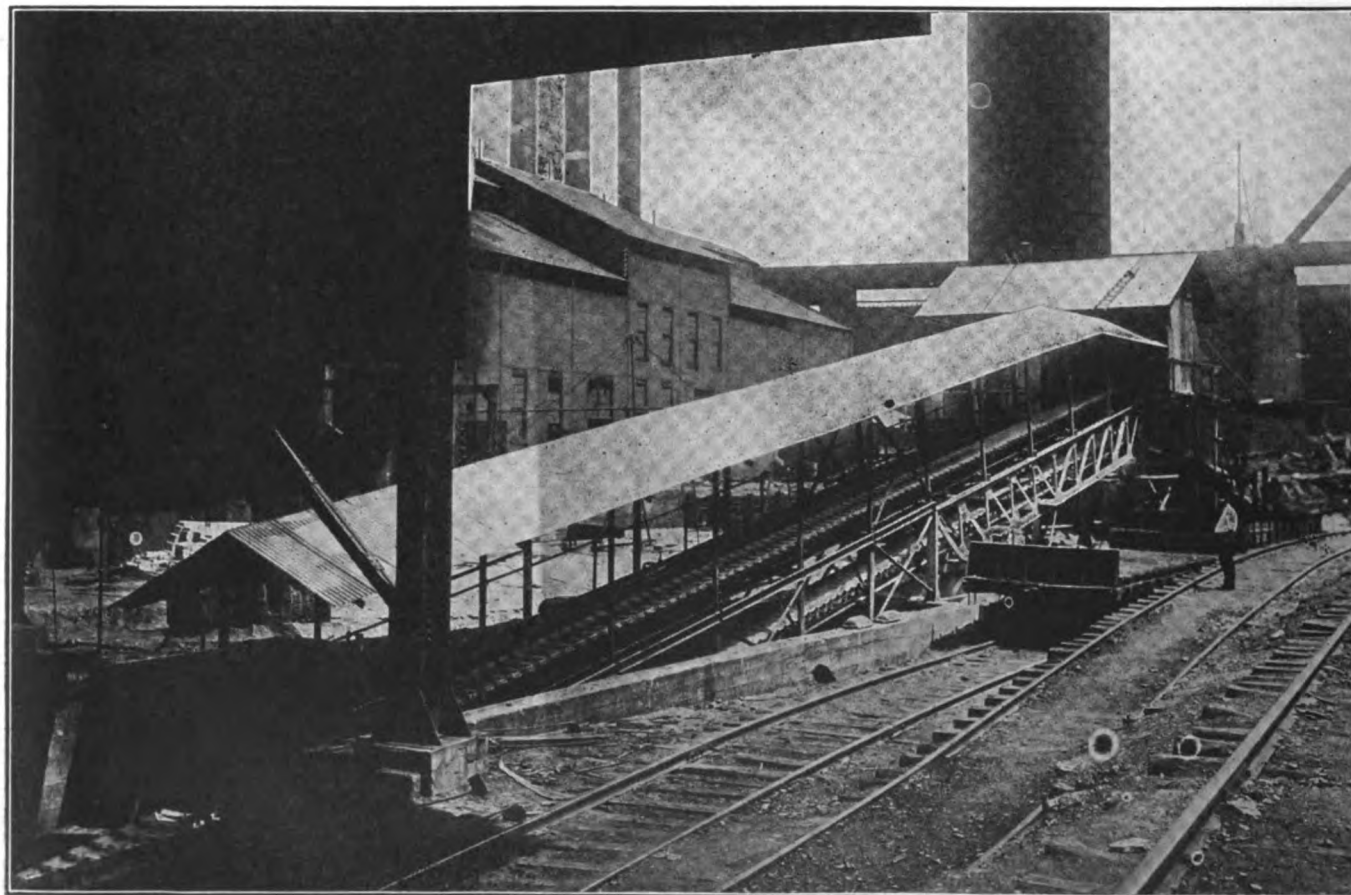
ESTABLISHED 1887

HEYL & PATTERSON, INC.

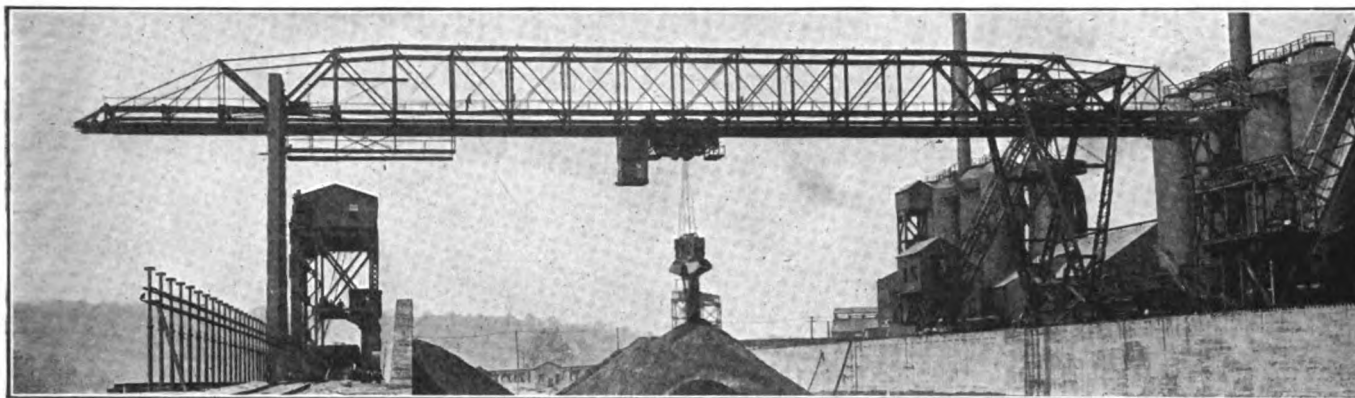
Contracting Engineers

MAIN OFFICE AND PLANTS
PITTSBURGH, PA.

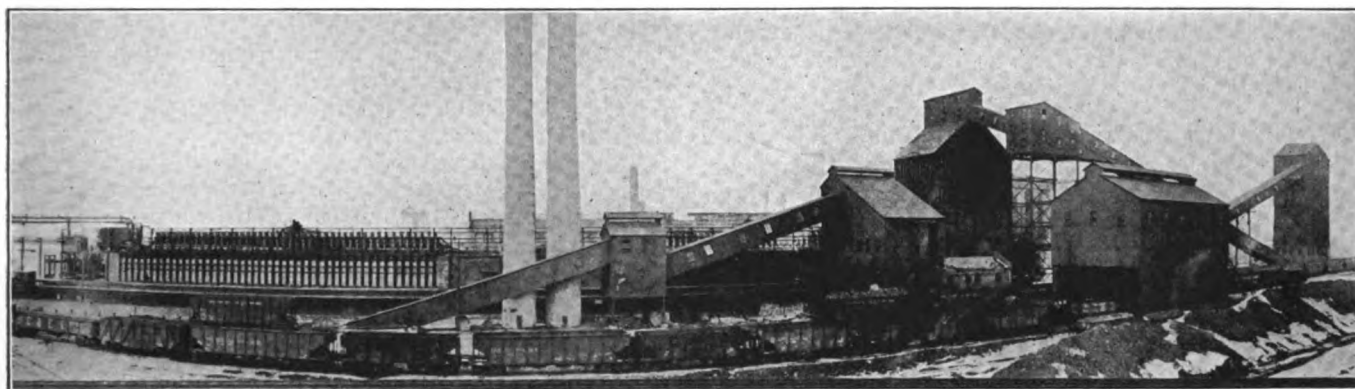
BRANCH OFFICE: 90 West Street, NEW YORK, N. Y.

Maintain CompleteEngineering Organization.
Structural and Machine Shops.
Field Forces.**Prepare Estimates, Plans and Specifications and Design and Erect the following Products:**Bradford Breakers
Batch Mixing Plants
Car Haulage Systems
Coal and Ash Handling Apparatus
Coal and Coke Crushers
Coal and Coke Plants for By-product Coke Ovens
Coal, Coke and Ore Storage Bridges and Cranes
Coal Washing Plants and Larry Bins
Gas Producer PlantsLehr Conveyors
Loading Booms
Picking Tables
Pig Iron Casting Machines.
Pulverized Coal Equipments
Refuse Disposal Cars
Rope Haulage Systems
Screening Plants
Shaking Screens
Storage Plants
Telfers
Tipples and Equipment
Transfer Cars
Traveling Batch Mixers
Unloading Towers
Wharf and Cargo Cranes

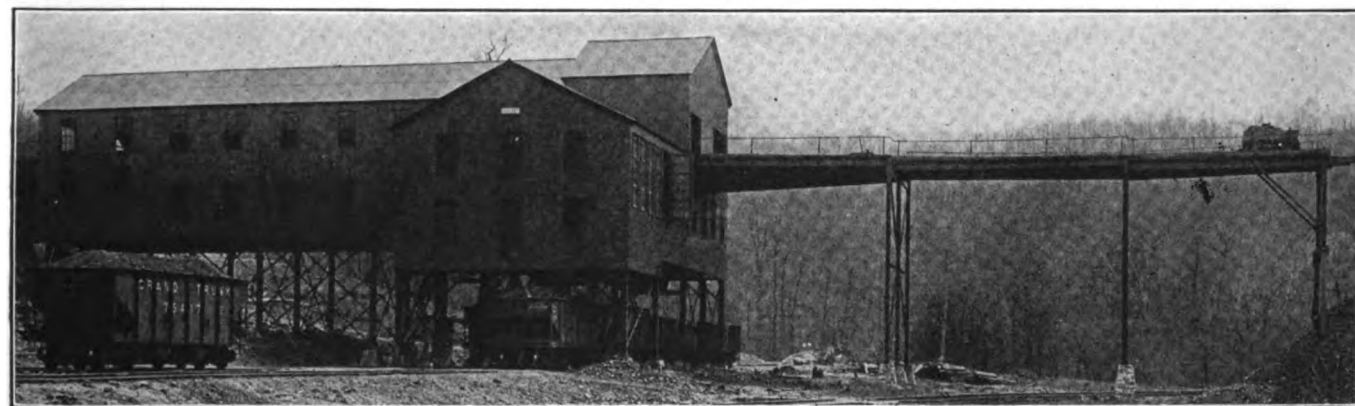
PIG IRON CASTING MACHINE



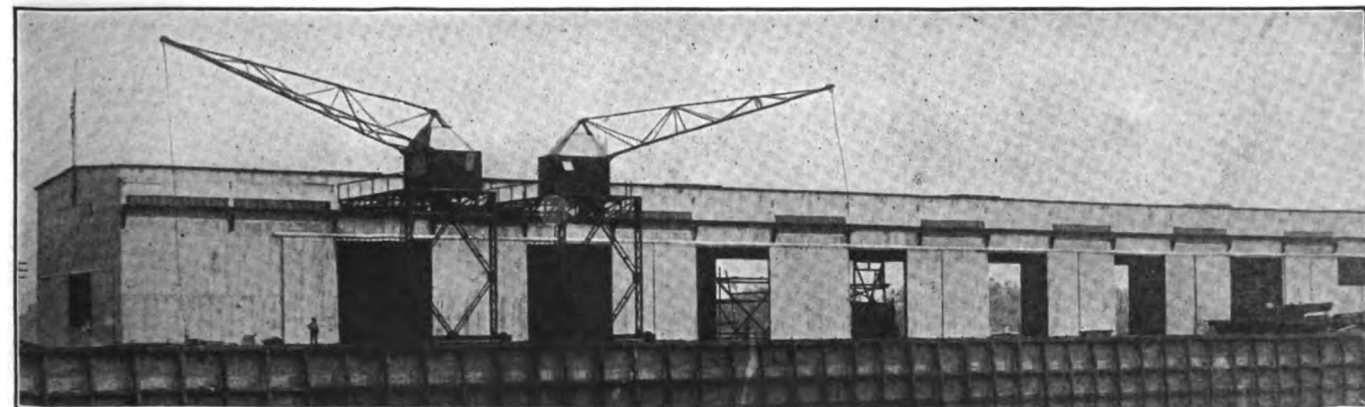
ORE HANDLING BRIDGE



COAL AND COKE HANDLING FOR BY-PRODUCT OVENS



COAL TIPPLE AND PICKING HOUSE



TRAVELING WHARF CRANES

THE JEFFREY MANUFACTURING COMPANY

Elevating, Conveying and Crushing Machinery

966 North Fourth Street
COLUMBUS, OHIO

BRANCH OFFICES

NEW YORK, 50 Dey Street
BOSTON, 141 Milk street
PHILADELPHIA, 1126-28 Real Estate
Trust Building
ST. LOUIS, Railway Exchange Building
BUFFALO, Marine Trust Building
CHICAGO, McCormick Building

DENVER, 421 U. S. National Bank
Building
PITTSBURGH, Farmers Bank Building
CLEVELAND, Leader-News Building
DETROIT, Book Building
LOS ANGELES, H. W. Hellman
Building

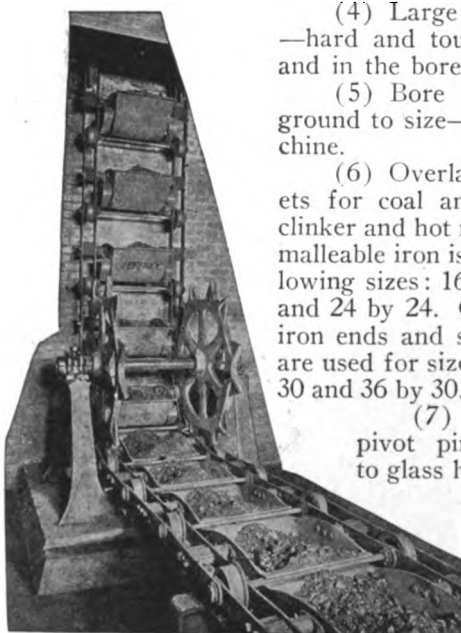
SCRANTON, 516 Union National Bank
Building
MILWAUKEE, M. & M. Building
MONTREAL, Power Building
BIRMINGHAM, Brown-Marx Building
DALLAS, Western Indemnity Building
CHARLESTON, W. VA.

Products.

CARRIERS; CRUSHERS; SWING HAMMER PULVERIZERS and SHREDDERS; LOADERS; ELECTRIC TROLLEY and STORAGE BATTERY LOCOMOTIVES; ELEVATORS; CONVEYORS: Belt, Pan, Bucket, Scraper and Apron.

Jeffrey Pivoted Bucket Carriers.

- (1) Double bushings in chains—glass hard and tough.
- (2) Steel cross rods—connect carrier chains at the bucket lips; do not obstruct bucket opening.
- (3) High carbon steel side bars—shockproof.



JEFFREY IMPROVED BUCKET CARRIER
STANDARD SIZES

Buckets		Chains		Carrying capacity for coal in tons per hour at 50 f. p. m.
Width, in.	Length, in.	Pitch, in.	Diam. rollers, in.	
16	18	18	5	30
18	24	24	6	50
24	24	24	6	70
30	24	24	6	85
30	30	30	7	130
36	30	30	7	160

- (4) Large roller in chains—hard and tough on the tread and in the bore.
- (5) Bore of chain rollers ground to size—too hard to machine.

- (6) Overlapping lip buckets for coal and ashes, cement clinker and hot materials. Tough malleable iron is used for the following sizes: 16 by 18, 18 by 24 and 24 by 24. Combination cast iron ends and steel plate bodies are used for sizes 30 by 24, 30 by 30 and 36 by 30.

- (7) Hardened steel pivot pins—heat treated to glass hardness.

- (8) Pivot blocks in chains—of hard white iron.
- (9) Tripping cams on buckets—glass hard and hot riveted to bucket ends.

- (10) Traveling and stationary trippers—deep chilled wearing surfaces; easy to operate.

- (11) Bucket acme of efficient design—every edge and corner reinforced for long service.

- (12) Absolute reliability under all conditions of service. Loaded buckets can not be carried around to filling point without first being dumped. Conveyor safeguarded throughout its entire course against improper action.

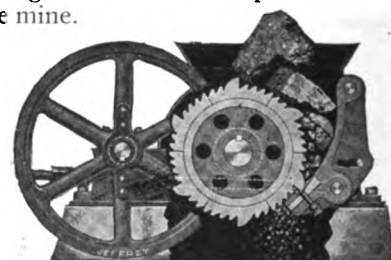
Write for Pivoted Bucket Catalogue No. 210-F.

Single Roll Crusher.

This machine is designed for use at the powerhouse, coaling station, and the mine.

It reduces large lump and run-of-mine coal to stoker size in a single operation.

For run-of-mine or hard lump coal this company recommends using the 30 by 30-in. size as it



JEFFREY SINGLE ROLL CRUSHER

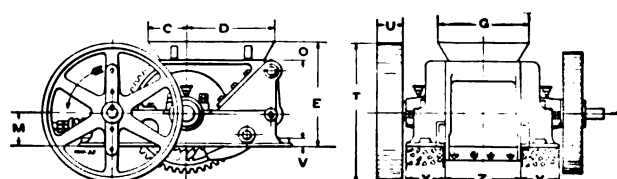
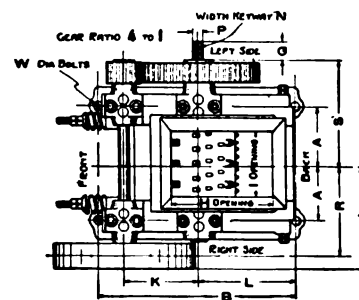


DIAGRAM JEFFREY SINGLE ROLL CRUSHER

AVERAGE RATING FOR MEDIUM BITUMINOUS COAL FOR STOKER SIZES

Size crusher, in.	Tons per hour	Approx. h. p.	Pulley, normal speed r. p. m.	All dimensions in inches																							
				A	B	C	D	E	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	Y	Z
18	30	15	300	14 1/4	47	9 1/4	20 3/4	25	22	24	16	26 1/2	17 3/4	23	8	4 1/2	2 1/8	4 1/2	23 1/8	25 1/2	34	6 1/2	2	1	9 1/2	19	
24	60	30	240	17 7/8	55 1/2	12 1/2	23 1/2	32 1/2	30	27 1/4	22	33	21	26	10 1/2	6	2 1/8	4 1/4	28 3/4	30 3/4	42	8 1/2	2 1/4	1 1/2	11	25	
30	85	40	200	22 1/4	65	14	27	37	36	32 1/2	28	39 3/4	25 1/2	30 3/4	12	3 1/8	4 3/4	35 3/8	36 1/2	48	10 1/2	3	1 1/4	13 1/2	31		
36	125	60	160	27 1/4	76	16 3/4	31 1/4	44 3/4	43 1/2	40	35 1/2	52 3/4	30 1/2	37	15	1	6	3 1/2	5 1/2	44 3/4	45	60	15 1/2	3 1/2	2	17 1/2	37

has proved the best suited for maximum lumps. (See table at foot of preceding page for sizes.)

Receives coal in any volume direct from a track hopper, grab bucket or mine car without the use of any mechanical device for regulating the feed. Feeder is often used simply to limit the crusher output to the smaller capacity of a receiving conveyor beneath the crusher.

It can be started up under full load and can not be flooded or choked down.

Easily adjusted and has large range for size and capacity.

Consumes but little power. Costs little to install.

Occupies small space in proportion to its capacity.

All joints are machined. Gears are of steel with cut teeth.

Provided with an efficient safety device which protects against shock and accidents. Send for bulletin.

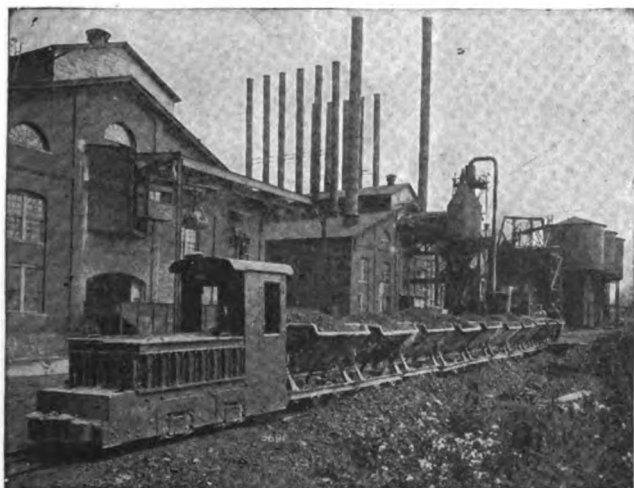
The long teeth do not interfere with the adjusting of the breakerplate up close to the roll when a fine product is required, slots being provided in the breakerplate through which they pass freely and still prevent large pieces of coal getting through without being crushed.



DIGGING AND LOADING HARD ACID PHOSPHATE IN FERTILIZER PLANT WITH JEFFREY TYPE "G" LOADER

Locomotives.

Storage battery locomotives are used extensively in industrial plants and mines. Trolley type locomotives are also built.

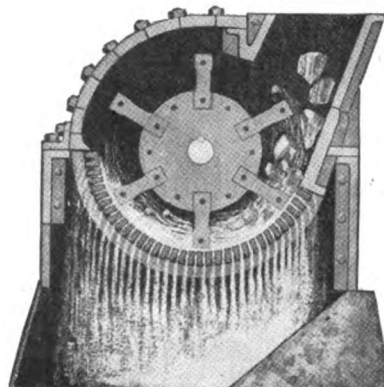


JEFFREY STORAGE BATTERY LOCOMOTIVE

Jeffrey Swing Hammer Pulverizer and Shredder.

Of various types and sizes for reducing large quantities of granular and fibrous materials. Complete details on application.

Write for Catalogues No. 147-N and No. 259-I.



JEFFREY SWING HAMMER PULVERIZER

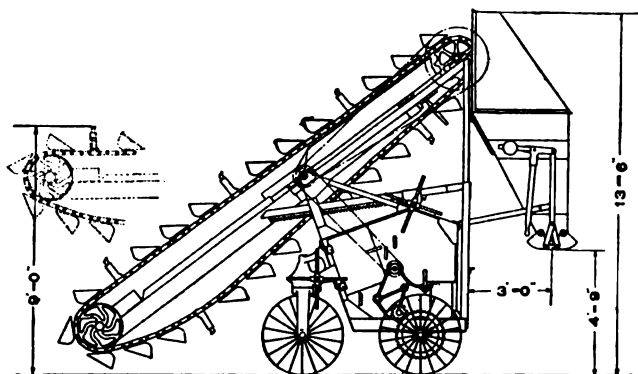
Type "G" Loader.

The Jeffrey Type "G" loader is a large wheeled powerfully geared machine, capable of handling, per minute, $1\frac{1}{2}$ to 2 cu. yds. of loose materials, such as crushed stone, sand, gravel, coal, coke, ashes, cinders, acid phosphate, fertilizer, salt, etc. The machine is self-propelling, having two speeds forward and two reverse, the fast speed to carry it from pile to pile and the slow speed suitable for feeding into the material.

The boom is narrower than the buckets, hence it will dig 8 ft. straight back into the pile without meeting an obstruction. The buckets are malleable iron, very heavy and protected by renewable serrated steel digger edge, operating over a large diameter foot wheel, thereby enabling the machine to handle large lumps successfully.

The machine is mounted on three large wheels forming a 3-point support which causes the machine to set solid on any uneven ground, to travel over rough ground, to run over obstacles without harm and to go over moderately soft ground without sinking. The machine will turn short and readily and will sweep the ground in wide circles. The boom is adjustable for depth of cut or to collapse to pass obstructions.

For loading wagons, automobiles, trucks, cars, etc., a swivel chute is supplied. When handling loose materials which are carted, such as, salt, fertilizer, acid phosphate, etc., the machine is fitted with large capacity storage hopper and quick acting clamshell valve for loading wheelbarrows and small carts, thus keeping a string of wheelers busy.



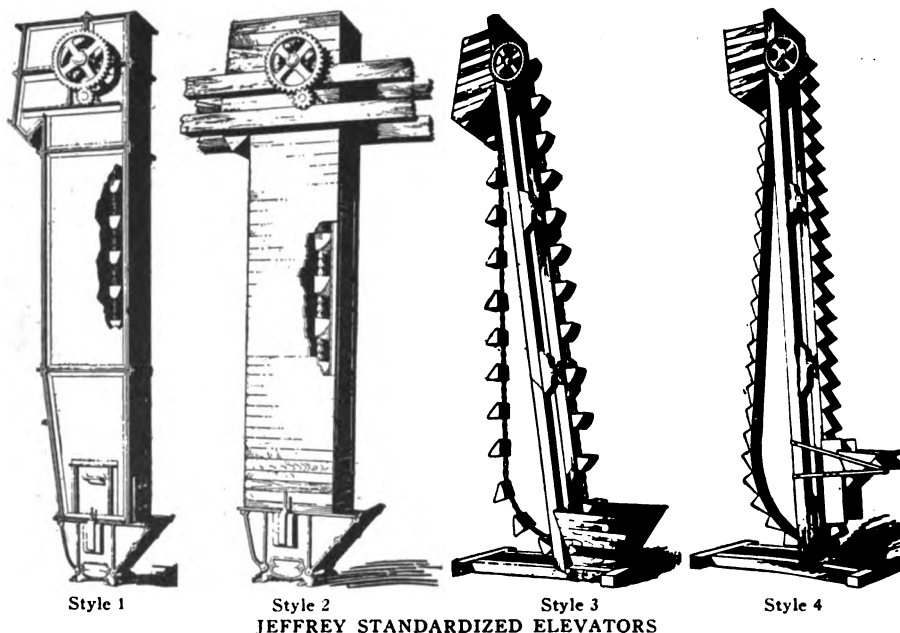
CONSTRUCTION OF THE JEFFREY TYPE "G" LOADER

Continued on next page

Standardized Elevators.

Years of close personal contact with the industrial field in the building of conveying and elevating equipments have made it possible to select 50 elevators out of numerous styles for the handling of a wide range of materials—these being known as Jeffrey standard elevators.

Jeffrey standard elevators are made vertical or upon an incline and can be furnished with or without steel casings. Capacities range from $6\frac{1}{2}$ to 80 tons of material per hour with vertical lifts of from 10 to 75 ft. The nature of the materials handled may vary from non- or semi-gritty materials, such as grains and coal, to gritty substances, such as ashes, coke, sand, gravel and stone. The size of the material may vary from dust to $4\frac{1}{2}$ -in. cubes. These elevators consist of



CAPACITIES AND HORSEPOWER OF JEFFREY STANDARDIZED ELEVATORS

	Capacity, tons per hour	Max. size pieces, in.	0-40-ft. Centers				41-80-ft. Centers				Style
			Elevator number	Chain number	Size of bucket, in.	Horse- power	Elevator number	Chain number	Size of bucket, in.	Horse- power	
Coal, or similar material, weighing approx. 50 lbs. per cu. ft. Centrifugal Discharge Type.....	6.5	2.5	103	88J	6 x 4	.55	132	88J	6 x 4	1.1	1
			1103	88J	6 x 4	.55	1132	88J	6 x 4	1.1	2
			108	82R	8 x 5	1.3	137	82R	8 x 5	2.5	1
	12.2	3	1108	82R	8 x 5	1.3	1137	82R	8 x 5	2.5	2
			115	82R	12 x 7	2.2	144	82R	12 x 7	4.2	1
	23.2	4	1115	82R	12 x 7	2.2	1144	82R	12 x 7	4.2	2
			1119	110H	14 x 7	2.5	149	110H	14 x 7	4.8	1
	25	4	1119	110H	14 x 7	2.5	1149	110H	14 x 7	4.8	2
			1122	110H	16 x 8	3.3	152	110H	16 x 8	6.6	1
	36	4.5	1122	110H	16 x 8	3.3	1152	110H	16 x 8	6.6	2
Ashes, 40 lbs. per cu. ft. Centrifugal Discharge Type.....	14.4	4	166	110H	12 x 7-A	2.0	179	111H	12 x 7-A	3.6	1
	24	4	169	110H	14 x 7-A	2.5	182	111H	14 x 7-A	4.8	1
Stone, 100 lbs. per cu. ft. Centrifugal Discharge Type.....	24.5	3	208	82R	8 x 5	2.1	233	82R	8 x 5	4.1	2
			1208	82R	8 x 5	2.1	1233	82R	8 x 5	4.1	3
			216	110H	12 x 7-A	3.2	241	110H	12 x 7-A	6.2	2
	36	4	1216	110H	12 x 7-A	3.2	1241	110H	12 x 7-A	6.2	3
			220	110H	14 x 7-A	4.8	245	111H	14 x 7-A	9.4	2
	60	4	1220	110H	14 x 7-A	4.8	1245	111H	14 x 7-A	9.4	3
Stone, Continuous Bucket Type.....			0-30-ft. Centers.				31-60-ft. Centers				
	39	3.5	258	82R	12 x 6	2.6	283	110H	12 x 6	5.2	4
	80	4.5	266	110H	14 x 8	5.0	290	111SP-H	14 x 8	9.3	4

endless chains provided with buckets of steel or malleable iron, spaced at short intervals or close together, designated in the table accompanying as centrifugal discharge types and continuous bucket type, respectively.

Delivery—These elevators are made from standard specifications; by specifying same much shorter delivery may be obtained than is the case with special elevator requiring layouts and complete shop details.

Prices—The home office or any one of the branches is in a position to furnish immediate prices on any of these standard elevators. Just state the number of the elevator and the distance from center of head shaft to center of foot shaft. Catalogue No. 244-D.

Belt Conveyors.

A belt conveyor, where properly installed and operated, forms one of the most flexible and economical type of mechanical handling devices.

The range of materials which the belt conveyor will handle satisfactorily includes nearly all bulk materials, from the lightest of grains to the heaviest of ores, as well as packages of all kinds. It is well adapted to carry fragile materials without undue breakage.

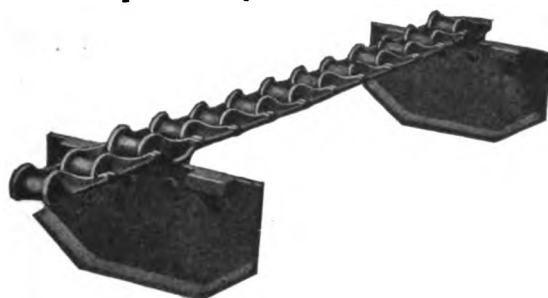
The space occupied by the belt conveyor is small and the power consumption and cost of upkeep are low, making it an ideal conveyor covering a very wide range of application.

Jeffrey belt conveyors are so standardized that the selection of the proper conveyor is very simple.

They have a range of 36 to 1724 tons per hour on any length up to 600 ft. Catalogue No. 175-R.

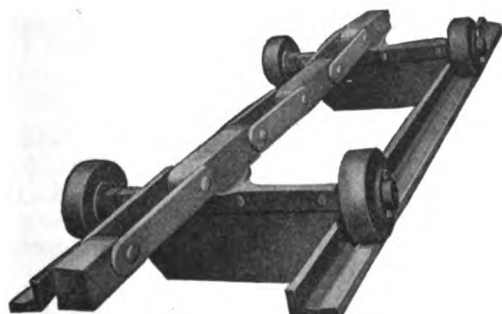


JEFFREY STANDARD BELT CONVEYOR

Standard Scraper Conveyors.

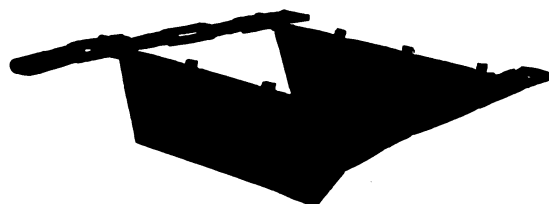
NO. 1 TYPE SCRAPER CONVEYOR

The smallest standard conveyor of No. 1 type has plain cast iron scrapers 10 by 5 in. for handling material 3 in. and under with a maximum capacity of 42 tons of coal per hour, and a maximum length of 150 ft. Four other standard conveyors of this No. 1 type are offered for material up to 5-in. diameter with a maximum capacity of 63 tons of coal per hour and up to 150 ft.



NO. 2 TYPE SCRAPER CONVEYOR

Standard conveyors of No. 2 type are similar to No. 1 type, except the scrapers are larger, made of steel, and are equipped with rollers and heavier chains. Capacity of 48 tons per hour for 3½-in. coal up to 70 tons per hour maximum coal of 5 in. and are made up to 200-ft centers. Similar type is made with wearing blocks instead of rollers.



NO. 3 TYPE SCRAPER CONVEYOR

Double strand plain chain steel standard conveyors of No. 3 type come in four sizes to handle maximum size coal of 9, 12, 14 and 16 in. with capacities of 60, 92, 167, 241 tons per hour respectively, and in lengths up to 200 ft.



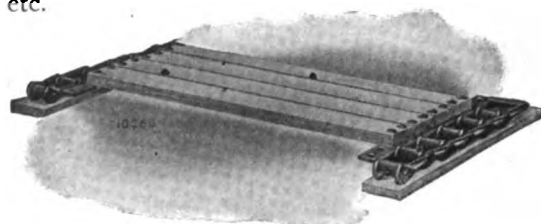
NO. 4 TYPE SCRAPER CONVEYOR

No. 4 type is made in the same general sizes as the double strand No. 3 type, and in most respects is the same, except the various styles of chain are provided with rollers to reduce friction.

Catalogue 257-A.

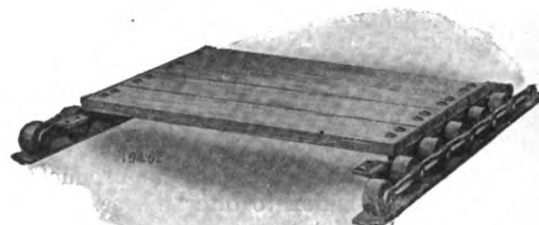
Standard Apron Conveyors.

Standard wood apron conveyors handle large bulk materials, such as packages, bags, boxes, kegs, barrels, etc.



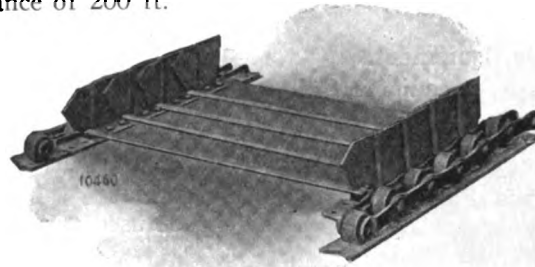
NO. 1 TYPE APRON CONVEYOR

Type No. 1 conveyors are made up with detachable chains and intended for handling packages up to 100 lbs. and for a distance not in excess of 200 ft.



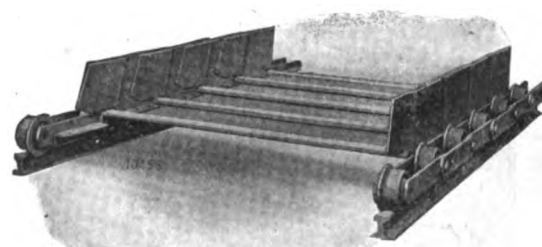
NO. 2 TYPE APRON CONVEYOR

Type No. 2 is made up with roller chains of malleable iron with plain rollers for the lighter loads, and steel thimble roller chains with either plain or flange rollers for heavy work. They are intended for handling packages weighing from 100 to 1600 lbs. for a maximum distance of 200 ft.



NO. 3 TYPE APRON CONVEYOR

Types 3 and 4 handle small loose material. Particularly adapted for use as apron feeders. They consist of two strands of roller chain, either malleable iron as Type 3 or steel thimble roller chain as Type 4, to which are attached double beaded steel flights with steel ends thus forming a continuous trough or apron. Stand-



NO. 4 TYPE APRON CONVEYOR

ard conveyors have a capacity range of from 56 to 1000 tons per hour. Size of material may vary from dust to 24-in. cubes. These standard conveyors may be obtained in any length up to 100 ft.

Catalogue No. 258-A.

LAKE SIDE BRIDGE AND STEEL CO.

Conveying Equipment

406 Villard Avenue
NORTH MILWAUKEE, WIS.

Products.

LABRIDE EQUIPMENT for handling coal, ashes, limestone, sand, salt, etc.

CRANES: Ship Gantry, Wharf, Jib, etc. •

Bridges, Steel Buildings, Coal Tipples, Power Plants, Monorails, Bins, Tanks, Tainter Gates, etc., designed, fabricated and erected.

Engineering Service.

This company has specialized for many years in the design, fabrication and erection of the products listed above, and is in a position to offer the services of its highly trained engineering corps and erection force.

The long experience of these experts enables this company to suggest economies which will lead to substantial savings in both initial investment and in operating expense of the plant or structure under consideration.

Consult these experts, whose services are at the disposal of prospective purchasers without charge. Upon receipt of requirements, they will submit recommendations, detailed plans, specifications and estimates.

Labride Equipment.

Labride equipment offers an economical method of quickly handling coal, whether from car to pile, pile to boiler room, or for quick repiling when the temperature rises; also for storing ashes, gravel or other similar materials at a minimum cost. A hook can be substituted for the bucket and the gantry can be used for general storage purposes.

Hoist can be equipped with an extra drum so that a hook can be used without removing the bucket—a decided advantage where a variety of material is to be handled.

Labride equipment, with one operator, will move coal at the rate of 60 to 100 tons per hour, depending on size of bucket and distance bucket must travel.

It provides *cheap* and *safe* coal storage, does not require skilled labor to operate, operates continuously, eliminates demurrage charges on coal cars, and eliminates labor troubles, as it requires only one operator whose station is in the cab and who is thus protected from the weather. It also eliminates the inefficient, wasteful, old-time shovel-and-wheelbarrow method of handling coal.

Structural Features—No overhung gears used except motor pinion.

Trolley truck bearings are standard M. C. B. bearings with bronze bushings and large oil boxes.

Hoisting drum of latest design with grooves machined from the solid.

All brakes are oversize.

Motors especially designed for crane service.

Electrical equipment of special design for this work, with all of the latest improvements that have proved successful.

Proper provision made for all parts subject to impact and rough usage.

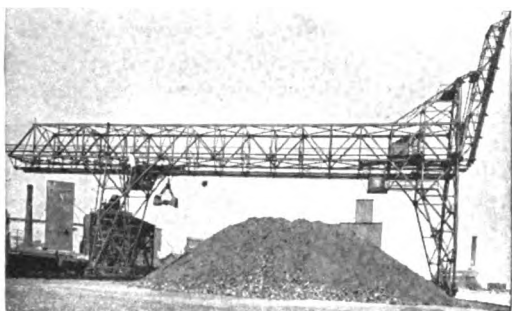
When writing for estimates, give full information regarding requirements, including amount of coal or other material to be handled per day, kind of current and voltage; also submit sketch showing general outline of the yard.



A LABRIDE INSTALLATION EQUIPPED WITH BUCKET FOR HANDLING COAL, AND A HOOK FOR HANDLING STEEL

Labride Gantry for Docks.

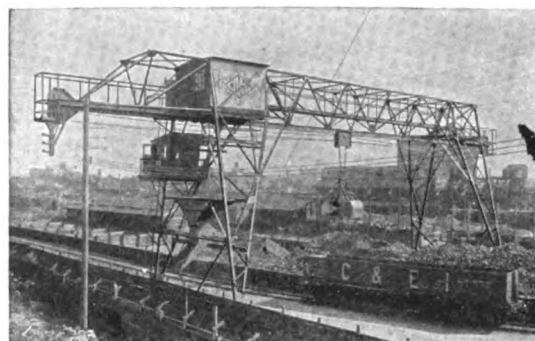
The gantry type of coal bridge is the most successful type for handling and storing coal. It is efficient and speedy, and insures a minimum breakage. This gantry has a capacity of 250 to 300 tons per hour. The span is 166 ft. and the bucket holds 3 tons.



UNITED COAL & DOCK CO.

Labride Gantry for Retail Yards.

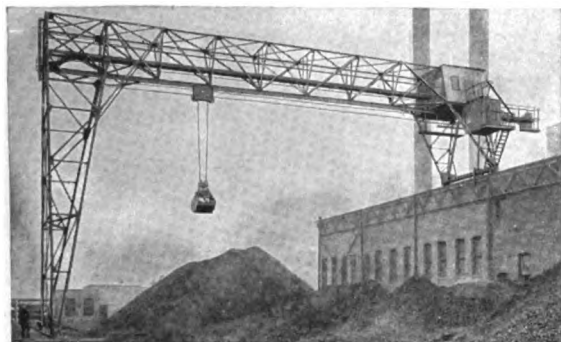
Our Labride coal gantry affords the most economical method of handling coal in a retail yard. It has a large reserve capacity and eliminates all demurrage charges on coal cars. A car can be unloaded in 30 minutes and a truck loaded in 2 minutes.



GREAT LAKES COAL & DOCK CO.

Labride Gantry for Power Plants.

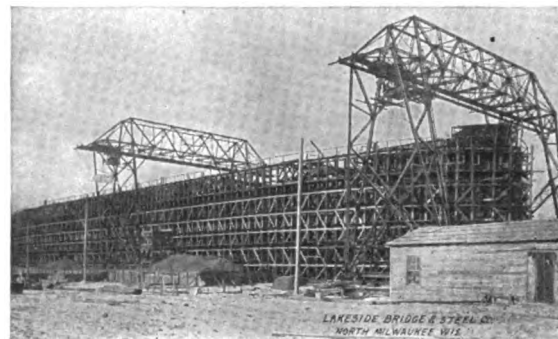
Coal is unloaded from cars directly to the overhead bins above the stokers or to the storage pile. This gantry comprises the entire equipment for handling coal—no conveying machinery inside of the building being necessary.



UNITED STATES GLUE CO.

Labride Gantry for Shipyards.

This type of gantry has proved successful in yards both along the Great Lakes and the ocean. The operator is always over the load and can see it at all times. This saves considerable time and is much safer than where he depends on signals to guide him.



FRED T. LEY & CO.

Jib Cranes.

We manufacture both large and small jib cranes. The large ones in the illustration are used in assembling machinery, tanks, etc. Small ones are used extensively in foundries, machinshops, etc. We have a jib crane at all of our punches and shears.



LAKESIDE BRIDGE AND STEEL CO.

Buildings.

We specialize in mill buildings, power plants, etc., which require engineering services. We are equipped to design and fabricate all kinds of steel structures, coal-ing stations, bins, tanks, monorail systems, tipples; also special machinery for mines, mills, wharfs, etc.



P. B. YATES MACHINE CO.

ROBERT L. LATIMER & CO.

PHILADELPHIA BRANCH OF THE CHAIN BELT COMPANY

Elevating, Conveying and Power Transmission Appliances

24 and 26 North Front Street
PHILADELPHIA, PA.

Products.

Manufacturers of and dealers in REX CHAINS; SPROCKET WHEELS; CLUTCHES; HANGERS; GEARS; PILLOW BLOCKS; ELEVATOR BUCKETS; SCREW CONVEYORS; ELEVATOR CASING; and REX TRAVELING WATER SCREEN.

Also a complete line of General Mill Supplies.

Rex Chains.

Rex chains as illustrated below, are designed to fill all of the varied needs in conveying and elevating chemicals, coal, ashes, stone, sand, etc.

REX CHAIN

TRADE-MARK

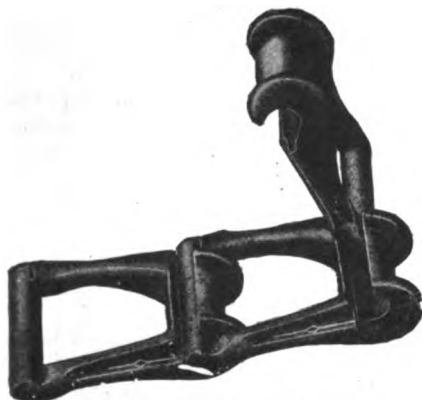
Rex Elevating and Conveying Machinery.

Constructed in several standard types, details of some of which are illustrated on opposite page.

Long experience and excellent manufacturing facilities insure equipment of approved design and construction at attractive prices.

Information.

Prices and further information on our entire line will be, promptly furnished on request.



REX DETACHABLE CHAIN

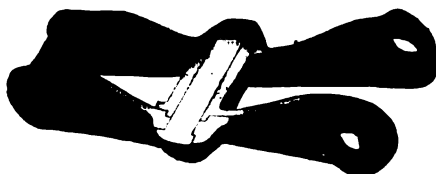
Fills a distinct field where a stronger and more expensive chain would not be permissible. Links changed in a few seconds



DETACHABLE ATTACHMENT LINK
For scraper conveying work

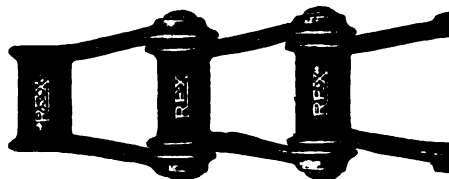


REX GRIPLOCK CHAIN (RIVETED)



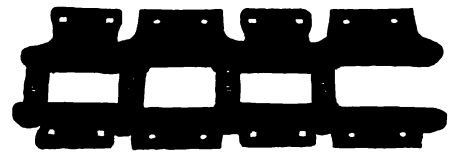
REX GRIPLOCK CHAIN—CROSS SECTION SHOWING THE GRIPLOCK JOINT

For driving and elevating work; especially adapted for heavy service. We can also furnish this chain riveted, pin and cotters or bolted. Some numbers of this chain will run on standard numbers of detachable chain sprocket wheels



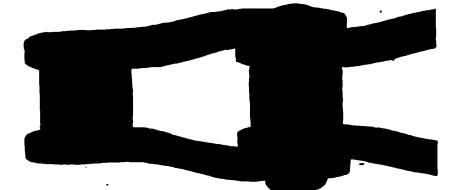
REX PINTLE CHAIN

Used for both driving and conveying purposes where a light, economical and yet strong chain is required. An alternative for and stronger than detachable chain and will operate on detachable chain sprocket wheels. Extensively used with agricultural machinery and canning machinery



REX COMBINATION CHAIN

Has great strength and wearing qualities. Used in cement mills, fertilizer plants, etc.



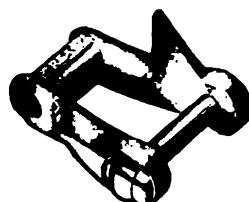
REX CHABELCO CHAIN

An all-steel chain which meets the most difficult conditions. Accurate and standard in pitch. All pins and bushings, case hardened. Great strength and wearing qualities



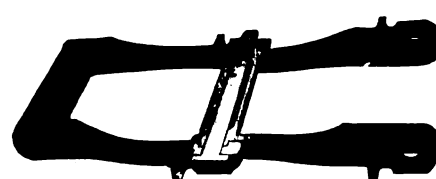
REX GRIPLOCK ROLLER CHAIN

Especially adapted for use with platform and freight conveyors, etc.



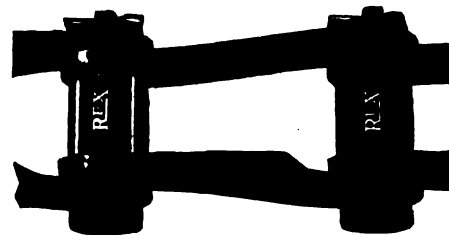
REX RIVETED MILL CHAIN

For both drive or transfer and conveying purposes. Extensively used in saw mills



REX GRIPLOCK CONVEYOR CHAIN

For all types of conveyors, especially saw-dust and refuse



REX LEY BUSHED CHAIN

Adapted for heavy drives and for elevators and conveyors handling ore, sand, coke, etc. Made with case hardened pins and bushings



REX GRIPLOCK RENEWABLE CHAIN

Endures heavy labor of unusual speeds, as drive or conveyor chain. Barrels can be renewed and thus rebuild the chain at small cost



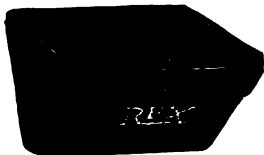
REX TRANSFER CHAIN

Roof top type. Superior to any chain for lumber transfer. Also made in flat top type



TAKE-UPS

Used to take up the slack in belts of elevators and conveyors. Made in 2 styles—A and B



REX MALLEABLE ELEVATOR BUCKET
Style AA

Heavy reinforced front edges and corners increase life of bucket in handling silicious materials. Cast in one piece and carefully annealed



RIGHT HAND SPIRAL JAW CLUTCH

Made in 3-jaw square clutch type also. Furnished in any desired form



REX BEVEL GEARS

All kinds of spur, bevel, miter and worm gearing



SPROCKET WHEELS

Made of high grade refined iron. Also furnished in semi-steel, cast steel and chilled, in which teeth and rim are tempered to an exceeding hardness, leaving the hub of tough cast iron, easily bored and machined



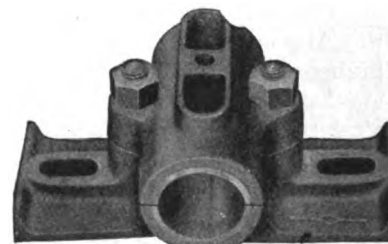
CONTINUOUS TYPE BUCKET

Made in one piece and used on continuous elevators



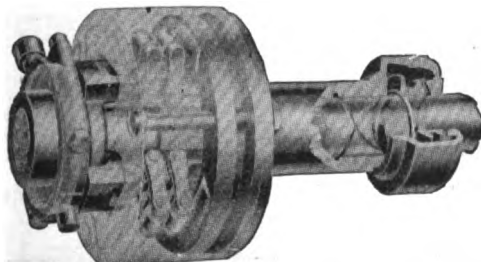
UNIVERSAL DROP HANGER

Adapted for our ring oiling or roller bearing boxes



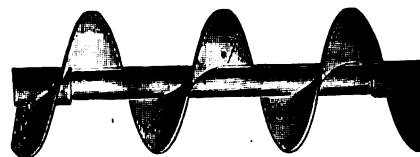
REX FLAT BOTTOM SHAFT BOX OR PILLOW BLOCK

Rigid. Babbitted. Large reservoirs. Liberal lateral adjustment



MULE PULL FRICTION CLUTCH

Antifriction toggles. Self-lubricating shifter collars. For direct driving. Enclosed. Ring oiling



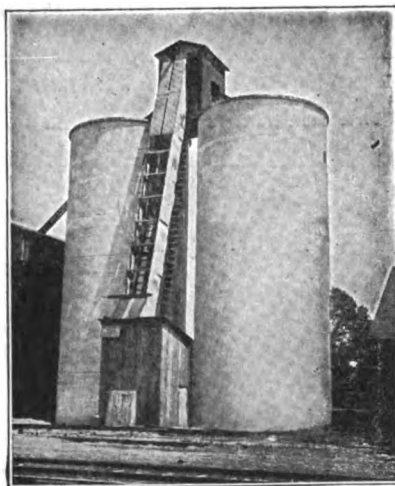
STANDARD STEEL SCREW CONVEYOR

Furnished in standard and special lengths, from 4 to 18 in. in diameter. Also furnished in brass or copper for use in chemical works, tanneries, etc.



SINGLE STRAND TYPE ELEVATOR

Also furnished in double strand



CONCRETE TANKS AND ELEVATOR FOR THE STORAGE OF COAL

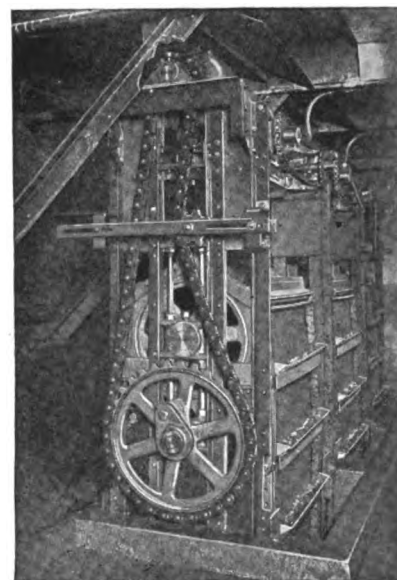
Designed and erected by ROBERT L. LATIMER & Co.

We are engineers and manufacturers of general elevating and conveying machinery for handling coal, ashes, stone, sand, gravel, ice and bulk material



REX STEEL ELEVATOR CASING

Of the most approved design. Furnished in every description



REX TRAVELING WATER SCREEN

Designed to remove foreign material from water. Removes refuse from water to be used in production of steam power or for industrial purposes requiring a large supply of clean water. Also for removing by-products from water for reclamation or to prevent contamination of waterways

THE McMYLER INTERSTATE COMPANY

Manufacturers of Material Handling Machinery

CLEVELAND, OHIO

For Branch Offices, See Page 106

WORKS:
BEDFORD, OHIO

Products and Services.

COAL and ORE LOADERS and UNLOADERS.

COAL and ORE BRIDGES.

CRANES: Barge Fueling, Bridge, Dry Dock, Floating, Gantry, Jib, Shipbuilding Hammerhead.

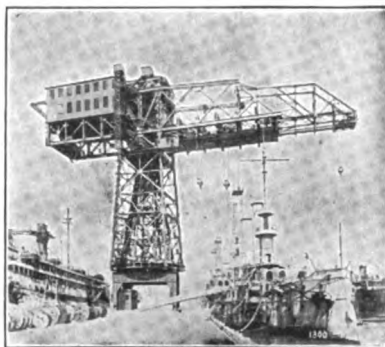
CAR DUMPERS; DERRICK CARS.

PILE DRIVERS; DRAGLINE EXCAVATORS.

Also heavy Forgings, Turntables; Transfer Tables.

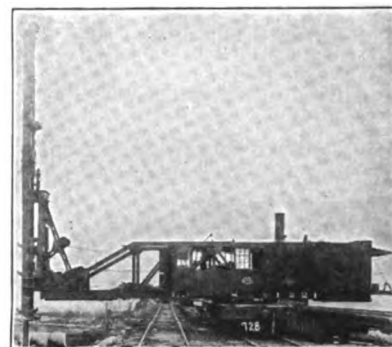
Designers, Fabricators and Erectors of Steel Buildings and Structures.

For Locomotive Cranes, see page 65; for Clamshell Buckets, see page 106.



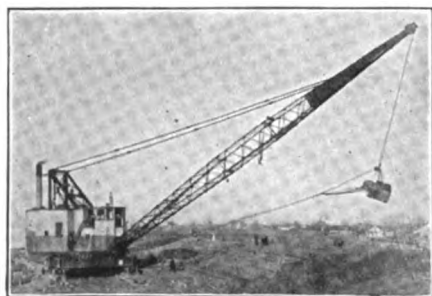
HAMMERHEAD SHIPBUILDING CRANE

Largest in the world. Capacity, 350 gross tons



PILE DRIVER

One of four standard types made by this company



TYPE "P" EXCAVATOR

This crane handles dragline, clamshell or orange peel buckets



A FAST UNLOADING PLANT FOR COAL, ORE AND OTHER MATERIALS



STANDARD RAILROAD DERRICK CAR

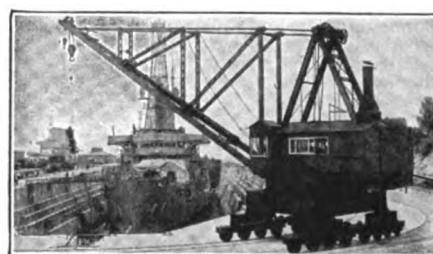


ORE, COAL AND LIMESTONE BRIDGE

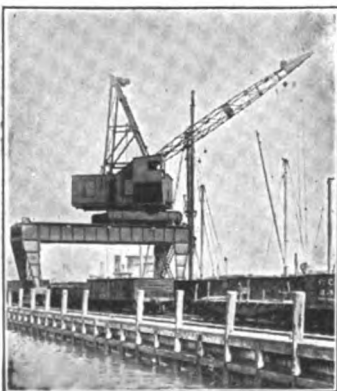


GANTRY CRANE FOR POWERHOUSES

This crane has handled all coal consumed in the mammoth plant of the Firestone Tire & Rubber Company, Akron, Ohio



SPECIAL DRY DOCK CRANE



TYPE "I" GANTRY CRANE

A desirable machine for installation at terminals and docks



TYPE "A" GANTRY CRANE

Operates clamshell buckets or fall blocks. Large number in use at coaling stations on railroads



TYPE "K" BARGE FUELING CRANE

A large number are in operation in and around New York, Philadelphia and Baltimore



STANDARD RAILROAD CAR DUMPER

THE WELLMAN-SEAV-ER-MORGAN CO.

Apparatus for Handling and Transporting Raw Materials and Finished Products,
Steel Works Equipment, Coke Oven Machinery, Rubber Machinery

CLEVELAND, OHIO

BRANCH OFFICES

NEW YORK, N. Y.

DENVER, COLO.

BIRMINGHAM, ALA.

SAN FRANCISCO, CAL.

WORKS: CLEVELAND AND AKRON, OHIO

Products.

MECHANICAL GAS PRODUCERS; ELECTRIC and STEAM MINE HOISTS; MANIPULATORS for Charging Furnaces; RUBBER CALENDERS.

Also manufacturers of:

Coal and Ore Handling Machinery: Traveling Bridges with Grab Buckets; Car Dumpers; Car Haulages; Transfer Cars; Boat Loaders.

Revolving Derricks; Excavating Buckets; Weighing Larries.

Cranes: Pontoon and Gantry.

Hoisting and Mining Machinery: Cages and Skips; Revolving Car Tipples; Akron Chilian Mills.

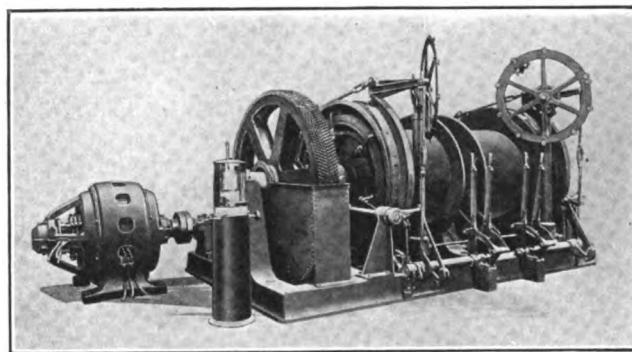
Hydraulic Turbines: Horizontal or Vertical with spiral or steel plate cylindrical casings or for open flume settings.

Steel Works Equipment: Open Hearth Furnaces and Metal Mixers; Charging Boxes; Gas Reversing Valves.

Coke Oven Machinery: Coal Levelers; Door Extractors; Coke Quenchers; Pushers and Loaders.

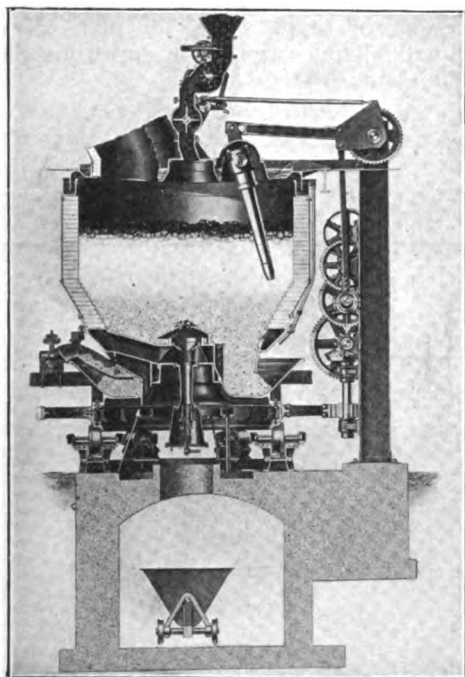
Rubber Machinery: Hydraulic Tire and Vulcanizing Presses; Mixing and Grinding Mills; Tubing Machines; Moulds and Cores; Iron and Steel Castings; Jobbing Work of all kinds.

Port and Terminal Equipment: Machinery for Loading, Unloading and Fueling Ships and for Handling Freight in Sheds.



DOUBLE DRUM HOIST, HIGH TYPE

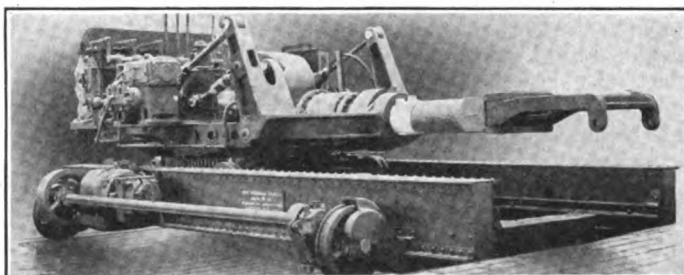
Driven through one reduction of herringbone gears. Fitted with hand operated clutches and post brakes



SECTION, HUGHES MECHANICAL GAS PRODUCER

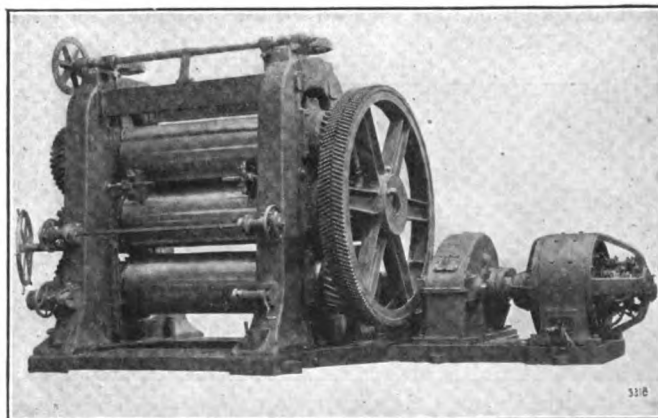
The only machine with the combination of a revolving fuel chamber and ash bed with a reciprocating, water cooled poker.
Will gasify 3000 lbs. of standard bituminous gas coal per hour, gas containing an average of 168 B.t.u. per cu. ft. and with an ash loss of less than 1%

SWEET'S CATALOGUE



TRAVELING WHEEL BLANK MANIPULATOR, WITH REVOLVING TROLLEY

Capacities from 1000 to 6000 lbs.



FRONT VIEW, W-S-M 3-ROLL STANDARD RUBBER CALENDER

AMERICAN MANUFACTURING & ENGINEERING CO.

Manufacturers of Coal Conveyors

GOSHEN, IND.

Products.

PEERLESS COAL CONVEYORS for unloading and re-handling coal and all loose bulk material.

Description and Adaptability.

The Peerless conveyor consists of a $1\frac{1}{2}$ -yd. clamshell bucket operated by a 2-ton electric driven Peerless hoist on monorail track.

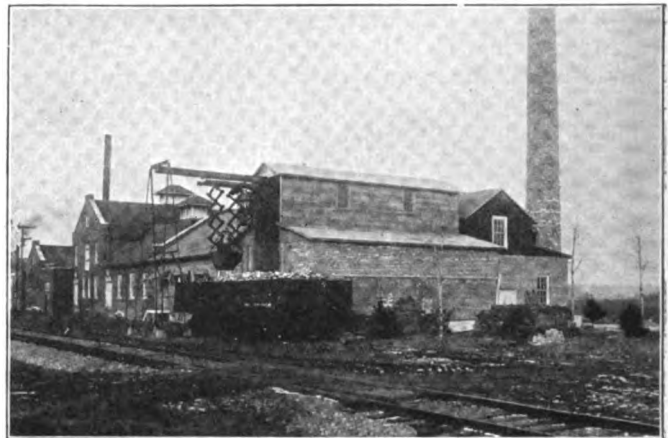
The Peerless conveyor is adaptable for handling all loose bulk material, such as coal, coke, crushed rock, sand, gravel, etc. By substituting a platform or box for the clamshell bucket, it can also be used for conveying and storing other heavy materials both in the yard and in the manufacturing plant. The Peerless hoist will travel around curves. In the track layout it is possible to use either two- or three-way switches.

Advantages and Details.

The Peerless conveyor gives all of the advantages of the clamshell bucket type of conveyor, plus exclusive advantages of its own, at about one-half the price of the conventional heavy designed clamshell bucket telfer conveyor. The Peerless $1\frac{1}{2}$ -yd. clamshell bucket weighs 1500 lbs., yet it will dig in and pick up as much material as a 4000-lb. bucket. This is accomplished by means of extension arms that hold the bucket down while it is being closed and filled. These hold-down extension arms are an exclusive invention of our own.

The hold-down extension arms have further advantages; they steady and control the bucket so that the operator is able to place the bucket in the most exacting position. Furthermore, they greatly simplify the construction of the bucket. This is what makes it possible to quote the Peerless conveyor equipment at about one-half, or less than one-half, of the price of the other telfer conveyors doing the same work.

The Peerless bucket is extremely simple in design, yet it accomplishes all that any other clamshell bucket

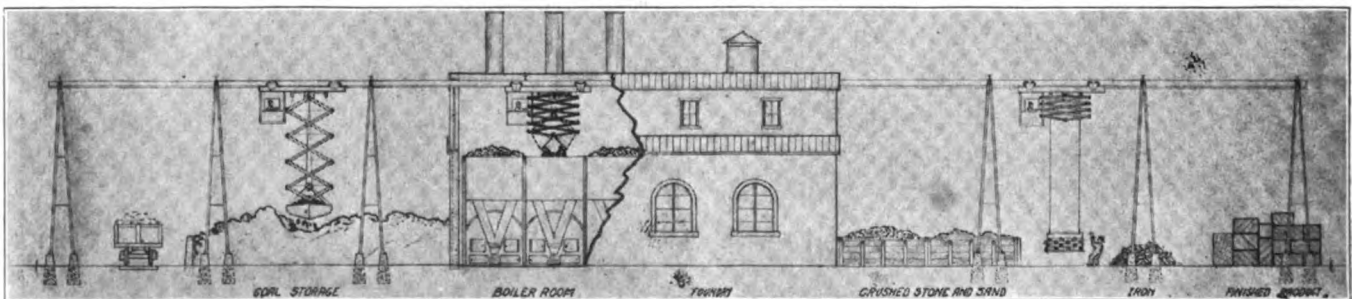
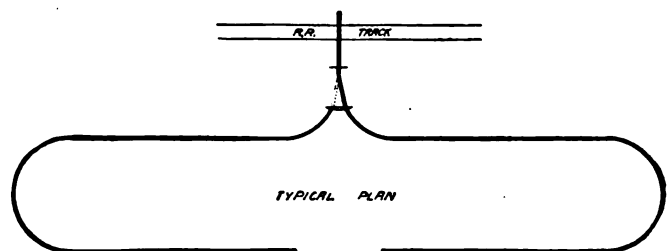


PEERLESS CONVEYOR IN OPERATION

will do. The bucket is hoisted and operated by means of three cables, which keeps the bucket central and eliminates the necessity of counterweights to balance the bucket. The Peerless hoist is equipped with two electric motors, one for hoisting and one for track travel.

Literature and Estimates.

On receipt of rough sketch or plans of requirements, we will submit estimate on entire installation in new or old plants.



ELEVATION AND PLAN OF PEERLESS COAL CONVEYOR

CONVEYORS CORPORATION OF AMERICA

FORMERLY AMERICAN STEAM CONVEYOR CORPORATION

Overhead Trolley Carriers

326 West Madison Street
CHICAGO, ILL.

110 West 40th Street
NEW YORK, N. Y.

ENGINEERING SALES OFFICES IN PRINCIPAL CITIES

Products.

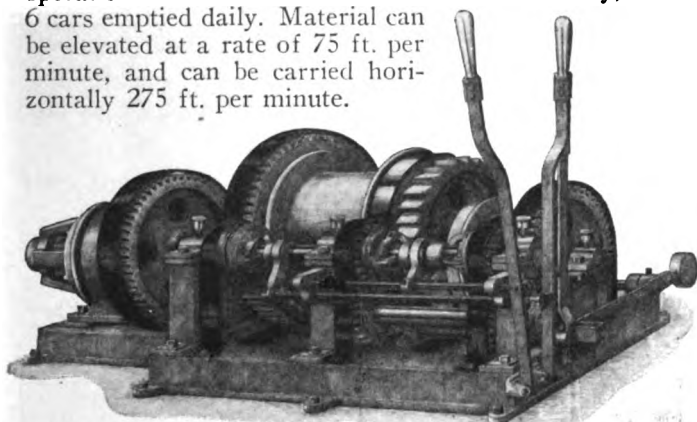
AMERICAN TROLLEY CARRIERS for handling coal, ash, sand, gravel, limestone, and other loose, bulky materials.

For Steam Jet Ash Conveyors, see page 728.

American Trolley Carrier.

Description—Consists of either single-line, bottom dump bucket operated on overhead monorail track or cableway by 2-drum hoist; or of 2-line grab bucket from $\frac{3}{4}$ - to 4-cu. yd. capacity, operated in same manner by 3-drum hoist.

Operation—One man handles conveyor in all its operations—30 tons of coal can be handled hourly, 5 or 6 cars emptied daily. Material can be elevated at a rate of 75 ft. per minute, and can be carried horizontally 275 ft. per minute.



TWO-DRUM HOIST

Advantages—American trolley carriers transport coal from railway car to storage pile, then to bunkers or boiler rooms, or directly from railway car to bunkers. Materials are easily carried over such obstructions as railroad tracks and rivers.

Two Types—Whether cable or monorail conveyor should be used depends on the engineering features of the installation.

MONORAIL—A more rigid type requiring heaviest structural work and concrete footing. This is the type usually installed. We recommend structures of steel, obtainable in heights of 30, 35, 40, 45 or 50 ft.

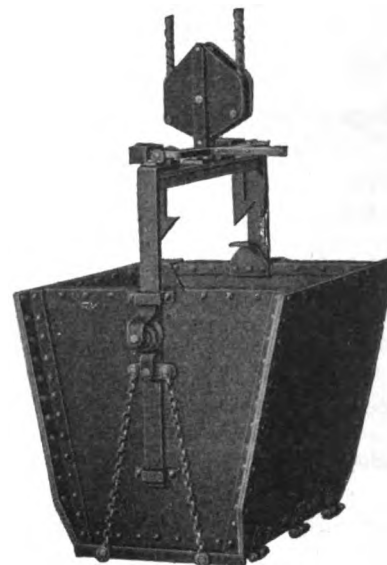
CABLE—A lighter equipment, especially adaptable

for moving material across such obstructions as rivers, railroad tracks, etc.

Bucket—Type B bucket is self-dumping, self-closing, of 1-ton capacity. It can not be accidentally dumped. Opening and closing of bucket acts independent of weight or contents. A angle iron protects mechanism at side and doors. No springs or sensitive parts.

Hoist—While using the 2-drum hoist, the operator is not obliged to move from his station. Hoist is strong and substantially made. Compact in arrangement. Faces of gears double width. Friction wedge type clutches. Extra wide break band.

Hoist may be driven by electric motor, steam or gasoline engine. Direct gear connection is used, unless local conditions make belt or chain drive desirable.



GRAVITY BUCKET

Flexibility of Design.

The American trolley carrier can be designed to meet the building conditions of practically any yard or power plant.

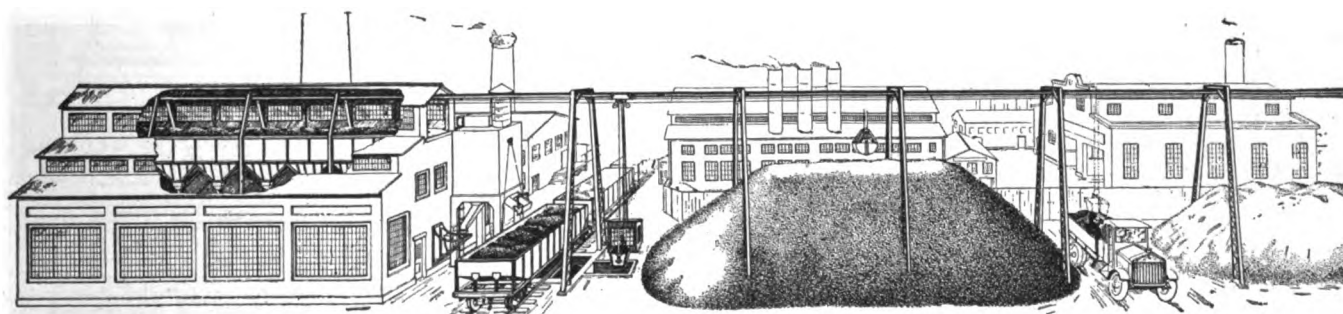
Engineering Service.

Our Engineering Department is entirely at the service of those having conveying problems. Send sketch, showing location of railway siding, unloading point, pile, silos, pockets or bunkers, together with measurements of distances between points.

Estimates will be furnished without obligation.

Literature.

Catalogue sent on request. Mention SWEET'S ENGINEERING CATALOGUE.



GENERAL LAYOUT OF AMERICAN TROLLEY CARRIER

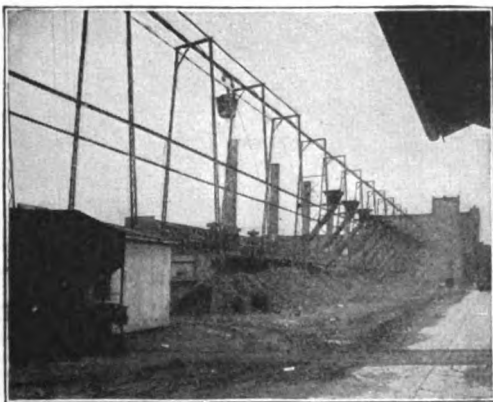
The "new heart" of the Godfrey conveyor is this company's latest hoist, its "salient points" being:

- (1) Extreme ease of operation and perfect control by operator.
- (2) Large hoisting drum driven by raybestos-faced clutch.
- (3) Reversible traction drum driven in either direction by raybestos-faced clutches.
- (4) Both drums bronze bushed revolving on heavy stationary steel shaft.
- (5) Adjustment for taking up clutch wear.
- (6) Wide raybestos-lined brake bands operated from foot pedals.
- (7) All castings carefully machined in the Godfrey factory.
- (8) All gears machine cut.

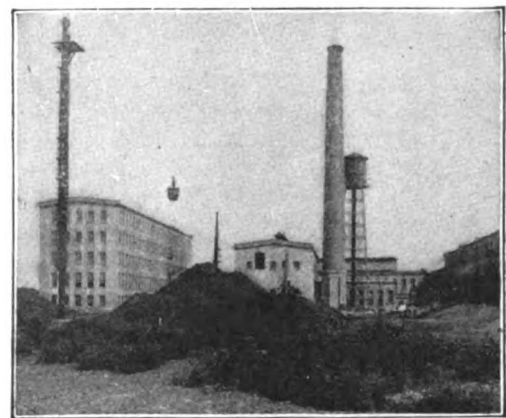
- (9) Quietness of operation due to elimination of ratchet brake and chain driven gears.
- (10) Both hoisting and traction levers at operator's finger tips.
- (11) Excess factor of safety in every part
- (12) Practically "foolproof."

Deliveries.

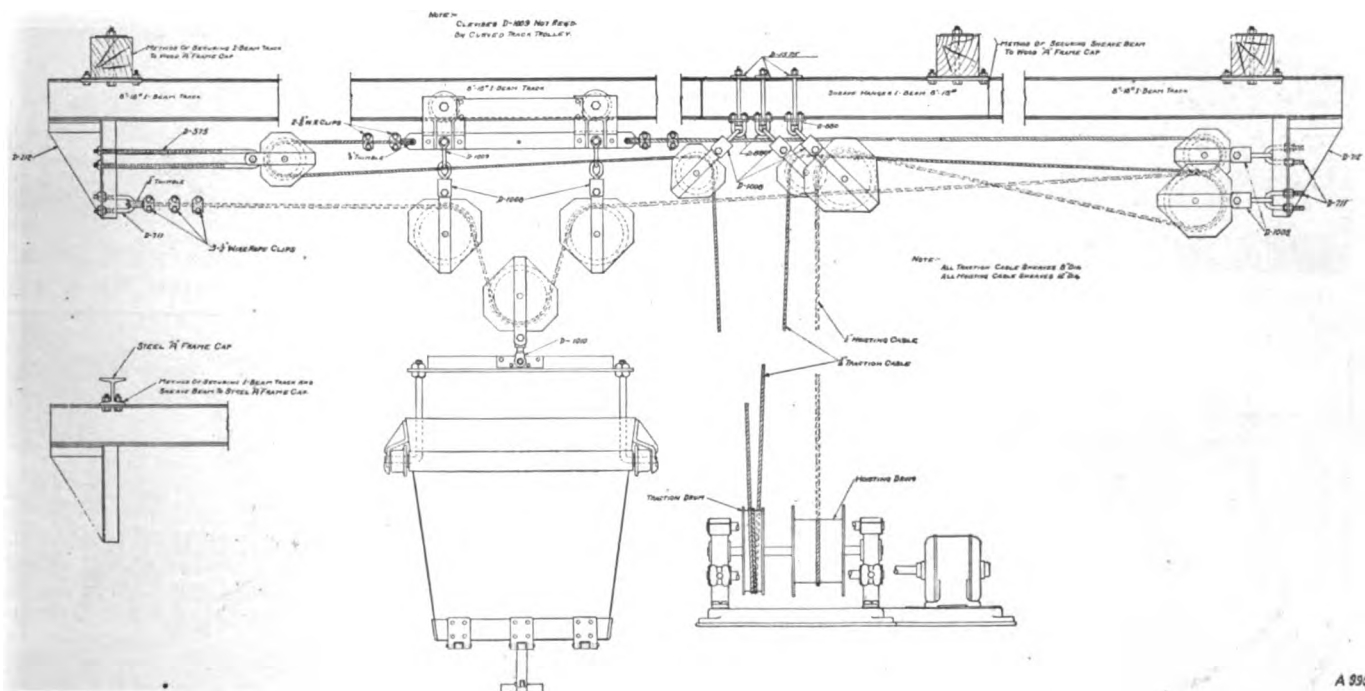
This company, due to large and efficient production facilities, is in a position to maintain a schedule of prompt delivery on its equipment. This, added to the low cost of installation and operation of its conveyor, has made possible a quick solution of conveying problems for many industries that handle coal or other materials.



I-beam Installation
A GODFREY CONVEYOR UNLOADING COAL FROM CARS TO
SELF-FEEDING STOKERS



Cableway Installation
A GODFREY CONVEYOR OPERATING BETWEEN COAL DUMP
AND BOILER ROOM



DETAILS OF CABLE INSTALLATION OF THE GODFREY CONVEYOR

C. L. INSLEE

W. G. HUDSON

EDWARD BURNS

W. W. RICKER

GUARANTEE CONSTRUCTION COMPANY**Coal and Ash Handling Equipment**144 Cedar Street
NEW YORK, N. Y.**Products and Services.**

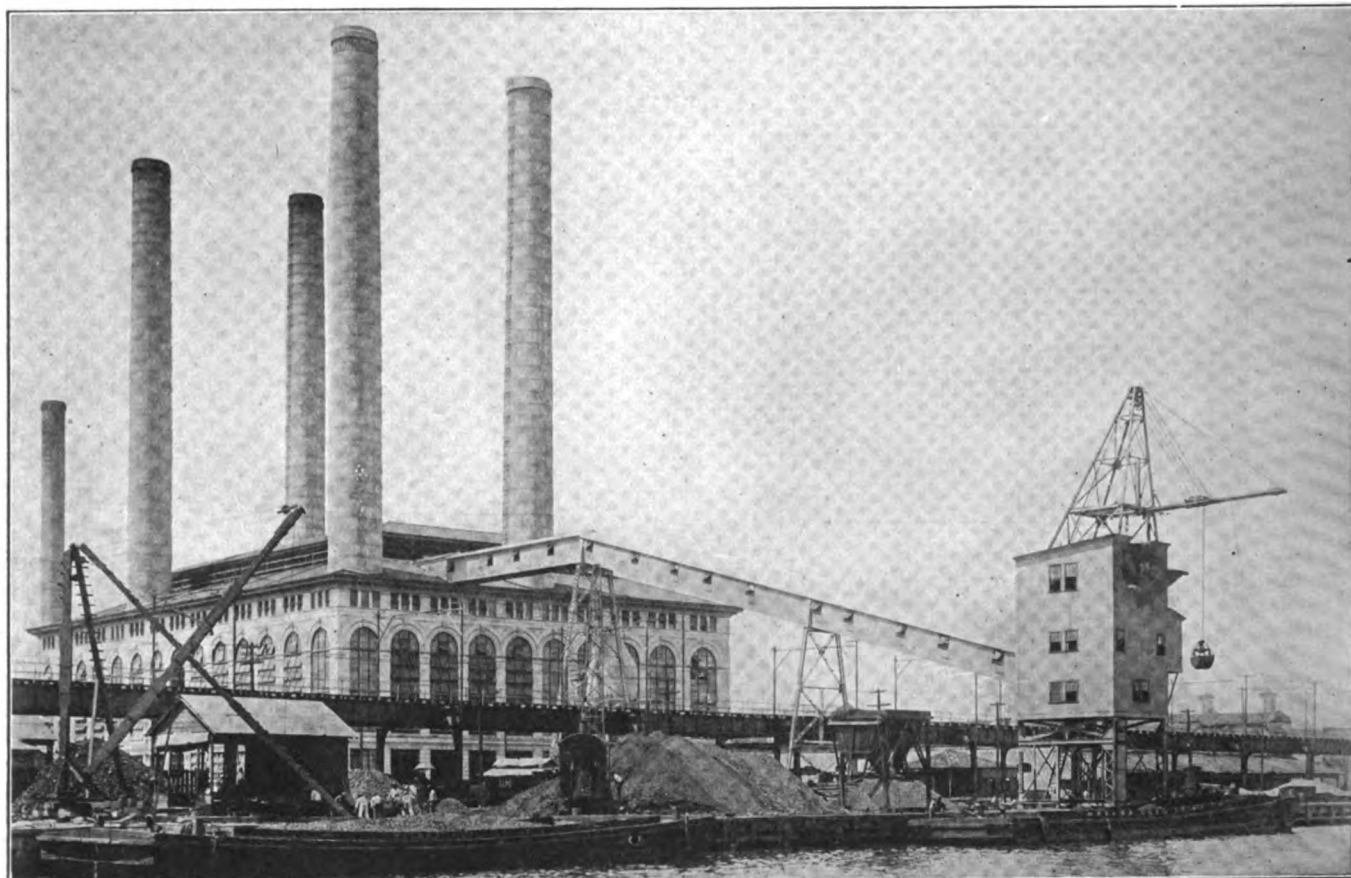
COAL, ASH, and MATERIALS HANDLING EQUIPMENT; SKIP HOISTS; PNEUMATIC CONVEYORS.

Also, Storage Bins and Bunkers of Timber, Steel and Reinforced Concrete.

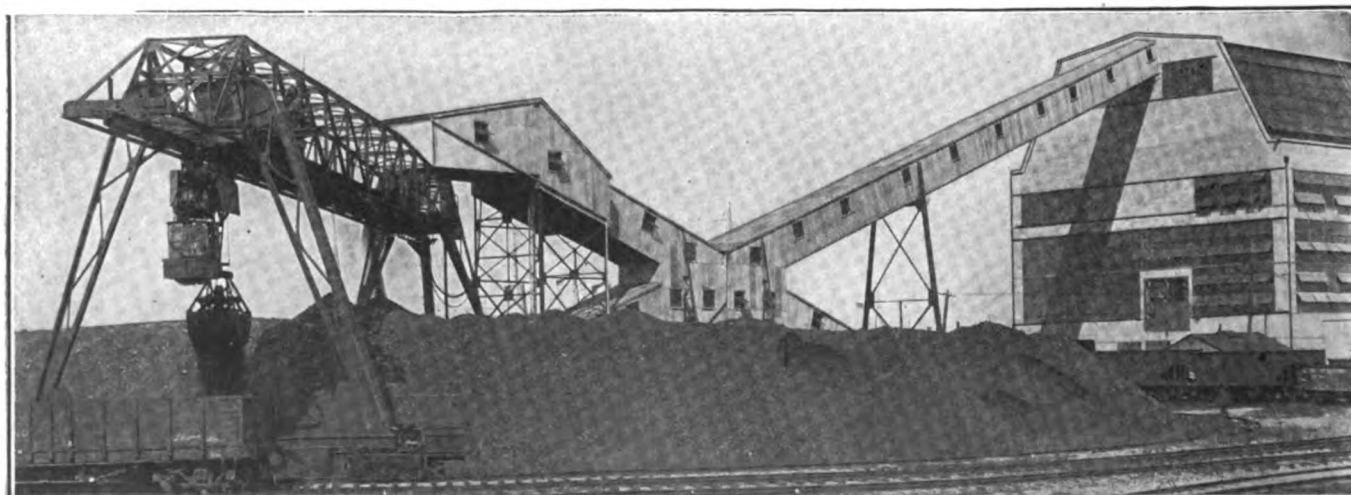
Nineteen years' experience in handling and storing materials has taught this company how to

design storage bins for maximum capacity at lowest cost; how to use conveyors and hoists to save labor; and how to arrange the building and equipment so that the simplest and most efficient conveyors can be used.

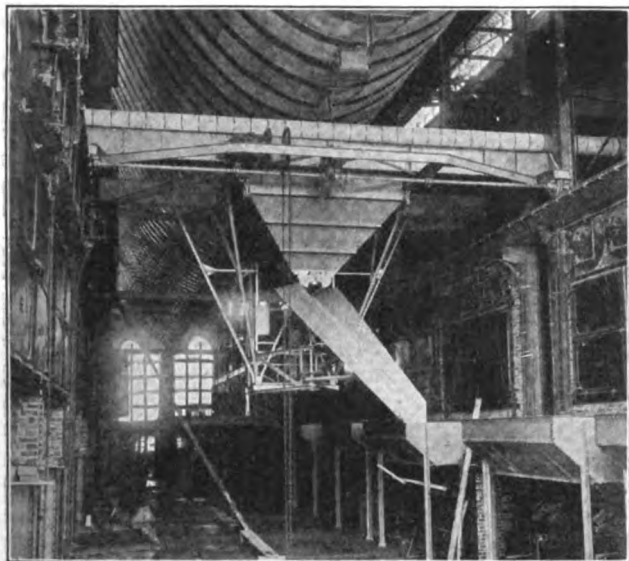
For Mill, Power Plant and Factory Construction, see page 17.



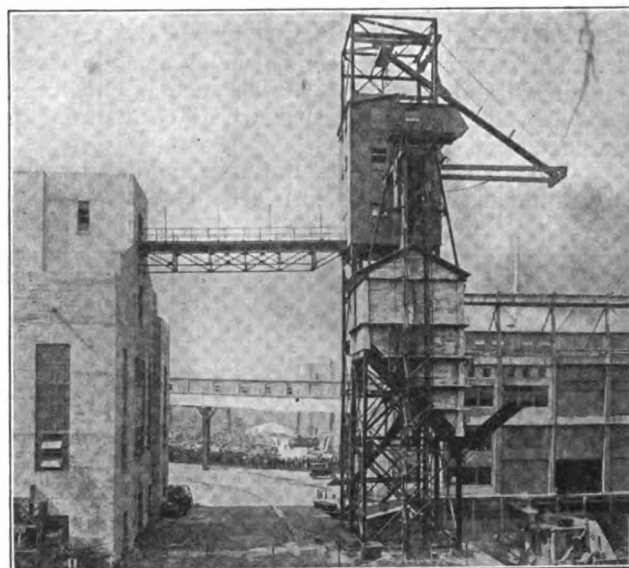
COMPLETE UNLOADING, WEIGHING, CRUSHING AND STORAGE EQUIPMENT WITH A CAPACITY OF 150 TONS PER HOUR



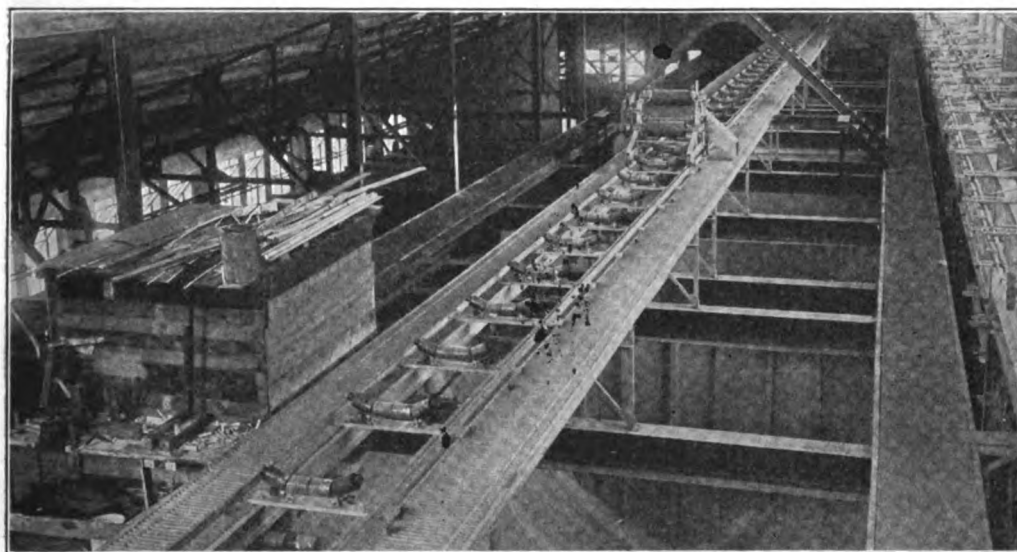
POWERHOUSE, COAL HANDLING SYSTEM, AND PIVOTED BRIDGE WITH GRAB BUCKET FOR RESERVE GROUND STORAGE—CAPACITY 150 TONS PER HOUR



WEIGHING LARRIES, $\frac{1}{4}$ TO 20 TONS CAPACITY



INCLINED BOOM COAL TOWER FOR CAPACITIES UP TO 100 TONS PER HOUR



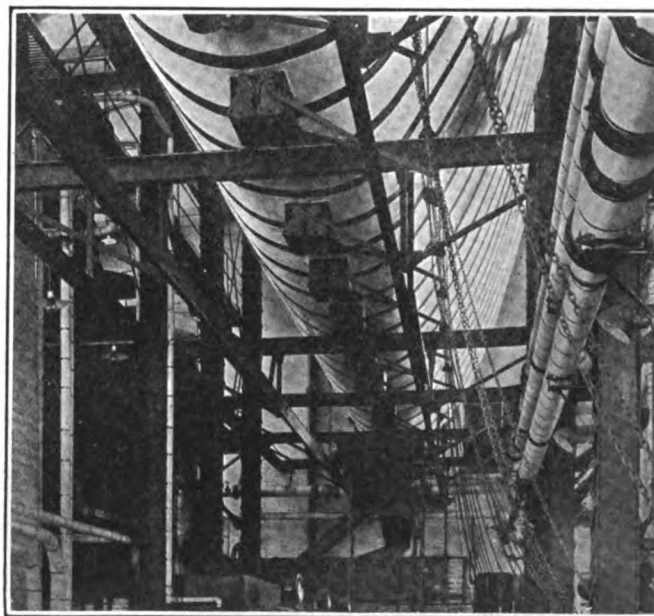
BELT CONVEYOR FOR 200 TONS PER HOUR CAPACITY, IN COURSE OF ERECTION, WITH SUSPENDED BUNKER BENEATH



AUTOMATIC AND SEMI-AUTOMATIC SKIP HOISTS



COAL AND ORE UNLOADING EQUIPMENT SYSTEM, ELECTRICALLY OPERATED



CONCRETE SUSPENSION TYPE STORAGE BUNKERS
Have been in service twenty years with no evidence of depreciation

The Airveyor (Pneumatic Conveyor).

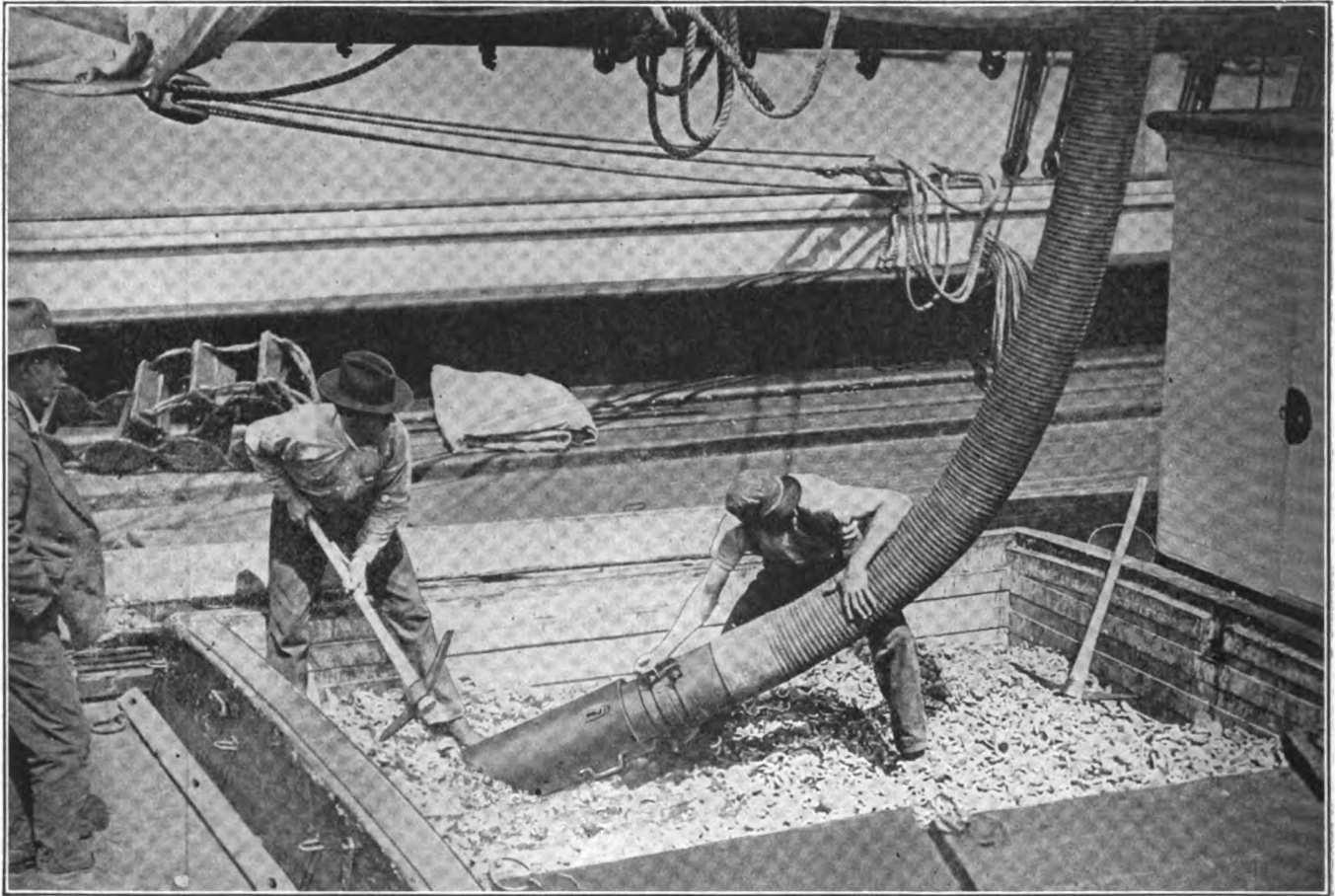
The most efficient means of handling and conveying pulverized and granular materials such as lime, cement, soda ash, coke, charcoal, ashes, wheat, corn, grains, food products, etc.

With the Airveyor the nuisance and hazard of dust are eliminated, and labor costs greatly reduced.

It has no moving parts except the motor and exhaustor, and the cost of upkeep is exceptionally low.

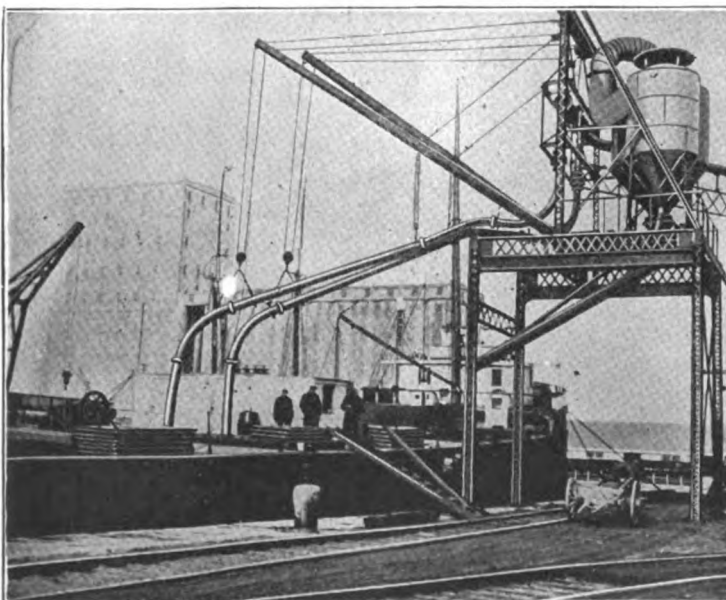
Literature.

Separate bulletins—"The Economical Handling and Storage of Coal, Ashes and Other Materials," and "The Airveyor"—will be sent on request.



"AIRVEYOR" UNLOADING BULK CARGO OF COPRA ON THE PACIFIC COAST WITH ONE-THIRD THE NUMBER OF MEN AND MAKING A NEW RECORD FOR SPEED OF HANDLING

The equipment involves car loader. Box cars are loaded to maximum capacity by blowing material at high velocity



REVERSIBLE PNEUMATIC CONVEYOR FOR TRANSFERRING GRAIN FROM BOATS OR CARS TO STORAGE ELEVATOR AND FROM STORAGE ELEVATOR BACK TO BOATS

SWEET'S CATALOGUE



AIRVEYOR UNLOADING BOX CAR CONTAINING SODA ASH

This solves a most difficult problem in material handling. Note the absence of dust; capacity, 8 to 30 tons per hour

THE UNIVERSAL CONVEYOR CO.

SOUTH BEND, IND.

Products.

Manufacturers of the UNIVERSAL CONVEYOR for handling coal, coke, sand, gravel, etc.

Universal Conveyor.

Very simple in construction and operation. The coal or other material flows by gravity from the bottom of the railroad car into a track hopper from which the bucket is filled, is elevated out of a shallow pit, and conveyed to storage or boiler house. The trolley or carriage is of the side-draft type, permitting the placing of intermediate track cable supporting frames each 100 ft. This construction gives the advantage of the monorail system, inasmuch as the sag or deflection is largely taken care of. The trolley glides smoothly over the point where the cable is supported.



Specifications.

Towers—Constructed of expanded steel beams, giving great strength.

Anchorage—Piers of concrete are designed for each type of tower. Special specifications are made for each installation.

Cable—The track cable consists of two types—locked coil track cable and aerial tramway cable. The hoisting and traction ropes are each $\frac{3}{8}$ -in. in diameter and are extra flexible for operating over sheaves.

Trolley—The trolley or carriage is 3 ft. 10 in. long. Its sheaves or wheels which ride on the track cable are 12 in. in diameter, turning on 1½-in. axles. They are bronze bushed.

Sheave Blocks—12-in. bronze bushed sheaves are used in all sheave blocks, except in the bucket block where a 14-in. sheave is used.

Bucket—The bucket is made of heavy tank plate steel, hot riveted. Weight, 600 lbs., equipped with patented dumping device. A trunnion on each side causes the bucket when lowered to glide over guides down to the chute for filling.

Power—Electric motor of standard make. Gasoline engine can be furnished if necessary.

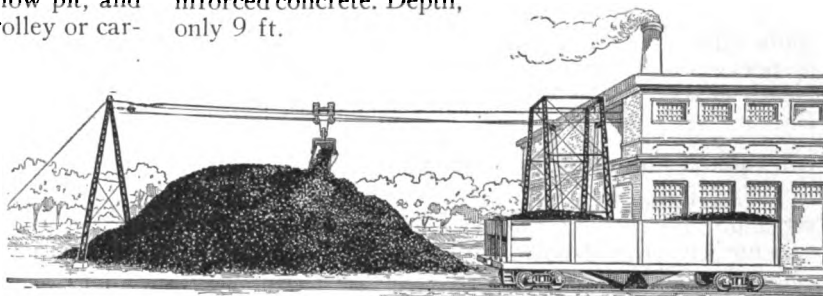
Steel Chute—Of the undercut type, made of $\frac{3}{16}$ -in. plate steel.

Saddles—Designed for supporting track cable; will not interfere with operation of trolley.

Turnbuckle—Designed to maintain a uniform tension on track cable.

Lubrication—Ample provision for efficient lubrication. All accessible bearings fitted with grease or oil cups; inaccessible bearings are provided with self-lubricating bronze bushings.

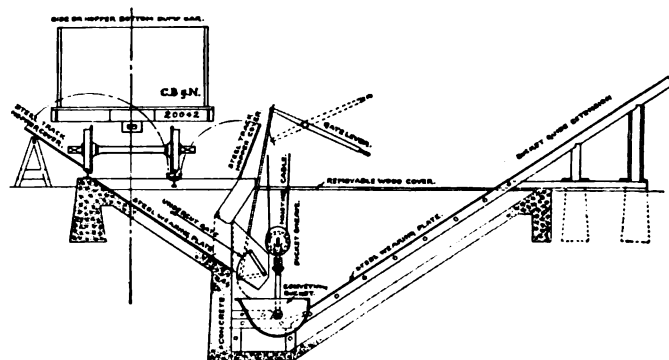
Pit—The standard Universal pit contains approximately 15 cu. yds. of reinforced concrete. Depth, only 9 ft.



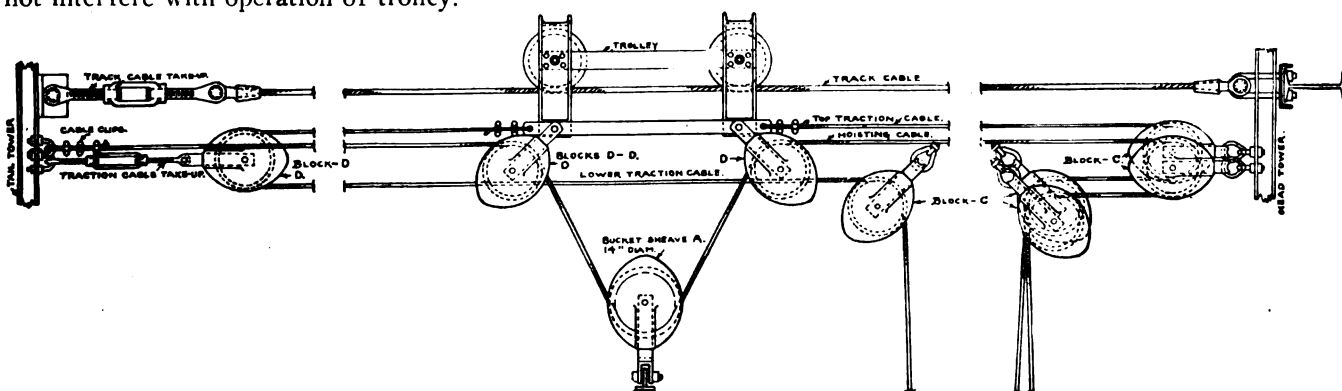
TYPICAL FACTORY INSTALLATION OF UNIVERSAL CONVEYOR

Engineering Service.

The services of this company's Engineering Department are at the disposal of engineers, architects and prospective users. Send rough layout showing location of siding, storage space, bins, and give approximate annual tonnage of coal or other material handled. From this data, an estimate will be prepared showing cost of installation of a Universal conveyor. This service is without charge or obligation.



OPERATING DIAGRAM UNIVERSAL CONVEYOR, SHOWING
DETAIL OF TRACK HOPPER AND PIT



DETAIL OF CABLE REEVING, UNIVERSAL CONVEYOR

FOUNDED 1880

THE BROWN HOISTING MACHINERY CO.

Manufacturers of Coal and Ash Machinery and Bins

MAIN OFFICE AND WORKS
CLEVELAND, OHIO

BRANCH OFFICES

NEW YORK, N. Y., 50 Church Street
CHICAGO, ILL., 208 South La Salle Street

PITTSBURGH, PA., Oliver Building
SAN FRANCISCO, CAL., Monadnock Building

EUROPEAN REPRESENTATIVE, H. E. HAYES, 12 Rue de Phalsbourg, PARIS, FRANCE

Products.

BROWNHOIST PATENT SUSPENDED BIN;
BROWNHOIST COAL and ASH HANDLING MACHINERY; BROWNHOIST WEIGHING LARRY.

For Locomotive Cranes, see pages 60-61; for Grab Buckets, see pages 96-97.

Brownhoist Patent Suspended Bin.

The Brownhoist patent suspended bin is a concrete bin for storing coal and ashes. It consists of two horizontal steel plate girders supported by upright columns, and from these girders the bin structure is suspended. At intervals of from 3 to 5 ft. steel straps, which are parabolic in shape, are hung from these girders. To the inside of these straps, our patent solid-sheet-steel reinforcement Ferroinclave is bolted, a wooden strip being placed between the Ferroinclave and the straps to prevent corrosion.

When the Ferroinclave is in place, the inside is first coated with concrete, a mixture 1:2:4 of cement,

BROWNHOIST

TRADE-MARK

sand and broken stone, all stone to pass a $\frac{1}{2}$ -in. mesh. The thickness of this lining varies with the span and loading. When this has set, the outside is covered with a mixture 1 to 2 of cement and sand with an addition of a little goat hair.

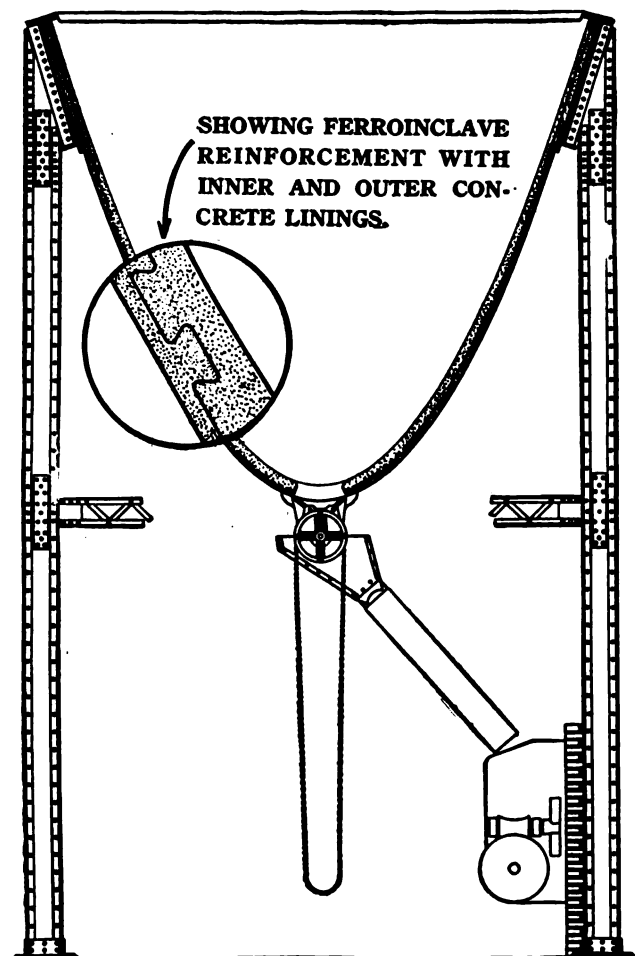
Capacities—The capacities depend upon the requirements of the customer, but they range from 1 to 20 tons per lin. ft.

Advantages—This bin lasts a lifetime, as all the steel is protected by the concrete; is fireproof; holds a maximum amount of coal in minimum space; is practically self-emptying; low cost of operation; makes a clean and neat boiler room.

Gates and Spouts—The bin is equipped with Brownhoist gates and spouts. The gates are easily operated from the floor, and are automatically locked when closed and when opened the full width. There are three kinds of spouts: the swinging, the stationary, and the stationary angle—which one to use depends upon requirements of the plant.



VIEW OF BROWNHOIST COAL BIN
SHOWING DISTRIBUTING SPOUTS



SECTIONAL VIEW OF BROWNHOIST CONCRETE COAL BIN

SWEET'S CATALOGUE

Weighing Larry.

A Brownhoist weighing larry can be put beneath the bin, and it will weigh every pound of coal as it passes to the stokers.

Coal and Ash Handling Machines.

Brownhoist coal and ash handling machines, of various types and designs, consist of the locomotive crane, man trolley, overhead traveling crane, gantry crane, and bridge crane—all used with Brownhoist buckets or tubs.

Estimates, etc.

On receipt of plans and requirements, we will submit estimates on the entire installation in new or old plants. Many views of the bin and machines in use are shown in our catalogue "S."

CRAINE SILO COMPANY, INC.

Manufacturers of Storage Pockets and Tank

EXECUTIVE OFFICE AND FACTORY
NORWICH, N. Y.

Products.

CRAINE MULTIPLE WALL STORAGE POCKETS and CRASCO INDUSTRIAL SILOS, for storing coal, coke, clay, lime, ashes, gravel, cinders, dry chemicals, sand, shavings, trap rock, crushed ore, crushed slate, etc.



Storage Problems.

In order to obtain the most economical means for storage and handling of materials involved in an industry, all the factors peculiar to that particular industry must be considered.

The CRAINE SILO COMPANY furnishes storage systems based upon recommendations of its engineering department, which is acquainted with many of the factors peculiar to the various industries which are involved in the solution of any particular storage problem.

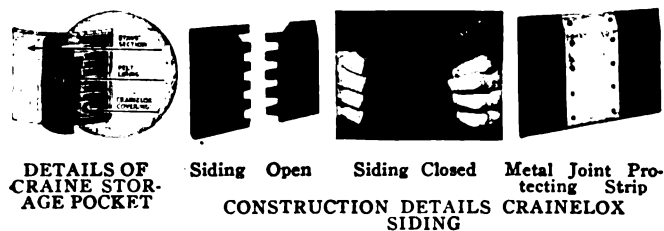
Why Craine Engineers Can Help You.

Many years of specialized study and the handling of varied problems have developed in the Craine engineering department a broad experience that should prove of value in your own particular problem. To make Craine service complete, our engineers have the cooperation of conveying machine specialists. This is of great importance as these two elements are correlated and interdependent.

Craine Multiple Wall Storage Pockets.

For a substantial, permanent, absolutely dry storage construction, the Craine multiple wall storage pocket covers every need.

Construction—Craine storage pockets while varying to suit conditions are all built upon the multiple wall principle—an inner cylinder of upright wood staves, over which is laid a layer of weatherproof and waterproof insulating felt. The whole is then bound with



CRAINE MULTIPLE WALL STORAGE POCKETS
Two 20 x 30-ft. pockets installed at Rutherford, N. J., for the Flint-kote Co., manufacturers of asphalt shingles and roofings

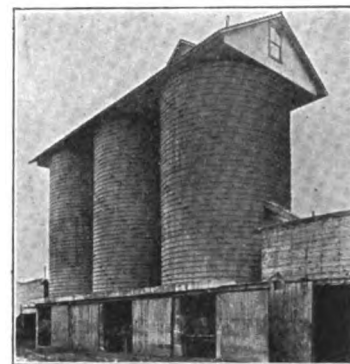
one or more layers of Crainelox spiral wood hooping, which forms a continuous binding like the wire around a gun barrel. They are securely joined by a patented interlacing endlock. The hoops of sheathing overlap and the sheathing as a whole overlaps the concrete water table, thus shedding water away from the structure.

Advantages—The Crainelox interlacing spiral hooping is a patented, exclusive, and superior type of construction. The high tensile strength of the wood fibers, and the continuous spiral binding, firmly locked, result in uniformly great strength over every inch of the structure. As the spiral hooping may be applied in several layers, this provides great flexibility. No condensation of moisture on the inside during rapid temperature changes. Not susceptible to the disintegrating effects of fumes and chemicals.

Crasco Industrial Silos for Coal Storage.

The Crasco silo meets the need of a storage pocket at a somewhat lower initial cost. It is accurately designed and well manufactured.

Construction—Crasco industrial silos consist of a cylinder of grooved staves, bound at intervals by steel rods. This permits of great flexibility in construction as the number of steel rods is determined by the nature of materials stored, weight, angle of repose, etc. Made of finest grade of well seasoned spruce or Oregon fir and held with steel rods of highest tensile strength.



INSTALLATION OF CRASCO SILOS
USED FOR COAL STORAGE

Data Required for Estimating.

We will be pleased to submit without cost, tentative plans, specifications and estimates after being supplied with necessary data. While it is usually more satisfactory to have one of our engineers look over the ground, we are prepared to furnish preliminary estimate upon receipt of the following information:

(1) Material to be stored and handled. (2) Storage capacity desired. (3) Hourly handling capacity desired. (4) Rough sketch showing ground conditions where plant is to be located.

CAPACITIES FOR COAL POCKETS

Diameter, ft.	Height, ft.	Cap., net tons, 52 lbs. to cu. ft.	Diameter, ft.	Height, ft.	Cap., net tons, 52 lbs. to cu. ft.
14	24	96	18	26	172
14	26	104	18	28	185
14	28	112	18	30	198
14	30	120	18	32	212
16	24	125	18	34	225
16	26	135	18	36	238
16	28	146	20	30	245
16	30	157	20	32	261
16	32	167	20	34	278
18	24	158	20	36	294

ALVEY MANUFACTURING COMPANY

Conveying and Elevating Machinery

ST. LOUIS, MO.

BRANCH OFFICES

NEW YORK, N. Y.
LOS ANGELES, CAL.

DETROIT, MICH.
CLEVELAND, OHIO

CHICAGO, ILL.
SEATTLE, WASH.

BOSTON, MASS.
BUFFALO, N. Y.

ATLANTA, GA.
PHILADELPHIA, PA.

Write or telephone nearest office

Products.

AMCO BALL BEARING GRAVITY CONVEYORS;
AMCO BELT CONVEYORS; AMCO ROLLER SPIRALS;
AMCO ALL-STEEL OPEN and ENCLOSED TYPES SPIRAL
CHUTES; AMCO AUTOMATIC VERTICAL ELEVATORS;
AMCO APRON CONVEYORS; AMCO POWER CONVEYORS;
AMCO PORTABLE ADJUSTABLE INCLINE CONVEYORS.

Also manufacturers of Ash Hoists, Bucket Conveyors, etc.

TRADE
AMCO
MARK

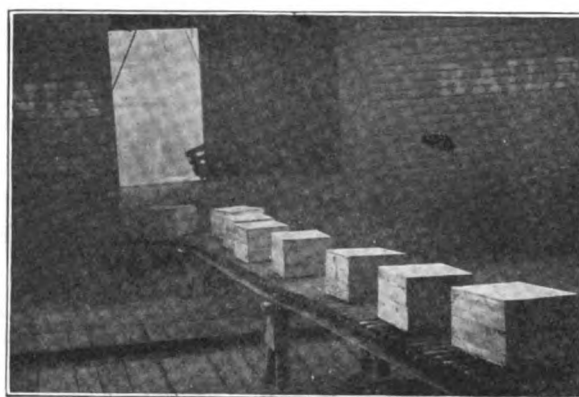
Amco Conveying and Elevating Machinery.

Designed and built to meet the individual conditions of practically any industry. Will handle rapidly, safely and economically any product in any form. Every part made of best material, by expert mechanics, under experienced engineers, in a modern plant.

Amco trained conveyor experts are at the disposal of those interested.



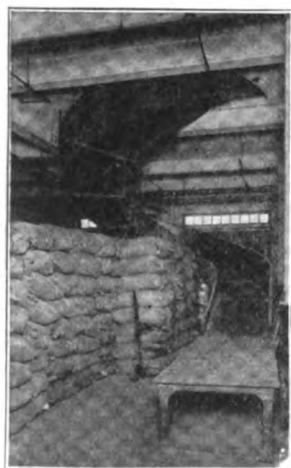
AMCO GRAVITY CONVEYOR AND
BOOSTER APRON ELEVATOR



AMCO BALL BEARING PORTABLE GRAVITY CONVEYOR



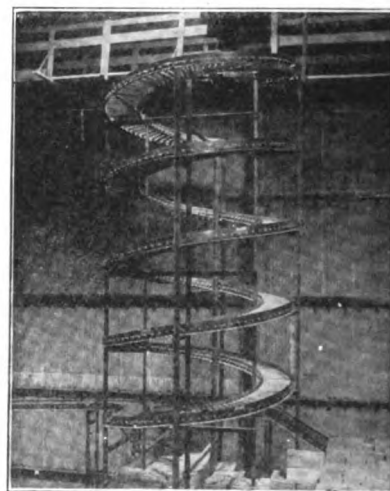
AMCO AUTOMATIC RE-
VERSIBLE INCLINE
APRON CONVEYOR FOR
RAISING AND LOWERING



AMCO SPIRAL CHUTE
Single blade, open type. Also
made in enclosed type and with
multiple blades in either type



AMCO PORTABLE ADJUSTABLE INCLINE BELT CONVEYOR
FOR COAL, SAND, GRAVEL, ETC.



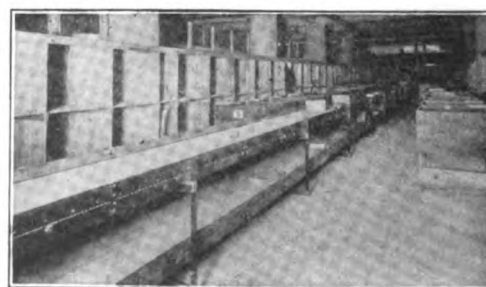
AMCO ROLLER SPIRAL
Note large storage capacity on conveyor.
This installation is in a prominent glass
factory



AMCO POWER APRON CONVEYOR



AMCO AUTOMATIC VER-
TICAL ELEVATOR



AMCO BELT CONVEYOR

ESTABLISHED 1876

INCORPORATED 1885

DOW WIRE AND IRON WORKS

Incorporated

Engineers and Manufacturers of Gravity and Power Conveyors

Franklin, Buchanan and Pocahontas Streets

LOUISVILLE, KY.

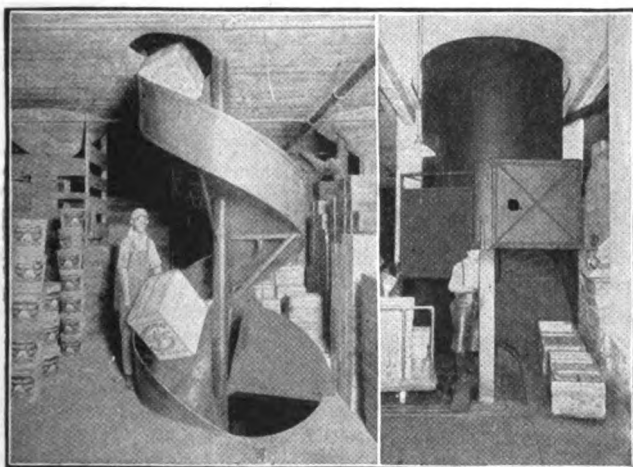
Products.

GRAVITY ROLLER CONVEYORS; STEEL SPIRAL CHUTES; BELT CONVEYORS; PORTABLE ADJUSTABLE ELEVATORS.

Also manufacturers of Apron Conveyors, Chain Conveyors, Slat Conveyors, Portable Pilers, Bucket Elevators and Special Conveyors.

Service.

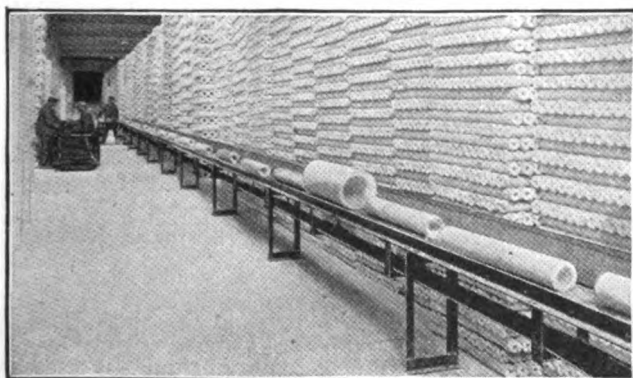
This company places at the disposal of engineers, architects and prospective users, the services of a skilled Engineering Department experienced in all manner of conveying problems. There is no charge for drawings and detailed information covering individual conveyor layouts.



OPEN AND CLOSED TYPES OF DOW STEEL SPIRAL CHUTES
HANDLING CASES

Scope of Use.

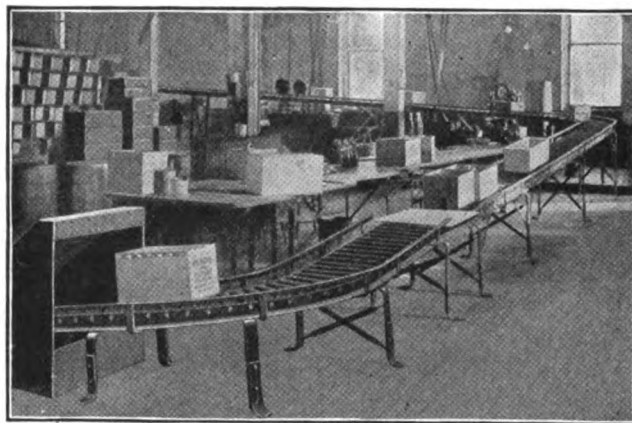
Dow conveyors speed up production, eliminate expensive and uncertain labor and save valuable floor space.



PART OF A SYSTEM OF DOW BELT CONVEYORS
Handling rolls of asbestos from factory to storage and shipping department

SWEET'S CATALOGUE

Used by factories, foundries, warehouses, wholesale houses, department stores, canning and packing plants, lumber and brickyards—in fact, any place where quantities of materials or merchandise of any description must be handled from one place to another.



DOW GRAVITY CONVEYORS IN A CANNING PLANT
The empty cases are received, filled, covered, and sent on to shipping or storage without leaving the conveyor

Gravity Conveyors.

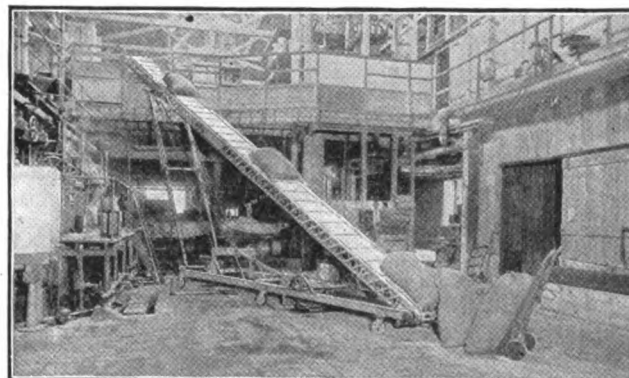
Furnish the ideal means of handling goods wherever they can be used. A grade of 3% to 5%, depending on the nature of the merchandise, is necessary for the operation of gravity conveyors. They require no power or attention of any kind.

Power Conveyors.

Of all descriptions, usually designed to operate in conjunction with gravity conveyors.

Estimates.

In writing for estimates or other data, state dimensions and weights of largest and smallest packages and send drawing or sketch with dimensions indicating points between which goods must be handled.



"HANDY ANDY," THE PORTABLE ADJUSTABLE ELEVATOR
Lifting sacks of grain from the first to the second floor in a mill

THE HASLETT SPIRAL CHUTE CO.

MAIN OFFICE AND FACTORY

510-512 North 61st Street
PHILADELPHIA, PA.

SAN FRANCISCO OFFICE, 228 Pine Street

BALTIMORE OFFICE, 523 Calvert Building

NEW YORK OFFICE, 110 West 34th Street

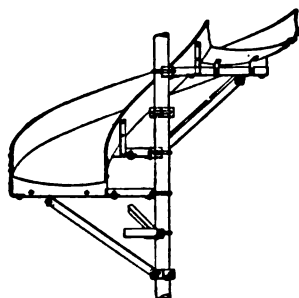
Products.

SPIRAL CHUTES; DIVERTING SWITCHES; VERTICAL LIFTS; BELT and CHAIN CONVEYORS.

Also manufacturers of Gravity Roller Conveyors, Inclined Elevators, Automatic Hoists, Wagon Loaders, etc.

Chutes.

Haslett Patented Concave Spiral Chutes—The patented Haslett concave bottom is designed to control the speed of merchandise so as to prevent damage. The rise of the concave toward the outside balances centrifugal force. The grade of the chute and the centrifugal force decrease with increase of radius.



STANDARD CONSTRUCTION HASLETT SPIRAL CHUTE

Therefore, when packages tending to travel fast are carried toward the outer rim by centrifugal force, the decreased grade reduces their speed. Packages can not clog in the chute because slow packages losing their centrifugal force are carried by the concave slope nearer the center where the chute is steeper. Successful results are dependent upon proper relationship between trough width, diameter, pitch and concave formation.

STANDARD SIZES OF HASLETT PATENT CO. CAVE CHUTES AND MAXIMUM SIZES OF PACKAGES HANDLED

Diameter	Trough width	Packages		
		Length	Width	Weight
3 ft.	12 in.	15 in.	9 in.	40 lbs.
4 ft.	19 in.	22 in.	14 in.	75 lbs.
6 ft.	24 in.	30 in.	18 in.	200 lbs.
*7 ft.	30 in.	36 in.	23 in.	350 lbs.
†9 ft.	36 in.	48 in.	28 in.	400 lbs.
9 ft. 10 in.	42 in.	52 in.	32 in.	600 lbs.
12 ft.	48 in.	60 in.	36 in.	1000 lbs.
15 ft.	60 in.	72 in.	46 in.	1400 lbs.

*Generally supplied to grocery jobbers.

†Generally supplied to hardware jobbers.

Special strength chutes can be built for especially heavy work in all sizes.

Floor Openings for Chutes—In completed buildings the floors can be cut and finished, but in new

buildings drawings are furnished by which builder can leave properly designed openings in the correct positions.

Flat Bed Chutes for Light Merchandise—This company also builds common flat bed chutes for use in department stores and mail order houses, etc. These can be either of the open outer rim type or cylindrically enclosed type.

They are supported by the central column consisting of standard wrought steel water pipe to which the sheet metal is bolted with cap screws in tapped holes.

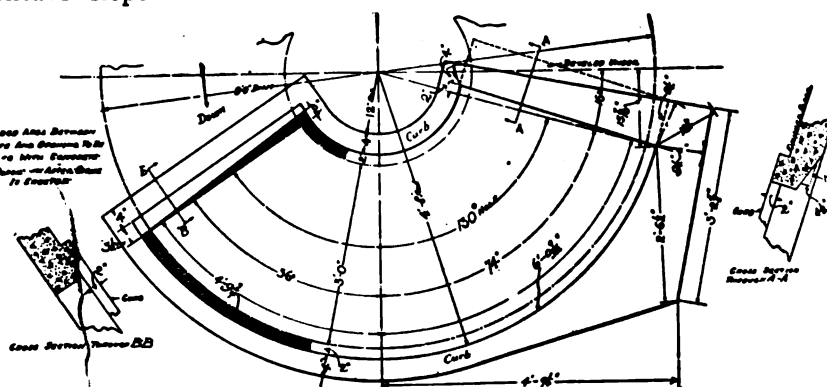
SIZES OF STANDARD FLAT BED CHUTES

Diameter	Trough width	Pipe column
3 ft. 4½ in.	12 in.	4 in. internal
5 ft. 6¼ in.	30 in.	6 in. internal
6 ft. 6¼ in.	36 in.	6 in. internal
7 ft. 8½ in.	42 in.	8 in. internal

Styles—Both styles of chutes can be built in single, double, triple or quadruple blade construction.

Equipment—Open chutes are furnished with hinged, counterweighted floor traps, and enclosed chutes with vertical sliding fire doors all constructed so as to meet the approval of the National Board of Fire Underwriters.

Diverting Switches—In addition to the patented combination fire door and diverting switch, several special types of switches for discharging goods at intermediate floors are built.



TYPICAL FLOOR OPENING FOR 7-FT. DIAMETER CHUTE FOR CONCRETE BUILDING

Vertical Lifts, Belt and Chain Conveyors, etc.

These are built to meet requirements. In addition to standard types, special forms for all kinds of warehouse, jobbing and factory needs are designed.

MATHEWS GRAVITY CARRIER COMPANY

Elevating and Conveying Apparatus

MAIN OFFICE AND WORKS
ELLWOOD CITY, PA.

BRANCH FACTORIES

LONDON, ENG., BRITISH MATHEWS, LTD.

PORT HOPE, ONT., MATHEWS GRAVITY CARRIER CO., LTD.

BRANCH OFFICES IN ALL PRINCIPAL AMERICAN CITIES

Products.

MATHEWS GRAVITY ROLLER CONVEYERS.

MATHEWS AUTOMATIC ELEVATORS.

MATHEWS GRAVITY SPIRAL CONVEYERS and
CHUTES.

MATHEWS ROLLER SPECIALTIES.

Standard Conveyor Units.

Single Roller Conveyor Units—Light and heavy construction used for handling light, medium and heavy sizes and weights of merchandise packed in boxes, crates, fiber cartons, barrels, kegs, etc., also miscellaneous articles and commodities having one smooth, reasonably hard surface.

Double Roller Conveyor Units—Light and heavy construction, designed for handling boxes, crates, cartons, etc., running to unusually large sizes and heavy weights.

Special Patented Flange Roller Units—Designed for handling brick, hollow tile, cement blocks, and miscellaneous building materials.

Special Patented Double and Single Roller Conveyor Units—Designed for handling lumber, lath, flooring, siding, dimension stuff, etc.

Special Patented, Ball Bearing Wheel Conveyor Units—Designed for handling shingles, green brick,

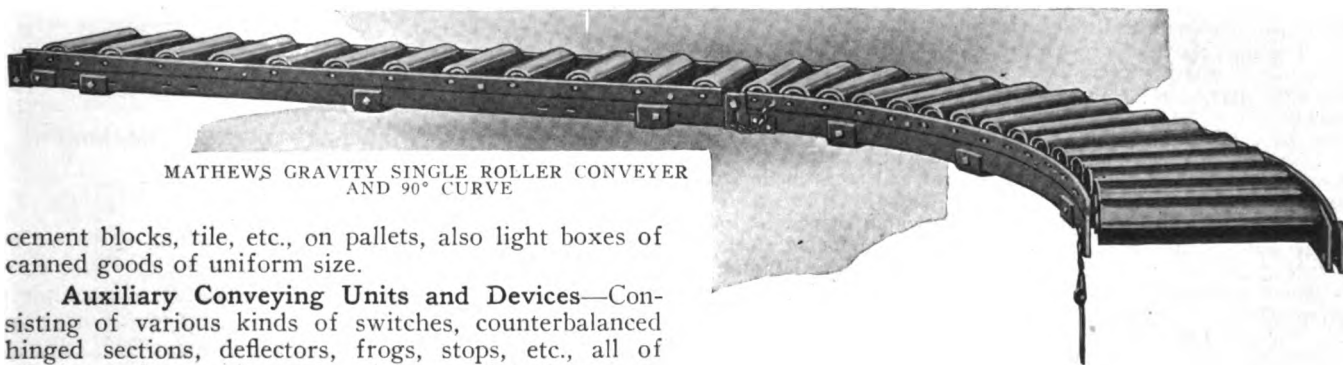
warehouse systems to accomplish continuous routing of packages in conformity with an efficient scheme of distribution, or to facilitate the flow of products through a series of processes from one department to another.

Roller Specialties—Consisting of ball bearing steel rollers of various diameters for individual assembly in belt conveyers, and numerous other commercial purposes, lumber dollies, car door rollers, roller trucks, etc.

Curve Units—Standard 90° and 45° curve units are furnished for use in connection with all types of straight roller conveyor units. Curves of any desired angle or radius are also designed to meet special or unusual requirements.

All types of roller conveyers will handle ordinary boxes and other flat, smooth packages, on a grade of 4% or less, depending upon character and weight.

Nearly all types of Mathews roller conveyers are designed for use either portably or installed in permanent locations. Portable units are supplied with universal couplings, making the sections interchangeable. Permanently installed units are supplied with strap couplings, consisting of fish plates and bolts. Curves are reversible, permitting turning of a portable line of carrier in either a right-hand or left-hand direction. Supports of different kinds are furnished, depending upon how the conveyor is to be used.



MATHEWS GRAVITY SINGLE ROLLER CONVEYER
AND 90° CURVE

cement blocks, tile, etc., on pallets, also light boxes of canned goods of uniform size.

Auxiliary Conveying Units and Devices—Consisting of various kinds of switches, counterbalanced hinged sections, deflectors, frogs, stops, etc., all of which are frequently employed in complete factory or



DOUBLE ROLLER CONVEYER STRAIGHT UNIT

Curve units of any desired degree made to fit purchaser's requirements



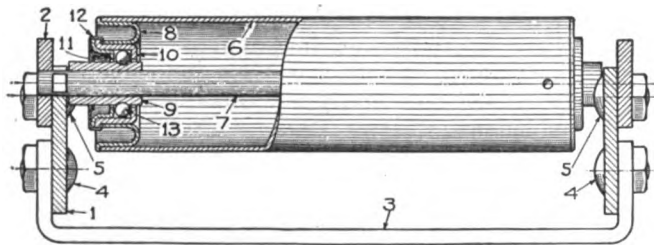
PATENTED WHEEL CONVEYER STRAIGHT UNIT

Curve units of any desired degree made to fit purchaser's requirements. Construction consists of ball bearing steel wheels, 2 3/4 in. in diameter, 1/2 in. face, assembled on 3-in. centers, bolted to steel frame rails; standard width, from center to center of wheels, 12 1/2 in. Made any desired width to suit requirements. Suitable for conveying bundles of shingles and boxes of uniform size

Ball Bearing Roller.

The cross-sectional drawing below clearly indicates the general design and structural details of a Mathews ball bearing roller. Illustration shows the 2¼ in. in diameter size, but a heavy duty roller, 3¼ in. in diameter, is also furnished. These two standard sizes do not differ in general design, but the materials in the larger roller are heavier and stronger than those used in the smaller size shown.

Specifications—The following specifications will indicate the general correlation of the different parts in the complete roller and frame assembly and apply to the 2¼-in. and 3¼-in. sizes:



CROSS-SECTIONAL DIAGRAM OF MATHEWS BALL-BEARING ROLLER

No. 1—Frame rail made of bar steel 2½ in. wide by ¼ in. thick, slotted on upper edge to receive ends of roller axles.

No. 2—Lock bar made of bar steel 1½ in. wide by ¼ in. thick, slotted to fit over ends of axles, holding them in rigid position.

No. 3—"U" brace, made of bar steel 1½ in. wide by ¼ in. thick, used to tie frame rails together.

No. 4—¾ in. by ¾ in. bolts, used for fastening "U" braces to frame rails.

No. 5—¾ in. by ¾ in. bolts, used for fastening lock bar to frame rail.

No. 6—Roller tube, cut from No. 16-gauge cold drawn seamless steel tubing.

No. 7—Roller axle, made of structural steel ½ in. in diameter.

No. 8—Housing made cup shaped to receive the detachable bearing, of .065-in. dead soft stamping steel.

No. 9—Cone (or sleeve) forming part of ball race, made of cold rolled screw stock, ¾ in. in diameter, bored to fit around the axle snugly, but with sufficient play to permit it to revolve slowly when roller rotates under load. Cone is thoroughly case hardened.

No. 10—Flanged steel ring, case hardened, shaped to form inner wall of ball cage, and outer part of ball race; made from .095-in. stamping steel.

No. 11—Retaining washer, case hardened, shaped to form outer wall of ball cage; made from .065-in. stamping steel.

No. 12—Lock ring, designed to bind parts Nos. 10 and 11 together, keeping space in ball cage constantly uniform; made from .035-in. stamping steel.

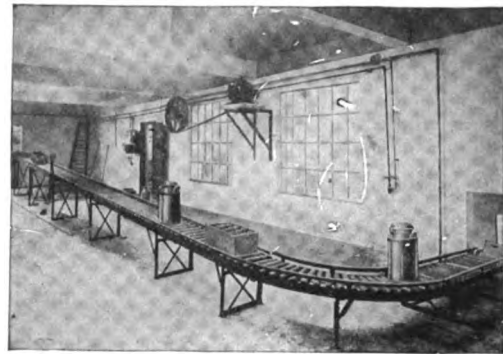
No. 13—Balls—11 in number, filling the ball race evenly; quality high grade, ¼ in. in diameter, made of hardened chrome tool steel.

It will be noted that the assembled detachable bearing is so designed that all parts are positively locked together. When bearing is inserted it is held in position by lock ring (No. 12) coming into contact with housing (No. 8) and by cone (No. 9) fitting against inside surface of frame rail (No. 1). The housing (No. 8) is firmly fastened into ends of roller tube by deep prick punching at three points.

Heavy Duty Roller Conveyers.

The Mathews heavy duty roller conveyer is a product built upon a thorough knowledge of requirements—not theories. It is adaptable to service of unusually severe nature and particularly for use in places where surrounded by conditions which cause rapid deterioration, such as the presence of moisture, steam, acids, salts, etc.

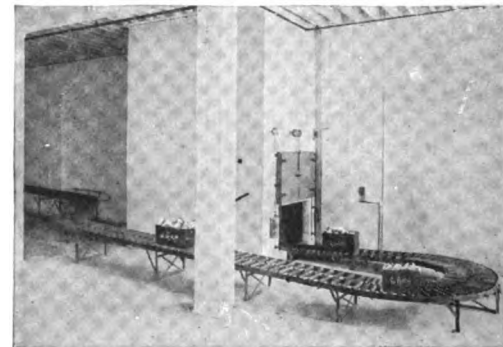
These conveyers will handle packages or commodities of extreme sizes and weights and are being successfully used for the handling of pig iron, billets, forgings, castings, shells, bars, angles, etc.



MATHEWS HEAVY DUTY ROLLER CONVEYER

Gravity Roller Conveyers.

The principle of gravity conveyance has been scientifically developed by Mathews' engineers during 16 years of continuous contact with conveying problems of every description, and today is being successfully applied to the handling of boxes, crates, cartons, barrels, kegs, trays, cans, drums, etc., in order to secure continuous routing, save rehandling, conserve floor space, eliminate waste of time and labor and to speed production and shipping.



MATHEWS GRAVITY ROLLER CONVEYER DESCRIBING A SHARP CURVE

Automatic Package Elevators.

Consisting of straight lift and inclined types. Designed to operate in connection with gravity roller conveyer runways, permitting installation of complete conveying systems for interdepartment transportation, serving all floors of factories, warehouses, etc. Func-



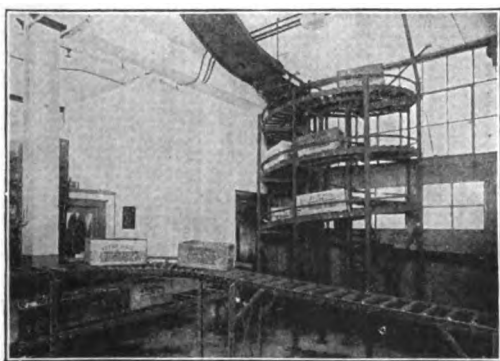
MATHEWS AUTOMATIC ELEVATOR OPERATING BETWEEN FLOORS

tion of elevators is to receive boxes, crates, cartons, etc., from roller conveyer runways at lower levels and carry same to higher levels, the act of receiving and discharging being accomplished without an attendant.

Gravity Spiral Conveyers.

Practically a continuation of a straight line of gravity roller conveyer units, but so constructed that packages move in a circle of limited diameter while descending from upper to lower levels, the movement being gentle to avoid injury to fragile containers or contents thereof. When desired downward vertical distance has been traveled, the packages are brought out of spiral on to a connecting line of portable or permanently placed units of roller conveyer, thence to destination.

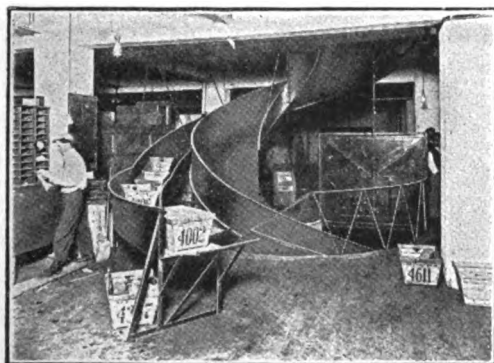
Made in several standard styles or of special design for inside or outside installation.



MATHEWS GRAVITY SPIRAL CONVEYER

Gravity Spiral Chutes.

A sheet metal runway built around a metal stand-pipe or open core, as conditions and requirements may demand. Function is to carry by gravity any kind of package or loose merchandise from upper floors of building to various destinations on lower levels. No positive control of the speed of packages is possible with this type of spiral except such as is exerted by friction produced by contact with bed plates and side guards.



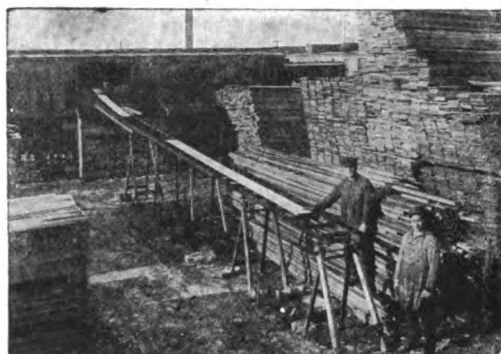
MULTIPLE TREAD SPIRAL CHUTE

Patented Lumber Conveyers.

Construction consists of two parallel rows of steel, ball bearing rollers assembled in 12-ft. steel units having three frame rails. The rollers are so arranged that lumber will not run off, although no guard rails are used.

Units are provided with universal couplings the same as the other styles of portable conveyers; boards of any width or length can be sent over these rollers in

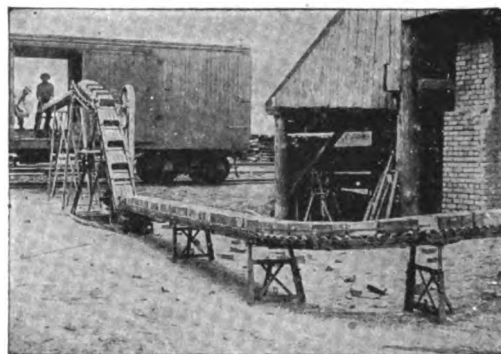
any desired direction—around corners or through tight places where teams can not go—using a down-grade of only 4%. Curves of 90° and 45° are also furnished, when needed, for proper routing to desired destination.



MATHEWS PATENTED LUMBER CONVEYER

Mathews Gravity Brick Conveyer (Patented).

As a substitute for wheelbarrows this conveyer has been approved and adopted by hundreds of brick makers throughout the country. All of the leading steel and iron mills are using thousands of feet for quick handling of fire brick.



MATHEWS GRAVITY BRICK CONVEYER

Mathews Service.

Sales and engineering offices are maintained in all the leading cities in charge of experts who are available for consultation on short notice. Branch office services are rendered without cost or obligation, and engineers are urged to make full use of the facilities provided.

In cases where correspondence with the home office is preferable, full details concerning conveying problems should be submitted in first letter, accompanied by pencil sketches or blue prints showing the objective points to be connected by conveyer units, distances, elevations, etc.

State minimum and maximum sizes and weights of boxes, crates, cartons or packages to be handled. In the case of milk cans, pails or other round containers, give diameter, height and weight. If barrels, give diameter of head and bilge, height, weight and whether they are to be conveyed filled or empty. Describe fully the size, shape and weight of any odd or unusual form of package or container. Give accurate distance articles are to be conveyed, and if curves are desired give degree of curves; also state any variation in floor levels on which the carrier line will be supported.

SAMUEL OLSON & CO.

Conveying and Elevating Machinery

TELEPHONE:
ARMITAGE 780, 781

2418-2422 Bloomingdale Avenue
CHICAGO, ILL.

NEW YORK OFFICE, 110 West 40th Street

Products.

CONVEYING and ELEVATING MACHINERY for handling materials of every description:

Coal and Ash Handling Elevators and Conveyors, Subveyors, Packing House Conveyors, Ice Handling Machinery, Spiral Chutes, Spiral Fire Escapes, Gravity and Belt Conveyors, Store and Office Service Conveyors, Patented Automatic and Pivoted Tray Elevators, Steel and Wood Apron Conveyors.

Also manufacturers of Power Transmission Machinery, Flour Blenders and Patented Automatic Proofers for Bakeries.

Conveyors, Spiral Chutes and Elevators.

Gravity Conveyors and Spiral Chutes—Gravity conveyors afford an economic medium of distribution of commodities within plants irrespective of their characteristics. Working in conjunction with spiral chutes, an ideal system is placed at the disposal of those whose business necessitates the storing of merchandise on various floors previous to final shipping.

Bucket Elevators—Can to advantage be efficiently employed in elevating bulk commodities such as sand, gravel, cement, coal, grain, flour, etc.

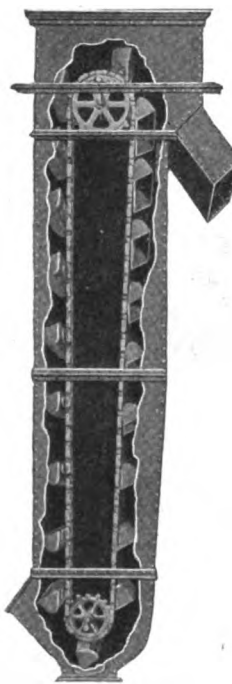
Belt Conveyors—Appropriately designed, they are the logical equipment with which to convey any and all commodities, ranging from coal and ore to the very lightest of packages.

Automatic Elevators.

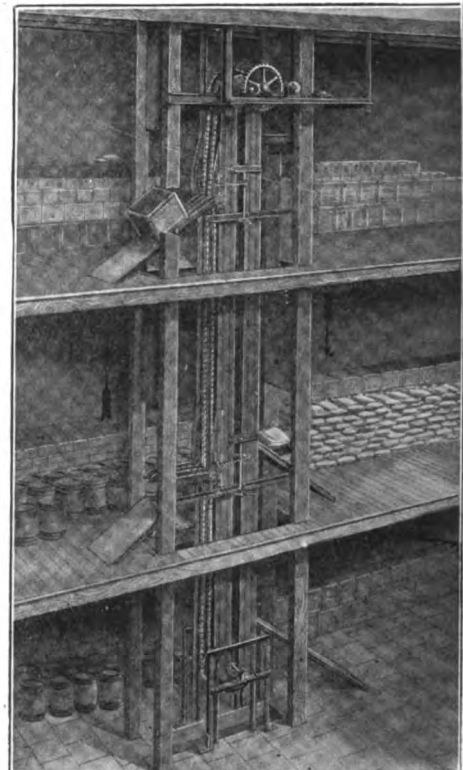
Olson automatic elevators will prove thoroughly efficient in handling packages, boxes, bags, etc., from the basement or lower floors to any desired upper floors; also for lowering packages, etc., from any floor above to any floor below. In other words, goods may be elevated on the upward moving trays unloading automatically on any desired floor, and other goods simultaneously being lowered on the downward moving trays unloading at any desired floor below.

Co-operative Service.

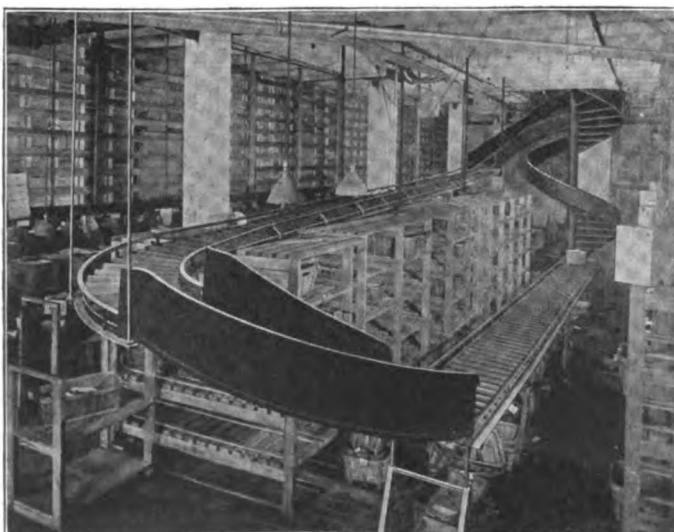
Engineers should use the vast experience of SAMUEL OLSON & Co. in solving intricate handling problems. Previous to making final decision as to any type of conveying machinery, consult this company. Recommendations particularly adapted for exact conditions will be supplied by experts.



SECTION OF BUCKET ELEVATOR



AUTOMATIC ELEVATOR



GRAVITY CONVEYORS IN CONJUNCTION WITH SPIRAL CHUTE



PORTION OF A COMPREHENSIVE CONVEYING AND ELEVATING SYSTEM INSTALLED IN PLANT OF AMERICAN CAN CO., MAYWOOD, ILL.

STANDARD CONVEYOR COMPANY

FORMERLY MINNESOTA MANUFACTURERS' ASSOCIATION

MAIN OFFICE AND FACTORY
NORTH ST. PAUL, MINN.

SALES AND ENGINEERING OFFICES
NEW YORK, N. Y., 227 Fulton Street CHICAGO, ILL., 549 West Washington Street

Products.

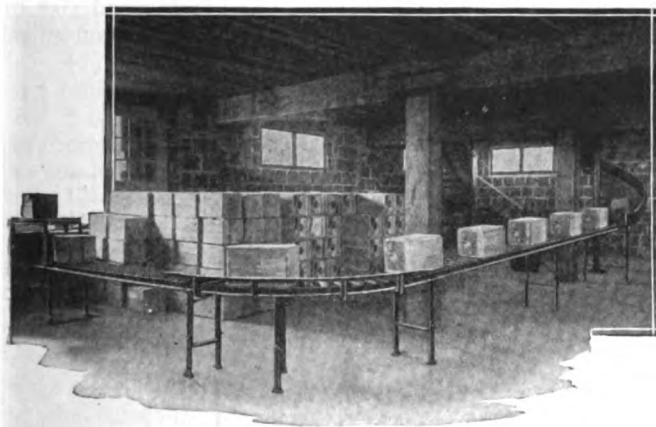
GRAVITY ROLLER CONVEYORS; GRAVITY SPIRAL CHUTES; POWER CONVEYORS; ELEVATORS.

Co-operative Service.

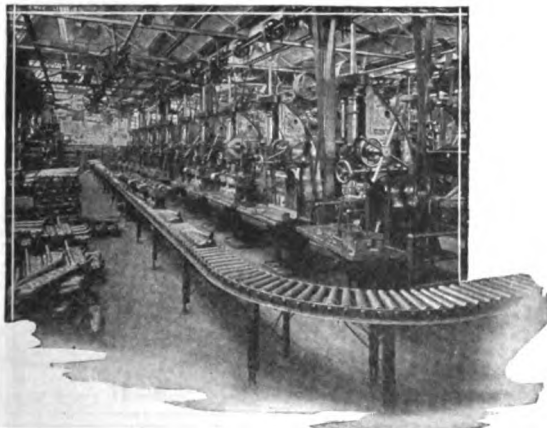
The services of experienced conveying engineers are offered to assist construction engineers, contractors and industrial managers in solving conveying problems. Extensive sales and engineering offices are maintained and branch offices or representatives are located in all principal cities.

Gravity Roller Conveyors.

Used for the conveying of boxed and cased goods, brick, lumber, pig iron, shells, tubing, and cylindrical shaped objects, and all merchandise having one hard smooth surface.



STANDARD GRAVITY ROLLER CONVEYOR CONVEYING BOXED AND CASED GOODS



STANDARD GRAVITY ROLLER CONVEYOR IN OPERATION IN LARGE AUTOMOBILE PLANT

Large castings and parts of machine products are moved on sections of gravity conveyor to and from various machines for specific operation. Trucking and operator's time waiting for materials entirely eliminated

Power Conveyors and Elevators.

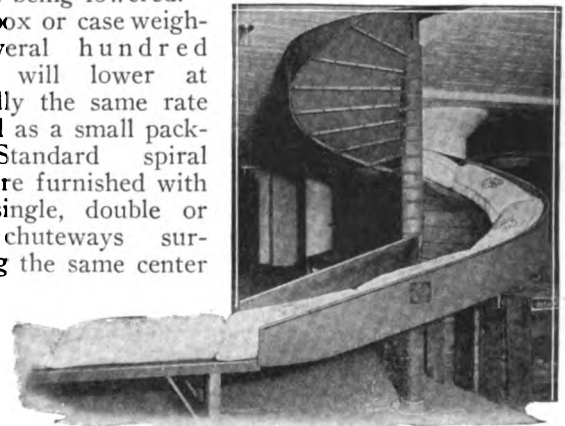
Consisting of slat conveyors, belt conveyors, and special conveying machinery, including inclined elevators and straight lift automatic elevators.

Spiral Chutes.

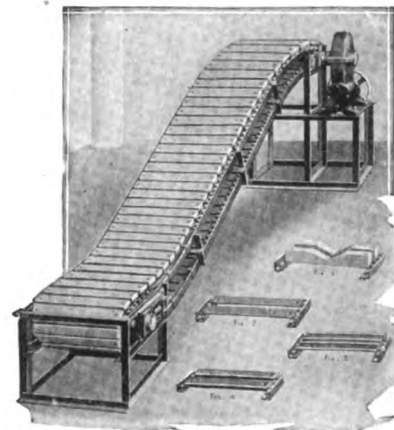
For the lowering of general merchandise for department stores, wholesale grocery houses, wholesale drug houses, and all establishments of two stories or higher.

Standard spiral chutes are constructed on a scientific basis, absolutely controlling the movement of the material being lowered.

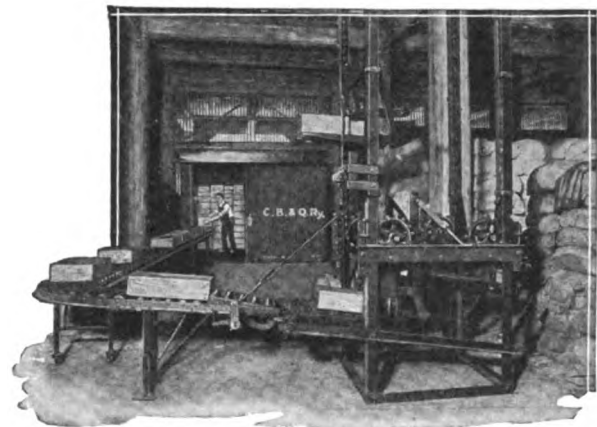
A box or case weighing several hundred pounds will lower at practically the same rate of speed as a small package. Standard spiral chutes are furnished with either single, double or triple chuteways surrounding the same center post.



SPIRAL CHUTE LOWERING BAGS OF SEEDS



POWER SLAT INCLINED ELEVATOR



STRAIGHT LIFT AUTOMATIC ELEVATOR

LOWERATOR COMPANY, INC. Manufacturers of Special Conveying Machinery Lowerator Building, York and Pearl Streets BROOKLYN, N. Y.

Products.

THE LOWERATOR; VERTICAL TRAY ELEVATOR-LOWERATOR.

Also, Gravity Rollers, Roller Spirals, Power and Gravity Inclines, Special Conveying Machinery.

The Lowerator.

This device lowers merchandise from upper floors, by gravity. There is no expense for power, no need of operators. Discharges automatically.

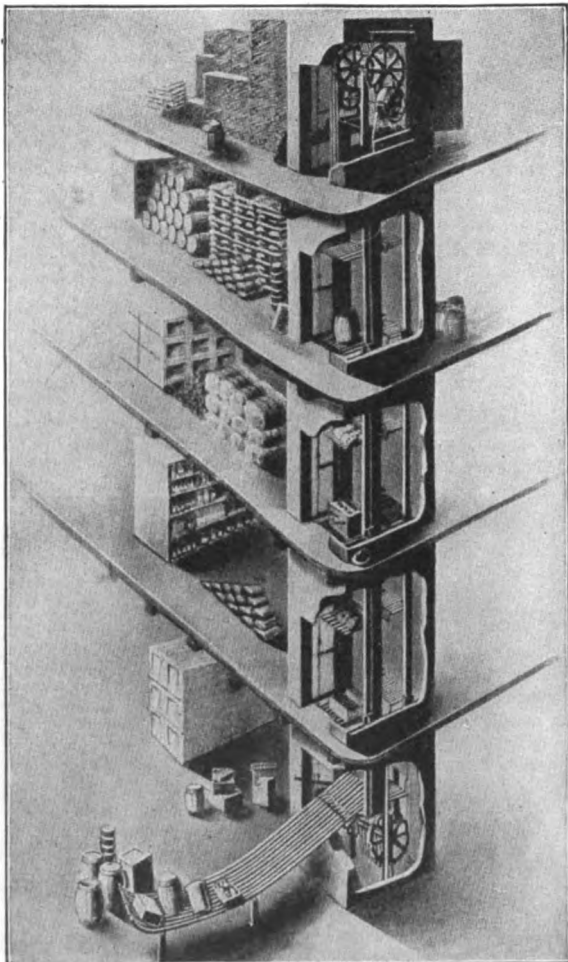
It is built in 5 standard sizes, or specially designed to answer requirements. Articles, packages, barrels, tote-boxes, containers or cases up to 48 by 52 by 72 in. and weighing up to 1500 lbs. each can easily be handled by this machine.

Machine is simple, strong, and fully guaranteed. It operates by means of the loading of trays or carriers attached to endless steel cables passing around upper and lower sheave wheels.

The car spacing is approximately 6 ft., thus affording two cars at each floor at all times.

Speed is regulated and controlled by automatic governor brake. A Lowerator occupies considerably less space than a freight elevator and handles under test four times the volume per hour.

Used in factories, warehouses, wholesale establishments, etc.



VIEW SHOWING INSTALLATION OF THE LOWERATOR

SWEET'S CATALOGUE

Vertical Tray Elevator-Lowerator.

This is an elaboration of the Lowerator principle wherein the upper terminals are equipped with electric motor for carrying merchandise up as well as down, at the same time in the same shaft.

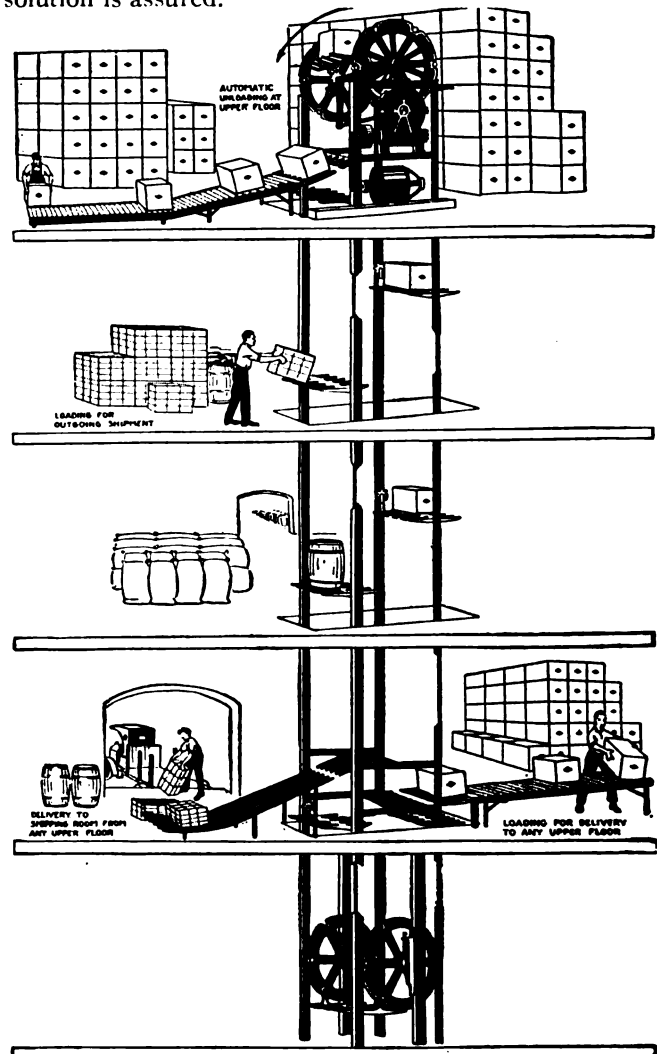
Goods may be sent from lower floors to any upper floor and automatically discharged. The reverse operation is also provided for. Complete and positive push button control on each floor.

No operator is needed. Requires small space and handles large volume per hour. Small horsepower required as machine is balanced.

Co-operative Service.

The LOWERATOR COMPANY, INC. designs and builds special conveying machinery to meet unusual and difficult conditions. Its Engineers have had years of experience in this particular field, and their services are free to engineers and architects for consultation.

When planning a new building write for detailed drawings of shaft or hatchway. State conditions in client's plant, especially as to floor heights and size of packages to be handled, and a practical and economical solution is assured.



VERTICAL TRAY ELEVATOR-LOWERATOR

MAIN BELTING COMPANY

Manufacturers of Belt Conveyor Rollers

13th and Carpenter Streets
PHILADELPHIA, PA.

For Branch Offices, see page 1170

Product.

CONVEYOR ROLLERS: Adjustable and Fixed Troughing Rollers; Flat Carrying Rollers.

For Belting, see page 1170

"Main" Belting Conveyor Rollers.

This company's troughing rollers have been designed to eliminate the objectionable features found in rollers. In the design and manufacture of the "Main" patented roller, the very best mechanical ability obtainable has been employed, resulting in the production of a roller in which the mechanical details are correct, and which possesses several radically new features.

Style "C" roller admits of instant adjustment to meet special conditions in any plant. Styles "A" and "E," while not adjustable, are perfectly finished and have the same high conveying qualities as the Style "C" roller.

Style "C" adjustable troughing roller has the following points of advantage, some of which may be found in other equipment, but no other one roller contains them all.

(1) **Maximum Angle of Trough Is 20°**—Troughing pulleys are adjustable to 3 positions: 10°, 15° and 20° from horizontal. If the troughing pulleys are put in their lowest position, a belt of much heavier ply may be used than would ordinarily be possible.

Experience shows that the maximum angle at which a belt may be troughed without finally cracking is 20°, and it should be troughed only so much as is necessary to keep the material from spilling. This is why adjustability is so desirable.

The slight gain in the carrying capacity of a belt troughed at 35° over one troughed at 20° is obtained at the price of the premature destruction of the belt, and a belt which is troughed excessively also has a decided tendency to run off the rollers.

(2) **Edges of the Troughing and the Flat Pulleys Overlap**—Troughing pulleys overlap the edges of the end pulleys on the center roll. The inside edge of the troughing pulley is considerably under the top line of the center roll

pulleys, and all possibility of the belt coming into contact with the edges of any of the pulleys is absolutely eliminated.

(3) **Self-adjusting Bearings**—The shaft of the flat roller is suspended in dustproof babbitted swivel bearings. The bearings are not rigidly fixed to their supports, but are suspended in them, and are free to adjust themselves to accommodate any warping of the stringers. Hence the possibility of the shaft binding in the bearings and ceasing to revolve is eliminated. A belt is worn excessively by pulleys which do not turn, as their rims are soon worn away, presenting holes whose knifelike edges cut the belt.

(4) **Flat Roll Carries the Load**—Maximum support is given to the belt in the center, where the load is carried, by comparatively long central pulley or roll—investigation having conclusively proved that the highest efficiency is attained by having a large portion of the belt width running flat.

(5) **Positive Lubrication at Each Bearing Surface**—Each bearing surface is provided with an individual compression grease cup effecting positive lubrication.

(6) **Correct Mechanical Details**—Rollers are ample in every respect.

Rims of the troughing pulleys are reinforced, making it impossible for the rim to wear away and leave a sharp edge to cut the belt.

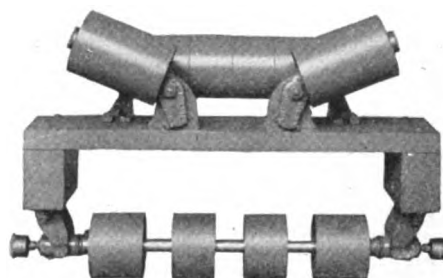
Shafting is $1\frac{3}{8}$ in. in diameter for all sizes.

Pulleys are 6 in. in diameter, with faces lathe-finished absolutely true with bore, making a true running smooth roll that will not wear the surface of the belt nor cause the belt to vibrate excessively.

Grease cups on troughing pulleys are placed well within pulley rim, thus protected from injury. Setscrews are all of ample size and easily accessible.

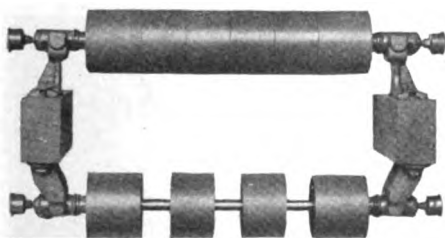
Literature.

For information regarding conveyor problems, see our book "Conveyor Problems and Their Solution."



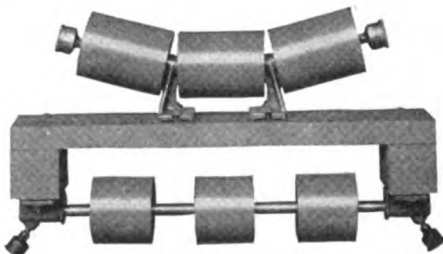
STYLE "C" TROUGHING ROLLER WITH
STYLE "R" RETURN ROLLER

Adjustable to 10°, 15° and 20° trough. Made for all belt widths from 18 to 36 in. inclusive. Style "F" similar to Style "C" except that it is not adjustable and is made for all belt widths from 24 to 48 in. inclusive



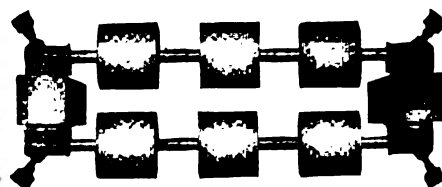
STYLE "E" FLAT CARRYING ROLLER
WITH STYLE "R" RETURN ROLLER

Bearings and pulleys interchangeable with similar parts of Styles "C" and "F." Made for all belt widths from 12 to 36 in. inclusive



STYLE "A" TROUGHING ROLLER WITH
STYLE "S" RETURN ROLLER

With 15° trough for 12- to 14-in. belt; 15° or 20° trough for 16- to 18-in. belt; and 20° trough for 20-in. to 24-in. belts



STYLE "S" RETURN ROLLER USED BOTH
AS CARRYING AND RETURN

Useful where it is desired to carry lightweight materials on a flat belt. Made for belt widths from 12 to 24 in. inclusive

ROBINS CONVEYING BELT COMPANY

Manufacturers of Robins Conveying Machinery

13-21 Park Row
NEW YORK, N. Y.

BRANCHES AND AGENCIES

CHICAGO, ILL., Old Colony Building
SALT LAKE CITY, UTAH, Newhouse Building
SAN FRANCISCO, CAL., GRIFFIN Co.

PITTSBURGH, PA., Union Arcade Building
BIRMINGHAM, ALA., C. B. DAVIS & Co.
TORONTO, CAN., GUTTA PERCHA & RUBBER, LTD.

Products and Services.

Manufacturers of CONVEYING MACHINERY.

This company furnishes Belt Conveyors, Bucket Elevators, Unloading Towers, Storing and Reclaiming Bridges, Coal Storage and Reclaiming Systems, Car Dumpers, Coke Cooling Wharfs, Ore Bedding and Reclaiming Systems, Standard and Adjustable Coal or Coke Crushers, Weigh Larries, and the auxiliary equipment such as Chutes, Feeders, Screens of various types, etc.

The ROBINS CONVEYING BELT COMPANY is prepared to design and install Conveying Machinery to meet any requirement.

Scope of Use.

Robins conveying machinery is handling coal, coke, ashes, ore, limestone, clinker, cement in bulk and in bags, wet concrete, sand, crushed stone, dirt, gypsum, phosphate rock, salt, grain, wood chips and pulp, rubbish, packages of all kinds and many other materials.

Lubrication.

Robins machinery parts are fitted for compression grease cup lubrication to protect the bearings from dust and corrosion. Consequently, troubles resulting from these causes are practically eliminated under the most severe operating conditions.

Belts.

Robins conveyor belts are made in a number of dif-

ferent grades, both of the stepped-ply and straight-ply construction, each grade being designed to give the most economical service under certain operating conditions. If this company believes that none of their brands of belts will give satisfactory service because of unusual conditions, they will manufacture a special grade of belt for the work.

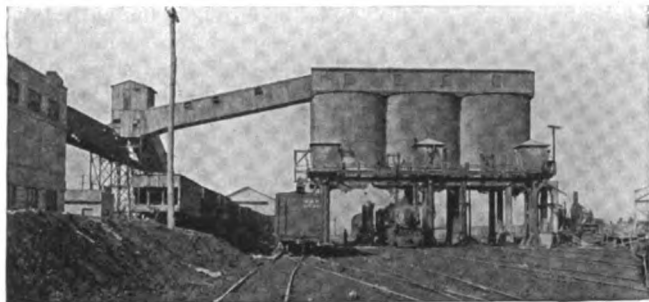
Robins stepped-ply belts have thicker rubber cover in the center than at the edges, thus giving more protection where the abrasion is greatest. A belt of this construction is flexible laterally, allowing it to conform to the shape of the troughing idlers, and causing it to run true even when empty.



ROBINS PATENTED STEPPED-PLY BELT

Handbook.

The Robins "Handbook of Conveyor Practice" will prove of value to engineers who are planning for or designing conveyor installations. It contains a group of useful tables concerning capacities, power requirements, speeds of conveyors and similar matter; also dimensions of conveyor parts, together with general data on conveyor practice. A copy will be gladly sent on request.



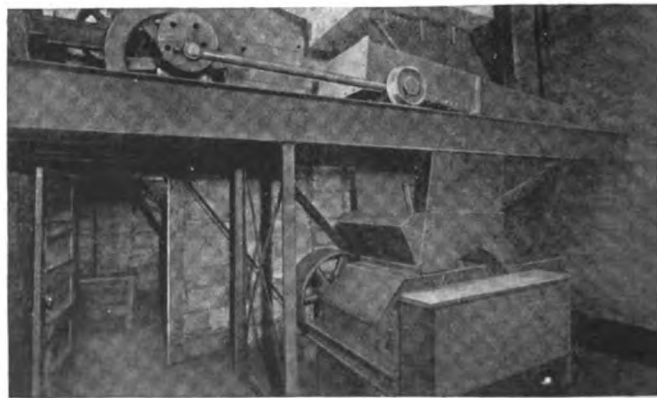
LOCOMOTIVE COALING STATION OF THE ERIE R. R. AT CROXTON, N. J.



ROBINS BELT CONVEYOR HANDLING COKE



ROBINS UNLOADING, STOCKING, RECLAIMING AND CONVEYING MACHINERY



ROBINS SHAKING FEEDER AND COAL CRUSHER

THE PERRINE STORE SERVICE CO.

Pneumatic Tube Systems and Conveying Apparatus MINNEAPOLIS, MINN.

Products.

PNEUMATIC TUBE SYSTEMS, POWER SAVING DEVICES, BELT CONVEYORS.

Also manufacturers of Light Hand and Electric Lifts, Cash and Parcel Carriers.

Pneumatic Tube Systems.

Types—VACUUM—Independent, twin tube line for each substation. Operated by low pressure, positive blower.

PRESSURE—Combination pressure incoming lines serving 3 to 4 substations each. Pressure outgoing line to each substation. Operated by low pressure, positive blower.

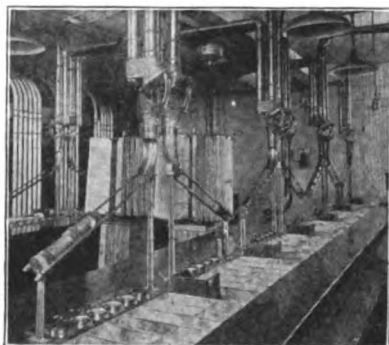
VACUUM PRESSURE—Vacuum incoming lines serving 3 to 6 substations each. Pressure outgoing line to each substation. Operated by 1 or 2 low pressure, positive blowers.

AUTOMATIC PRESSURE—Single tube for service in both directions between various stations. Equipped at each end with terminal, which automatically maintains air flow only while carrier is in transit. Operated on 5 lbs. air pressure from special compressor unit or reduced from high pressure air service. Especially adapted to light traffic and hotel service.

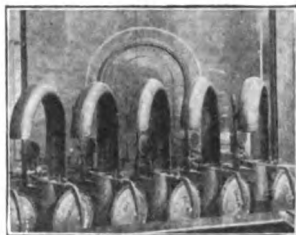
FOOT POWER—Single tube, for service in both directions between stations, with foot power operated compressor at each end.

For light service and distances not exceeding 200 ft.

Sizes of Tubes—2½-, 3- and 4-in. outside diameter tubing and 3 by 6-in. and 4 by 7-in. oval tubing; except foot power, which is 2½- and 3-in. outside diameter tubing only.



TYPICAL INSTALLATION PERRINE VACUUM PRESSURE PNEUMATIC TUBE SYSTEM



TERMINALS PERRINE AUTOMATIC PRESSURE PNEUMATIC TUBE SYSTEM

Cost—This company can save you 15% to 25% on cost of pneumatic tube system for your requirements. Quotations can be made from the building plans; merely submit plans showing approximate location of stations.

The table below will be of value in approximating cost of equipment under consideration. (Submit plans for definite quotation.) These costs are based on installations made by THE PERRINE STORE SERVICE CO.

Washburn-Crosby Co., Minneapolis, Minn.
U. S. Railroad Consolidated Ticket Office, Minneapolis, Minn.
Powers Mercantile Co., Minneapolis, Minn.
T. S. Martin Co., Sioux City, Iowa
Willys-Overland Co., St. Paul, Minn.
Fairbanks-Morse & Co., St. Paul, Minn.
Swift & Co., South St. Paul, Minn.
Swift & Co., Chicago, Ill.
Cleveland Hotel, Cleveland, Ohio
Morris & Co., Chicago, Ill.
Armour & Co., South St. Paul, Minn.
Drake Hotel, Chicago, Ill.
Montgomery Ward & Co., St. Paul, Minn.

Power Saving Devices.

For automatically cutting off air flow through the tubes when the carriers are not in transit. For both vacuum and pressure systems. They are extremely simple in construction and have no electric wiring or auxiliary air connections to get out of order.

Actuated by the presence of the carrier anywhere in the line, they are the only devices on the market which will always maintain air flow until carrier is delivered.

Covered by patents in United States and Canada.



PERRINE POWER SAVING DEVICES

Belt Conveyors.

Especially designed for handling merchandise in department stores and wholesale houses.

Construction—Both wood and steel framing; semi-oilless bearings; cut rawhide pinion drive; ceiling or floor supports.

Sizes—Width of belt, 12, 18, 24, 30 or 36 in. Larger sizes special to order.

APPROXIMATE COST OF PNEUMATIC TUBE SYSTEMS, INSTALLED

Type of system	Size of tubing, in.	Tubing material	Number of sub-stations	Size of building, ft.	Number of floors served	Average length of line central to substation, ft.	Maximum horse power required	Industry served	Cost per sub-station	Total cost of system, complete
Vacuum pressure "A".....	2½	Alloy	6	150 x 65	5	90	1½	Wholesale Paper House.....	\$220.00	\$1320.00
Vacuum pressure "B".....	2½	Alloy	12	100 x 50	2	110	2½	Retail Hardware.....	173.00	2076.00
Vacuum pressure "A".....	2½	Alloy	14	90 x 35	1	55	1	Railroad Ticket Office.....	121.00	1694.00
Vacuum pressure "F".....	2½	Alloy	32	150 x 150	7	170	10	Department Store.....	292.00	9344.00
Vacuum pressure "P".....	2½	Alloy	82	330 x 155	5	170	20	Department Store.....	200.00	16400.00
Vacuum pressure "C".....	3	Alloy	5	170 x 100	5	160	2	General Office, Packing Plant.....	375.00	1875.00
Vacuum pressure "F".....	3	Alloy	10	290 x 90	5	150	7½	General Office, Packing Plant.....	425.00	4250.00
Vacuum pressure "C".....	3	Alloy	14	1000 x 600	Plant	640	10	Packing Plant, Orders.....	1000.00	14000.00
Automatic pressure "N".....	2½	Brass	17 lines	230 x 135	14	175	5	Hotel, Cashier and Floor Service.....	380.00	6460.00
Automatic pressure "N".....	3	Alloy	2 lines	460 x 190	2	340	3	Automobile Assembly Plant.....	550.00	1100.00
Automatic pressure "M".....	3	Alloy	36	280 x 220	14	180	20	Hotel, Cashier and Floor Service.....	510.00	18360.00
Vacuum pressure "W".....	3	Steel	26	600 x 220	10	330	50	Mail Order House.....	1577.00	41000.00
Vacuum pressure "V".....	3	Brass	7	1700 x 600	Plant	700	17	Packing Plant, Orders.....	3000.00	21000.00

"A," single unit, 1 vacuum incoming line and 1 bank selective pressure outgoing line. "B," 2-unit, 2 vacuum incoming lines and 2 banks selective pressure outgoing lines. "C," 3-unit, 3 vacuum incoming lines and 3 banks selective pressure outgoing lines. "F," combination vacuum incoming lines and independent pressure outgoing lines equipped with power saving devices.

"M," automatic pressure, air compressor unit included. "N," automatic pressure, air compressor unit not included, but pressure reducing valve only. "V," independent twin vacuum lines to each sub-station with power saving devices. "W," combination vacuum incoming lines, and independent vacuum outgoing lines, equipped with power saving devices.

THE LAMSON COMPANY

Designers and Builders of Automatic Conveying Machinery

100 Boylston Street
BOSTON, MASS.

WORKS:
LOWELL, MASS.
TORONTO, CANADA

REPRESENTATIVES

ATLANTA, GA., 30 Moore Building
BALTIMORE, MD., Equitable Building
CHICAGO, ILL., 6 North Michigan Avenue
CINCINNATI, OHIO, 119 East 5th Street
CLEVELAND, OHIO, 2063 East 4th Street
DENVER, COLO., 1622 Arapahoe Street
INDIANAPOLIS, IND., Washington and Illinois Streets
KANSAS CITY, MO., 210 New Ridge Building
LOS ANGELES, CAL., 221 San Fernando Building
MINNEAPOLIS, MINN., 320 Tribune Annex

NEW YORK, N. Y., 9-11 East 37th Street
OMAHA, NEBR., 418 McCague Building
PHILADELPHIA, PA., 210 North Broad Street
PITTSBURGH, PA., 319 Third Avenue
ROCHESTER, N. Y., 194 East Main Street
SAN FRANCISCO, CAL., 617 Mission Street
SEATTLE, WASH., 215 Stewart Street
ST. LOUIS, MO., 709 Pine Street
TORONTO, CANADA, 136 Simcoe Street
VANCOUVER, B. C., 104 Empire Building

For Texas, Oklahoma, New Mexico and Western Louisiana Business, refer to
THE LAMSON COMPANY OF TEXAS, Dallas, Tex.

Products.

CONVEYING SYSTEMS for Cash, Papers, Merchandise and Products for All Industries.

PNEUMATIC DISPATCH TUBE SYSTEMS.

CONVEYORS: Gravity Roller, Belt and Automatic Selective Power.

SPIRAL CHUTES; SPIRAL CONVEYORS.

SELECTIVE OVERHEAD POWER CONVEYORS.

Also manufacturers of Light Hand and Electric Power Elevators and Lifts; Electric Cable and Wire Line Cash and Parcel Carriers; Sectional Metallic Receiving and Storage Bins.

Adaptability of Lamson Conveying Systems.

Lamson automatic conveying systems are as varied as industry itself, and adapted for a wide range of usefulness in nearly every conceivable business. They carry



TRADE-MARK

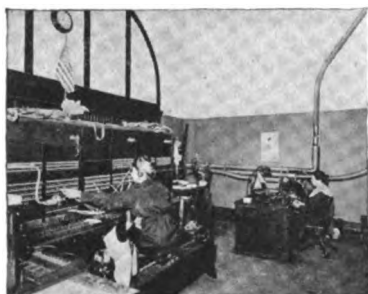
practically everything that is ordinarily handled—from papers, currency and the most fragile products to boxes, barrels, tools, castings, machine parts, etc.

No matter what the business is, Lamson conveying systems will *save time and expense*, and enable the organization to perform *more work with less effort*.

Lamson Service.

Specialists employed by this company are constantly solving all kinds of conveying and carrying problems, and their experience and service are at the disposal of those who desire a satisfactory solution of their conveying needs.

Full information covering any problem to which Lamson conveyors may be adapted will be furnished, without obligation.



Telegrams and messages relayed all over the factory by this Lamson tube station



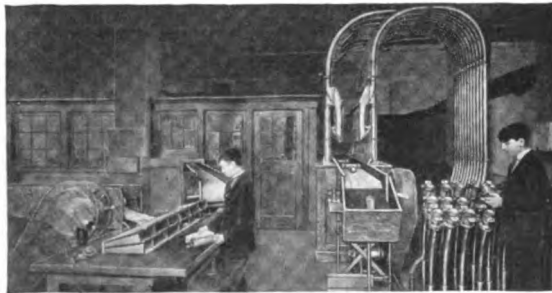
Labor, and the movement of materials, controlled from the central planning department. Lamson pneumatic tubes give practically instantaneous message service to all parts of the plant



This tube service is a quick, mechanical messenger between shop and main office



Papers are kept moving between executives and department heads by Lamson pneumatic tubes



This central desk serves the same purpose for the tube system as a central switchboard in a telephone system. Incoming pneumatic carriers are here relayed by tube to their destinations. The tube system is intercommunicating between all stations



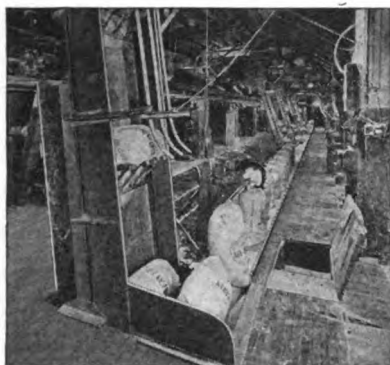
In banks, checks and debit and credit items are kept moving by Lamson pneumatic tubes

LAMSON PNEUMATIC TUBES, THE SWIFT MECHANICAL MESSENGERS OF BUSINESS

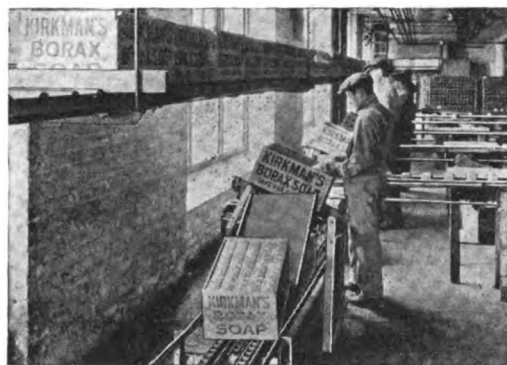
These illustrations show how Lamson pneumatic tubes speed up and systematize the transaction of business by carrying letters, requisitions, orders and other papers quickly and surely in the factory, office, bank and business house

SWEET'S CATALOGUE

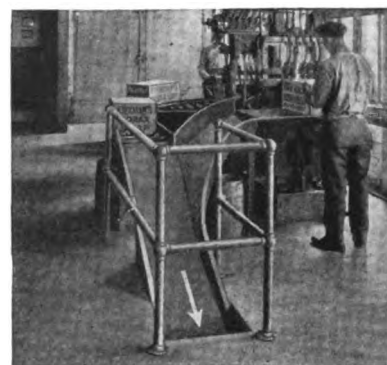
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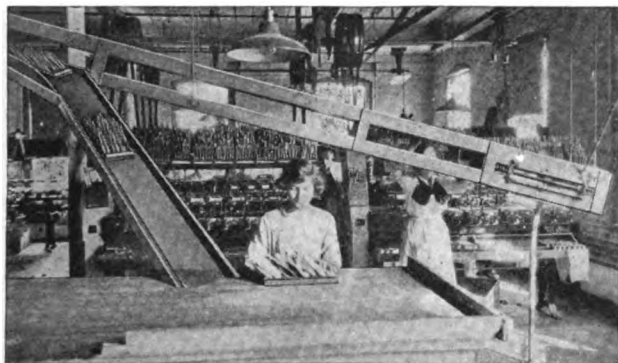
Belt and vertical conveyors carrying bags of flour from sewing machine to outgoing freight cars. They do away with the slowness and confusion of porters with trucks



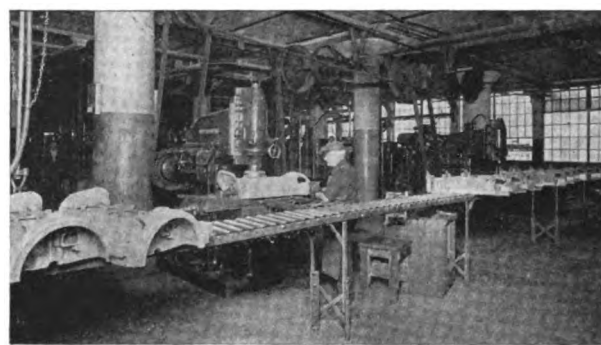
Packing of all kinds of products systematized by Lamson conveyors. Conveyors bringing empty boxes and bars of soap to packers and carrying packed boxes away to nailing machines



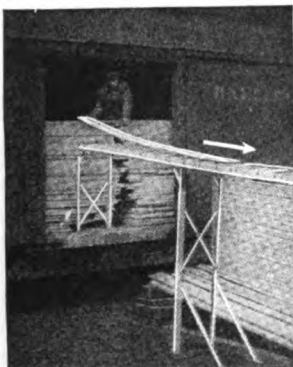
Boxes of soap, shown in illustration to the left are conveyed to these nailing machines. Nailed boxes are conveyed to storage or shipment



In textile mills, Lamson conveyors carry bobbins, laps, raw cotton, finished cloth, etc. Lower belt of this 2-way conveyor brings empty silk quills to filling machines. Upper belt returns filled quills



Castings and parts carried between machines in the modern machine-shop. Conveyors keep stock in motion between processes and cut down amount of stock that is necessary. They link a battery of machines into one complete unit



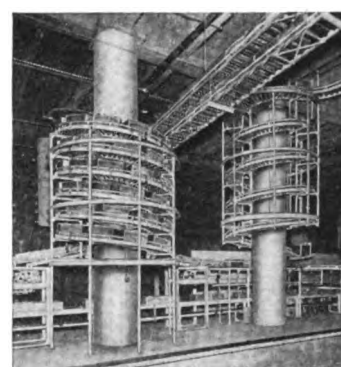
Lumber, boards, shooks and other wood products easily carried on Lamson gravity and power conveyors



Tote boxes of small parts carried by gravity or by this chain conveyor



Lamson spiral chutes carry a steady stream of packages vertically downward, quickly and without attention and without damage



Lamson gravity spiral conveyors carry packages downward to shipment and also serve as "live storage." Hundreds of boxes always "stand in line" ready for shipment



A completely equipped shop. Parts and products from every machine are carried on Lamson conveyors to the two main line conveyors, which in turn carry them to the packing and shipping departments

SAVING LABOR'S USELESS STEPS BY LAMSON GRAVITY AND POWER CONVEYORS

These views show how every phase of industrial work is speeded up when Lamson conveyors are used. These conveyors put the handling and carrying on the same footing as the manufacturing processes—on a quantity production basis

BROWN PORTABLE CONVEYING MACHINERY CO.

Portable and Sectional Elevating, Loading and Unloading Machinery

10 South La Salle Street
CHICAGO, ILL.

BRANCH OFFICES

NEW YORK, N. Y.

BOSTON, MASS.
SAN FRANCISCO, CAL.

PHILADELPHIA, PA.
CLEVELAND, OHIO

NEW ORLEANS, LA.

Sales Representatives in the principal cities of the United States and in Foreign Countries

Products.

BELT CONVEYORS for loose materials; PORTABLE and STATIONARY BELT CONVEYORS and ELEVATORS for package freight and other goods; VERTICAL TIERING MACHINES (Hand-I-Lift) for heavy and bulky packages; BOAT, CAR, and TRUCK LOADERS and UNLOADERS for packed and loose materials. "MOTO-LIFT" for moving and tiering heavy and bulky packages.

Scope of Use.

"Brown Portable" continuous motion machines are used for the rapid and low cost handling of packed and loose materials. They are built to fit the job. They handle various sizes and weights of packed, tied, wrapped, boxed, rolled or loose materials. The "Hand-I-Lift," a vertical tiering machine, handles heavier, bulkier, and more irregularly shaped packages; the belt conveyor handles practically all forms of loose and bulk materials such as coal, coke, sand, gravel, crushed stone, loose scrap, ashes, etc.

"Brown Portable" Performance.

"Brown Portable" conveying machines reduce cost of handling from 50% to 80%.

Always ready for service.

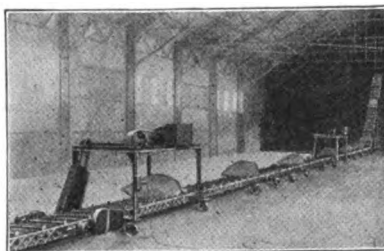
Insurance against strikes and labor shortages.

Deliver goods to same height at same cost.

Prevent man-handling of goods and eliminate breakage.



PORTABLE ELEVATOR
PILING BAGS
No handlers between floor
and top of pile



PORTABLE SECTIONAL CONVEYOR
AND ELEVATOR OPERATING
AS ONE MACHINE
Eliminating truckers and stackers



BELT CONVEYOR HANDLING LOOSE MATERIALS CHEAPLY
AND QUICKLY

Do quickly the heavy labor which over-exerts men.

Delivery heights may be adjusted without cutting off power.

Make greater piling heights possible and thereby save floor space.

Increase the output of plants.

Few wearing parts; any man can operate them.

Power.

Self-contained; either electricity, gasoline, kerosene, air or steam.

Prices.

Quoted without obligation on receipt of details of handling conditions. Send for Bulletin 140.

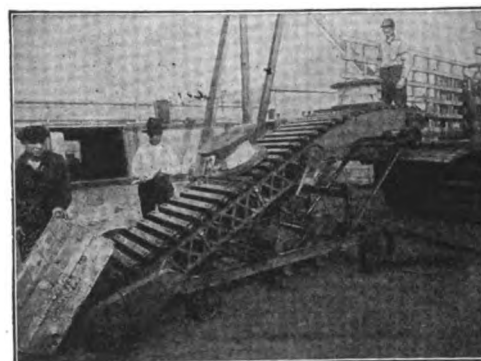
Guarantee and References.

Every machine fully guaranteed.

Used in 40 different countries by nationally known industries such as steamship and railroad lines, municipalities and governments. Names of users in your industry on request.

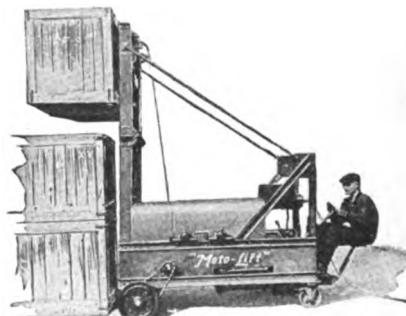


VERTICAL TIERING
MACHINE ("HAND-I-
LIFT") FOR HEAVY
AND BULKY
PACKAGES
Frame folds to permit
passage through door-
ways



TRUCK OR CAR LOADER

Made in many forms to suit local conditions



"MOTO-LIFT" FOR MOVING AND TIERING HEAVY AND BULKY
GOODS

McKINNEY-HARRINGTON CO.

Elevating and Conveying Machinery

NORTH CHICAGO, ILL.

Products.

PORTABLE COMBINATION CAR and TRUCK LOADERS and PILERS (Patent applied for).

PORTABLE CONVEYORS and PILERS.

Service.

Trucking, loading, unloading and storing problems are solved by this company. A material saving can be effected by devising and making a portable conveyor especially designed to fit individual needs. Stock conveyors are not sold by this company. A study is first made of particular requirements and then the best possible machine to meet this demand is designed and built.

The McKINNEY-HARRINGTON CO. is composed of experts under the guidance of Henry Harrington, a pioneer in the designing and construction of portable elevators and conveying machinery. He is able to give personal consideration to all cases, and it is assured that the conveyor planned and built for a plant will be the most efficient possible.

Scope of Use.

The portable conveyors and pilers manufactured by this company contain their own power—electric motor or gasoline engines. They handle bags, bales, boxes, barrels, cartons, rolls and a great range of packed commodities. They stack from the floor to the ceiling, convey from floor to floor or any distance across level or sloping space, load from factory or warehouse into wagon or railway car. By reversing the motion materials can be moved in opposite direction.

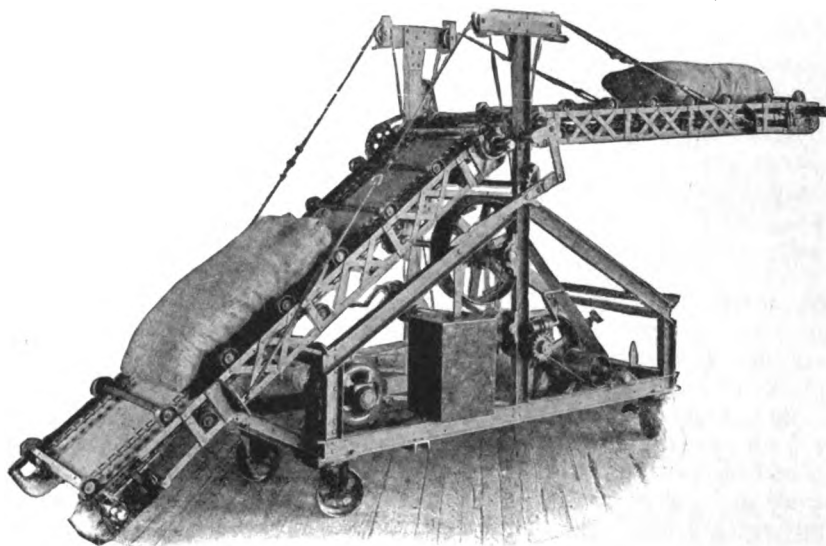
Portable Combination Car and Truck Loader and Piler (Patent Applied For).

This machine, in addition to loading cars and trucks, is well adapted for piling in the warehouse to a height of about 10 ft., thus giving a combined use. The design of the machine is such, that not only the upper tiers can be placed, but piling can start from the floor.

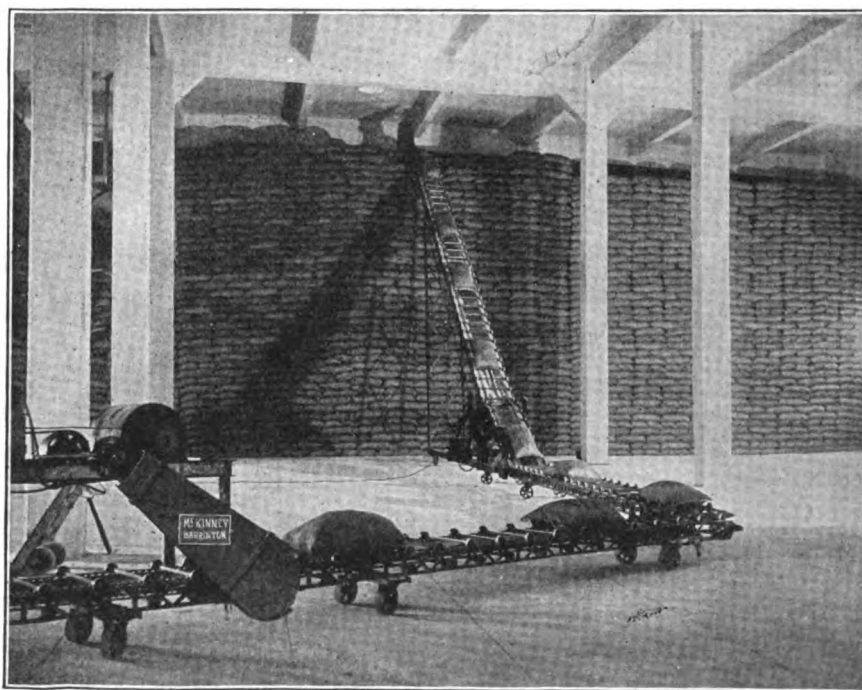
In operation as a car loader, one end of the car is first filled. Then instead of having to run the machine out of the car to turn it around, as is the case with the ordinary car loader, this machine is rolled to the opposite end, the lever of the double throw switch is placed in reverse

position and the elevating chains and axles run in opposite direction. What was the delivery end, becomes the receiving end. To move the machine and make this change takes less than five minutes.

As the car is filled, loader is moved out and the final fill in the center of the car is through the car door. The design and size of the machine is such that it will readily pass in and out of an ordinary freight car.



PORTABLE COMBINATION TRUCK AND CAR LOADER AND PILER
Position when loading or piling



PORTABLE CONVEYOR AND BAG PILER IN USE IN THE AMERICAN BEET SUGAR CO.'S PLANT AT ROCKY FORD, COLO.

A floor type conveyor, showing overhead power frame, sacks turning right angle and delivering to piler and to top of pile. Bags are piled 40 high. The entire work is done by only two men; not less than ten men were required to do the work by the old-time method of hand trucking and piling.

CHICAGO AUTOMATIC CONVEYOR CO.

Manufacturers of Portable and Stationary Conveyors

11 South LaSalle Street
CHICAGO, ILL.

BRANCH OFFICES

NEW YORK, N. Y. PHILADELPHIA, PA. PITTSBURGH, PA. CLEVELAND, OHIO DETROIT, MICH.
ST. LOUIS, MO. OMAHA, NEBR. MINNEAPOLIS, MINN. SAN FRANCISCO, CAL.

Products.

CHICAGO AUTOMATIC CONVEYORS (Patented), comprising Portable and Stationary Conveyors, drag, belt or bucket.

Chicago Automatic Conveyors.

Every detail surrounding the use of conveying equipment has been taken into consideration by this company in developing its line of conveyors. The result is a machine low in cost, and one that can be applied to sheds and conditions as they exist without extensive alterations. Exceptionally strong, simple, foolproof, flexible, it has very few wearing parts, all of which can be quickly and cheaply replaced. One of the principal features in this connection is the absence of special castings, thus obviating any delay, in case of a breakdown, that might obtain by difficulty in securing wearing parts made from special patterns.

The Chicago automatic conveyor, whether handled by means of a trolley rail or on a wheel frame, is complete in every detail. The motor is built into the conveyor and all the necessary attachments, such as trolley, chain hoist, plugs, receptacles, portable cord, chutes, trolley rail, etc., which are needed to get the proper work from such an outfit, are included.

Service and Guarantee.

Every outfit is installed under the supervision of our experienced erecting foremen, insuring the completion of the work of installation promptly, cheaply, and correctly, with no time lost on account of mistakes and experimenting, thus relieving the purchaser of all responsibility.

The Chicago automatic conveyor, in addition to being complete in every detail and suited to the buyer's exact needs, is fully guaranteed as to the amount of tonnage it will handle, and against all defects in material or workmanship. The company's force of trained foremen, available for any place on short notice, are always ready to make this guarantee good.

In order to fully insure this service and guarantee, it is necessary that this company furnish the motor or



BELT TYPE CHICAGO AUTOMATIC CONVEYOR

Equipped with gasoline engine and friction clutch; mounted on yoke wheel frame. Note receiving end, sprockets, etc., are completely booted in



DRAG TYPE CHICAGO AUTOMATIC CONVEYOR

For loading trucks. Capacity over 60 tons per hour; mounted on yoke wheel frame with chain hoists for adjusting delivering end

engine and all parts of the conveyor. If motor is not built into and a part of the conveyor, it devolves upon the purchaser to get one of proper characteristics, of the right size and speed, and the most practicable plugs, receptacles and portable cords, or a gas engine of the right design.



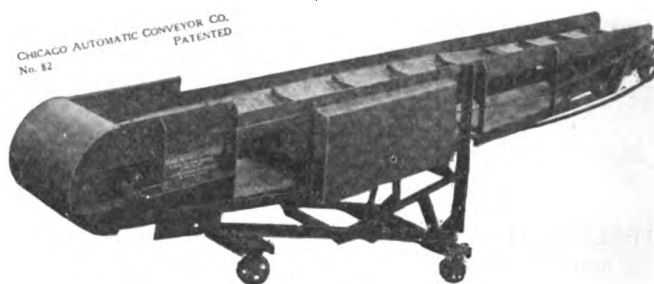
BUCKET TYPE CONVEYOR SUSPENDED FROM TROLLEY RAIL, UNLOADING COAL FROM HOPPER BOTTOM CAR TO OPEN PILE



BELT TYPE CONVEYOR PILING BALED SCRAP IRON
Each bale, weighing 275 lbs., is piled direct from baling machine, and later loaded from pile on to cars



FOUR BELT TYPE CONVEYORS OPERATING IN ONE PLANT
Two 16-ft. portables, suspended from trolley rail unload materials from cars on to 37-ft. inclined conveyor, which in turn transports material on to 47-ft. horizontal conveyor

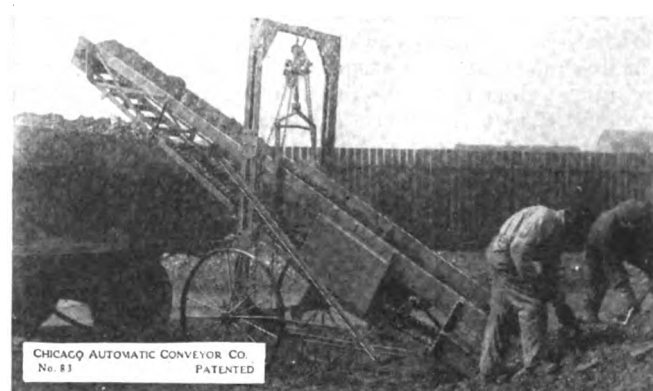


BELT TYPE WITH ESPECIALLY DESIGNED ROLLER BEARING CARRIAGE

For trimming fertilizer, lime, sacked cement, etc., back into box cars



BELT TYPE, SCREENING AND LOADING GAS HOUSE COKE ON TO RAILROAD CAR



DRAG TYPE 20 FT. LONG
Mounted on yoke wheel frame, capacity 60 tons per hour



BELT TYPE ON TROLLEY RAIL UNLOADING COAL.
This style conveyor adapted to unloading high hopper cars as well as gondola or box cars

ESTABLISHED 1892

THE GEORGE HAISS MFG. CO., INC.

Digging, Rehandling and Conveying Machinery

TELEPHONE:
MOTT HAVEN 0157

Canal Place and East 141st Street
NEW YORK, N. Y.

CABLE ADDRESS:
"COAL-HOIST, NEW YORK"

Products.

"PATH DIGGING" SELF-FEEDING, SELF-CROWDING, SELF-PROPELLING WAGON LOADERS.

HAND PORTABLE BELT CONVEYOR; SELF-PROPELLED BELT CONVEYOR; SELF-PROPELLED, REVOLVING BELT CONVEYOR.

Also manufacturers of Car Unloaders; Bag Loaders; Portable and Stationary Bucket Elevators.

For other Contractors' and Coal Dealers' Machinery, see page 104.



TRADE-MARK

the feeding propeller shaft towards the middle point where the buckets fill up. By the same operation the blades cut open a wide pathway to permit loader wheels to follow automatically in their wake, leaving no material to obstruct the slow, smooth progress of the machine.

The illustrations on this page show why a bucket can not go by without taking its proper load each time.

Operation—

Having been moved under its own power into a position at the foot of some material pile, the operator connects, by means of a clutch, the bucket elevator and the feeding propeller mechanism, and then, when these are in motion, he pushes into mesh a very slow traction gear, which "crowds" the entire loader at a speed of 30 in. per minute against the face of the material pile.



FEEDING PROPELLERS CLEANING UP A "PATH" AND LOADING BUCKETS IN SAME OPERATION

Wagon Loaders.

Uses—Wagon loaders are used for loading and unloading trucks and cars quickly. They will dig and elevate coal, ashes, sand, gravel, crushed stone, chemicals, coke, ore, etc., and can also discharge on ground storage adjoining railroad tracks.

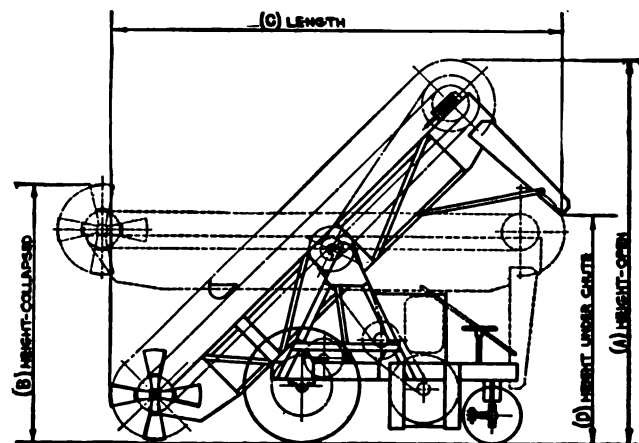
Advantages—The most desirable of all wagon loaders is the famous "Path Digging" loader, patented. In this machine are provided all the automatic features required, thus reducing the number of men otherwise needed to just 1, namely, the operator, who can control this machine so that it will give an uninterrupted discharge of $1\frac{1}{2}$ cu. yds. of material per minute all day.



"PATH DIGGING" WAGON LOADER HANDLING $7\frac{1}{2}$ CU. YDS. 2-IN. CRUSHED STONE IN 5 MINUTES

The "Path Digging" wagon loader is self-propelling, self-feeding, and self-crowding. In moving about from place to place and digging all kinds of materials, all through means of its own power, it so strongly appeals to most contractors, engineers and coal dealers that after comparison with other wagon loaders the purchase price of the "Path Digging" machine becomes a secondary matter, while the time of delivery takes first consideration.

The patented revolving feeding propellers have made the "Path Digging" wagon loader an admirable success. The blades on this device are so fixed along the lower wide spreading elevator shaft that when they revolve they force the material from both extremes of



DIMENSION DIAGRAM, "PATH DIGGING" WAGON LOADER

Types of wagon loaders	"Path Digging"	Hercules "Path Digging"	Super-Hercules "Path Digging"
Height, A.	14'-3"	19'-2"	21'-8"
Length, C.	17'-8"	18'-1"	19'-10"
Height of chute, D.	8'-6"	13'-6"	16'-0"
Height collapsed, B.	9'-0"	9'-3 $\frac{1}{2}$ "	9'-3 $\frac{1}{2}$ "
Overall width of propellers.	7'-0"	7'-0"	7'-0"
Electric motor.	10 h.p.	10 h.p.	10 h.p.
Gasoline engine.	*10 h.p.	†24 h.p.	*30 h.p.
Weight, with electric motor.	7,850 lbs.	8,200 lbs.	9,100 lbs.
Weight, with gas engine.	8,700 lbs.	9,600 lbs.	10,500 lbs.

*Also equipped with 24 h.p. engines.

†Note—This is a four cylinder motor installed for loader which is to handle sand, crushed stone, etc. A 10 h.p. gas engine may be installed for a machine handling coal, or other material not weighing more than 60 lbs. a cu. ft.

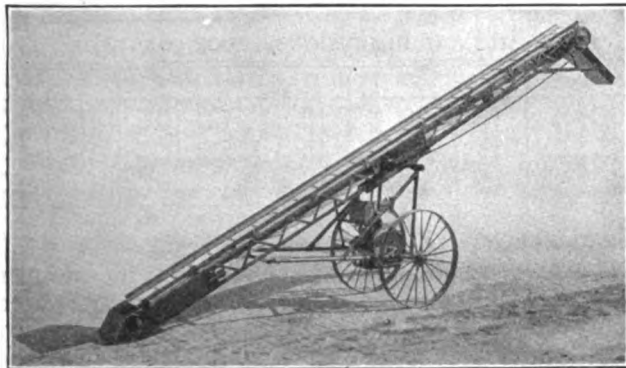
After the propellers undermine a pile sufficiently to cause small avalanches, the slow speed drive is thrown out, and comes into use again only when the feeding propeller blades have dug out all material within reach.

Cost of Operation—The wages of 1 man, and 1¢ or less for power, oil, depreciation and interest on each cubic yard of material dug, elevated and loaded into trucks or cars, covers the cost of operating a Haiss "Path Digging" wagon loader.

Haiss Portable Belt Conveyors.

Loading and Unloading Problems—Portable belt conveyors are indispensable for the rapid and cheap loading and unloading of railroad cars or trucks. They will deliver coal, coke, ashes, sand, gravel, crushed stone, chemicals, ore, etc., high upon ground storage piles adjoining railroad tracks. Also transfer packages or loose materials to stationary conveying systems from either a single belt unit, or along several such conveyors connecting up with one another. Frequently they are employed to carry away materials automatically dug and elevated by the famous Haiss "Path Digging" wagon loader.

Economy Is Only One of Their Many Advantages—Labor is reduced 75% to 90%, and the quantity output is increased wherever Haiss conveyors are installed. They take the place of expensive locomotive cranes with clamshell buckets. One of these low priced, light weight conveyors, moved by a man or two, or



HAISS PORTABLE BELT CONVEYOR
Will handle loose material and packages with equal facility

moved by self-propelling gear, will now do this crane work immensely cheaper. The cost for power is never over a ½¢ per ton or per cu. yd. handled. Much wheelbarrow labor is also discarded. New fields for the utility of these machines have been made possible by the ingenuity of contracting engineers.

Operation—The toe of the conveyor is shoved into the pile, and then one or two men with shovels avalanche the material toward the conveyor. The machine is balanced and moved about on the wheel axle by one man.

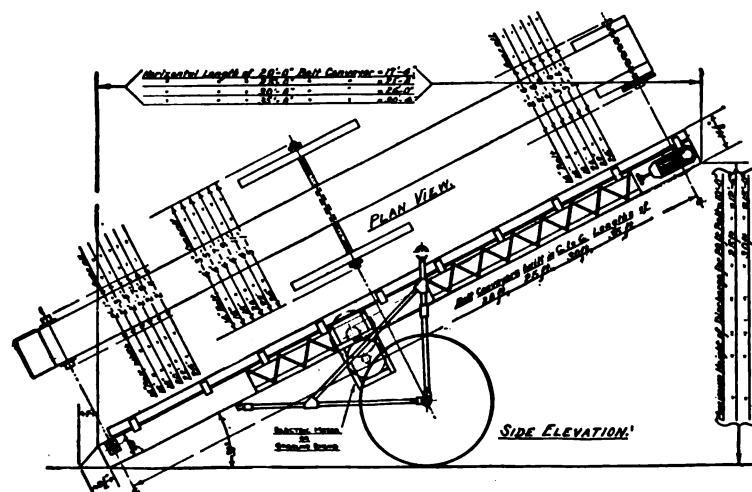
Another type, having a 4-wheel self-propelling chassis is equipped with a full swing turntable, permitting a conveyor to work at any point in a circle, and at the same time the toe end of the belt may be lowered upon the ground, or pivoted horizontally on the turntable. These conveyors are equipped with electric motors or gasoline engines; with 4-ply double sided rubber belting; fine take-up, and 4-way adjustment bearings, and many other extras that add to the notable features.

Self-feeding Attachment—Anthracite coal of domestic sizes, or other loose material not weighing over 50 lbs. per cu. ft., can be delivered on a Haiss portable conveyor belt in a steady and uniform manner by a self-feeding attachment.

Portability, Adaptability, Economical Operation, Low Price—These characteristics have never failed to induce active thought when discovered in a single little machine like the Haiss portable belt conveyor. Recollect for a moment that a portable crane and grab bucket riding on rails, on traction wheels or creepers, is the nearest type of equipment giving similar results. But in many places such cumbersome machines can not fit—are not adaptable, nor will their operating unit cost be on an economical basis, comparable to a Haiss belt conveyor. Then, lastly, comes the main objection—the money that heavy equipment costs, and the higher maintenance charges. Today, the portable belt conveyor is drawing a large portion of rehandling work into a special field of its own where no other machine can equal its performance for cheap and swift results.

Catalogues.

Literature covering the equipment in which one is interested will be sent free on application.



DIMENSION DIAGRAM OF THE HAISS PORTABLE BELT CONVEYOR

PORTABLE MACHINERY CO., INC.

Manufacturers of Portable Belt Conveyors

PASSAIC, N. J.

Products.

The "SCOOP" CONVEYOR.

Also Belt Conveyors for freight handling and for mine car loading.

The Scoop Conveyor.

Description—This is an original "belt type" of portable material handling conveyor designed to be moved and operated by *one man*.

Its predominating distinctive feature is the feed end which can be pushed and completely buried into the material to be conveyed, thus allowing the material to be scraped on to the carrying belt instead of being lifted by shovel into a feed hopper. This saves 50% labor in feeding.

Our experienced organization, together with our financial and moral responsibility, stand back of every machine we produce. All parts, except the motor, belt and drive chain, are manufactured in our own spacious factory under modern standardization and quantity production methods.

American and foreign patents protect purchasers against all possible patent infringement complications.

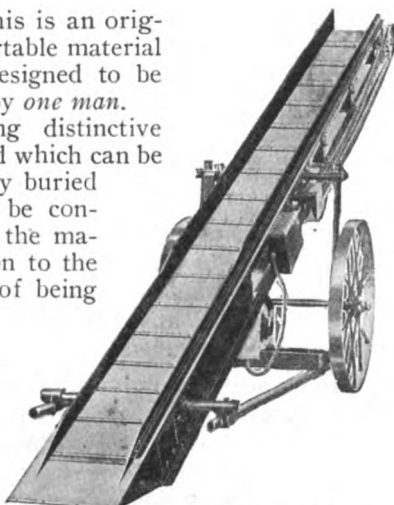
The construction of the latest model is based on that genuine practical experience which guarantees dependable and service-giving results.

Scope of Use—Used for moving loose materials, such as coal, coke, crushed stone, ashes, sand, gravel, etc.; also, sacks, packages, boxes and manufactured products. Adapted for service in retail coalyards; for unloading cars direct into trucks, bins, etc.; for loading cars, barges or holds of vessels from trucks, storage piles or ground; for filling in or extending embankments; for moving material from place to place.

Power—Machines furnished with either electric motor or gasoline engine. If customer supplies motor, we provide motor support and drive from motor shaft. Drive reductions are carried in stock for any motor speed from 700 r.p.m. to 1800 r.p.m.



TRADE-MARK



THE SCOOP CONVEYOR

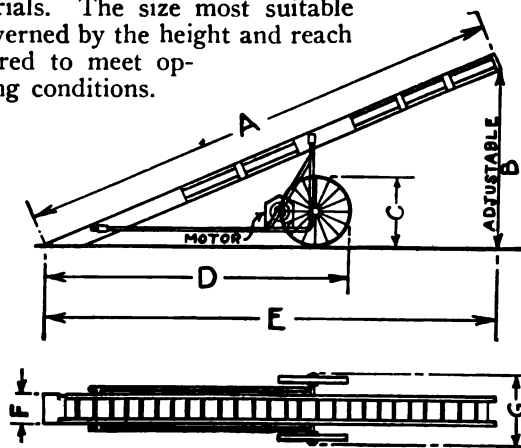
Weight—Ranges from 800 lbs. to 1600 lbs.

Horsepower—2 and 3 horsepower.

Capacity—1 ton in 1 minute.

Dimensions—See diagram below. The 14-ft. size conveyor is suitable for loading and unloading box cars, or loading industrial cars, and for general use in limited space.

Both the 20-ft. and the 24-ft. size are suitable for loading and unloading trucks or cars and for stacking materials. The size most suitable is governed by the height and reach required to meet operating conditions.



DETAILS AND DIMENSIONS, SCOOP CONVEYORS

Size	A	B	C	D	E	F	G
12" x 14'	14'	4' to 6'	42"	9' 6"	12' 5"	17"	43"
16" x 14'	14'	4' to 6'	42"	9' 6"	12' 5"	21"	47"
12" x 20'	20'	6' to 9'	42"	12' 0"	18' 3"	17"	43"
16" x 20'	20'	6' to 9'	42"	12' 0"	18' 3"	21"	47"
12" x 24'	24'	9' to 12'	42"	13' 3"	22' 6"	17"	43"
16" x 24'	24'	9' to 12'	42"	13' 3"	22' 6"	21"	47"

Guarantee.

All parts guaranteed against defects in workmanship and material. In addition, we guarantee that scoop conveyor repair costs through wear, including belt renewals will not exceed 1¢ per ton of material handled when conveying coal, coke, ashes, sand or similar material.

A reputation founded on years of experience and reflected by the confidence of thousands of users is guarantee of absolute dependability.

When Writing.

State operating conditions; kind of material to be handled; power available; where material is received and delivered, etc.



LOADING TRUCK FROM STORAGE



UNLOADING FROM CAR TO TRUCK

REVOLVATOR CO.

334 Garfield Avenue
JERSEY CITY, N. J.

Products.

PORTABLE ELEVATORS (Tying Machines), Revolvable, Non-revolvable and Open End Types for Hand, Electric, and Combination Hand or Electric Operation. Also Barrel Racks to meet any situation.

Revolvator.

The Revolvator is a portable elevator for stacking or tying bales, boxes, barrels, or any other heavy, bulky, or fragile articles.

Advantages.

A Revolvator will increase the storage capacity of a warehouse from 20% to 50%. Materials can be stacked clear to the ceiling, leaving no waste space and making wide aisles unnecessary.

It reduces material handling cost. Usually two men and a Revolvator can do the work of from four to eight men without one, and can do it more speedily.

Types.

The Revolvator is made in nine standard models, operated by hand, motor, and combination hand or motor. All are built in revolvable, non-revolvable and open end types.

Hand Operated—An economical machine which will materially reduce the costs wherever lifting, piling, and stacking is being done.

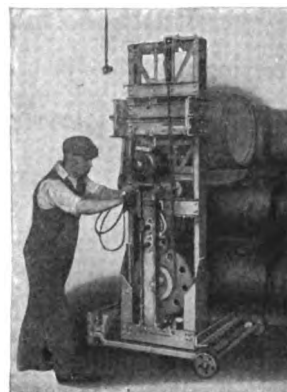
Motor Operated—For very high piling, for extra heavy loads or especially fast work, the electric motor driven Revolvator is recommended.

These machines are standard up to 1800 lbs. capacity, and can be built to order for greater weights or to meet special conditions.

Combination Hand or Motor Operated—A combination machine which may be run by hand or by electricity from the average lighting socket. The $\frac{1}{2}$ h.p. motor will raise a load of 1800 lbs. at much greater speed than the average man operating by hand.

The electric motor attachment used on this machine can be furnished for and installed on any hand operated Revolvator, or any make of tying machine.

Revolvable Type—The exclusive feature of this machine is the revolvable base. The whole upper structure including the loading platform may be swung around in any direction, like a turntable, without chang-



Operated by Hand

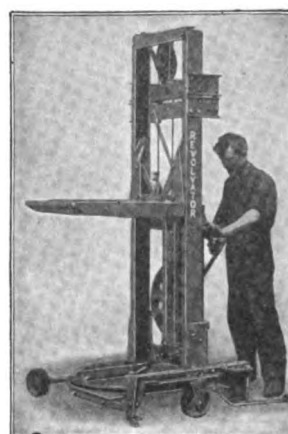


Operated by Motor

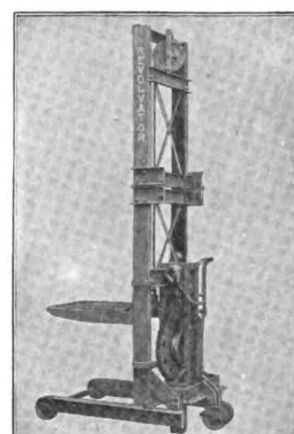
COMBINATION REVOLVATOR

ing the floor base or general position of machine. Exceptionally advantageous in narrow and cramped quarters.

Non-revolvable Type—Some types of piling may be done effectively with a machine of this kind, which is similar in construction to the revolvable type, but is made without the revolvable base feature.



REVOLVABLE TYPE



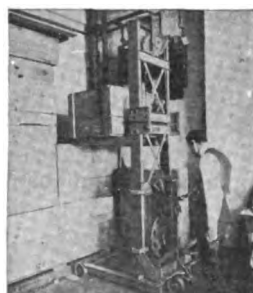
NON-REVOLVABLE TYPE

Literature and Information.

Literature giving full information on any of these machines will be sent on request.



PILING ROLLS OF PAPER



PILING CASES



PILING BALES



LOADING TRUCKS

SPECIALTY ENGINEERING COMPANY

Manufacturers of Conveying Machinery

Allegheny and Trenton Avenues
PHILADELPHIA, PA.

Products.

BELT CONVEYORS for conveying materials in package or bulk; TRUCK or WAGON LOADERS; CAR UNLOADERS; WEIGHING LARRIES; BOILER HOUSE EQUIPMENT including "V" BUCKET ELEVATOR-CONVEYORS, STEEL SUSPENDED BINS and STOKER SPOUTS; COAL CRUSHERS; SKIP HOISTS.

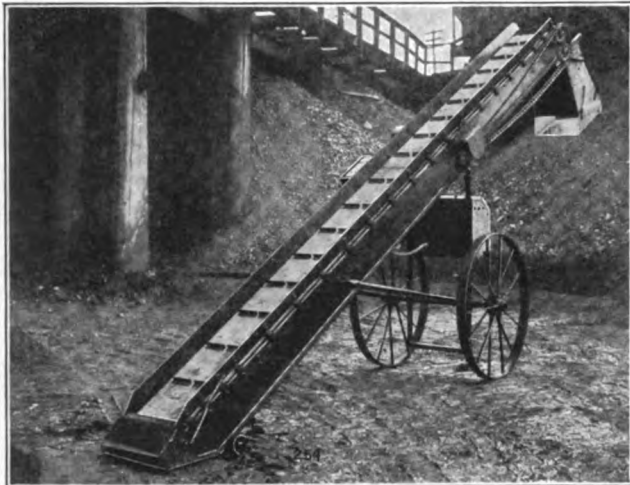
Service.

Catalogues and bulletins mailed on request. Estimate drawings and specifications are furnished. The experience of Specialty's Engineers is offered freely in recommending economical methods of handling materials and in selecting the equipment that exactly meets requirements.

The shops are equipped to manufacture any work in structural steel or steel plate construction.

Specialty Belt Conveyors.

Movable belt conveyors are used for rapid loading and unloading of soft coal, hard coal, ash, coke, brick, stone, dirt, lime, etc.



18-FT. SPECIALTY BELT CONVEYOR

Specialty belt conveyors are made in standard sizes. A three ply, 15-in. rubber belt is used. The machine usually purchased for loading trucks measures 18 ft. from center of the foot pulley to center of the head pulley. A 24-ft. belt conveyor is also made. This size is used for unloading cars and for piling to a height of 12 ft. The Specialty belt conveyor may be operated by an electric motor or a gasoline engine. Description and illustrations in Bulletin No. 8.



60-FT. BELT CONVEYOR

SWEET'S CATALOGUE

standard lengths from 30 to 60 ft. This type of belt conveyor is used to stock out large quantities of loose material over large areas or to a great height. This machine is sold with or without a hoisting mechanism. The hoisting mechanism consists of a steel frame and a durable quick acting chain block. Specifications and dimensions of the Specialty belt conveyor "troughing type" may be seen in Bulletin 1-C.

Wagon Loaders.

There are several designs of wagon loaders made to handle various materials and to meet certain requirements. The illustration shown is of Type No. 15. This wagon loader loads and screens all sizes of anthracite coal. The frame is of structural steel. Malleable iron buckets are attached to a double strand of malleable iron and steel chain. Large hopper for screenings. A set of screens furnished with each loader. Wagon loaders driven by electric motor located in dusttight casings. Details shown in Bulletin 4-A.



WAGON LOADER, TYPE NO. 15

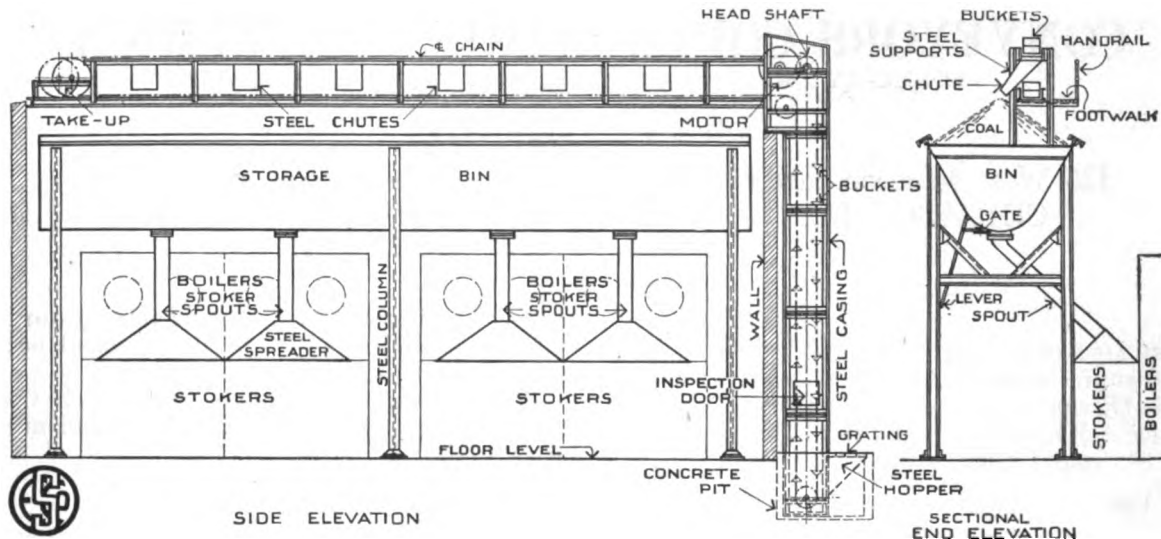
Car Unloaders.

Specialty car unloaders are used to unload cars of coal rapidly and cheaply. They also serve to stock out large quantities of coal or to load directly to wagons or trucks. Car unloaders are standard machines. This equipment consists of a concrete track hopper, an endless chain of steel buckets, a structural steel supporting frame and driving machinery. Operated by gasoline engine. Car unloaders are described in Bulletin 2.



CAR UNLOADER

Continued on next page

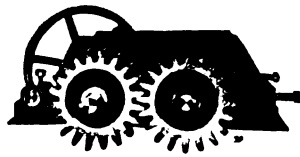


BOILER HOUSE EQUIPMENT TO HANDLE COAL

Steel hopper, "V" bucket elevator-conveyor, steel suspended bin and stoker spouts with spreaders

Coal Crushers.

To reduce bituminous coal to suitable sizes for use in automatic stokers. Four sizes of machines are manufactured, in capacities from 25 to 75 tons per hour, suitable for general boiler house and small industrial plant practice. The crusher is fitted with compression springs—a safety guard. Heavy bronze bushed bearings. For information on coal crushers, ask for Bulletin 6.



TWO-ROLL CRUSHER



SKIP HOIST INSTALLATION



BUCKET CONVEYOR IN CIRCULAR STEEL CASING

Skip Hoists.

For conveying cheaply coal, ash, and other bulk material, a single steel bucket is automatically hoisted on vertical tracks by means of a steel cable attached to a winding machine. The bucket dumps into a chute which directs material to a bin. Electrically operated.

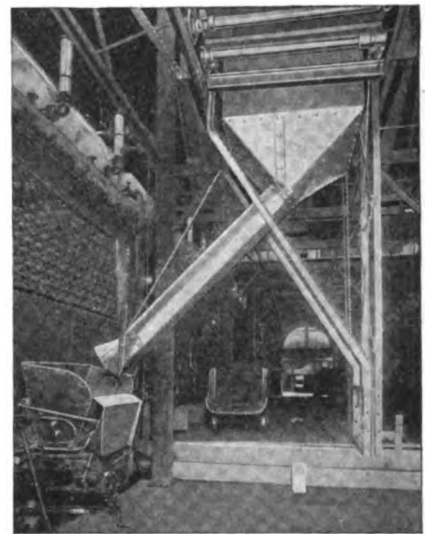
Bucket Conveyors.

The illustration shows an efficient and economical method of conveying coal from the car directly to the boiler room or to ground storage. The chain and bucket conveyor in the circular, self-supporting casing conveys the coal from the concrete track hopper to the top of the casing where it is discharged to a chute. The chute directs the coal to the boiler room or to ground storage.

Weighing Laries.

For automatically weighing coal and keeping an accurate record of the amount of fuel consumed by each boiler. Made in capacities from 1,000 to 10,000 lbs. Hand or electric power. A close spacing of gates may be had and little dead coal left in the bunker.

The weighing larry is one part of the complete outfit installed in boiler houses by the SPECIALTY ENGINEERING COMPANY. Equipments consist of track hoppers, reciprocating feeders, coal crushers, conveyors, bins, and laries.

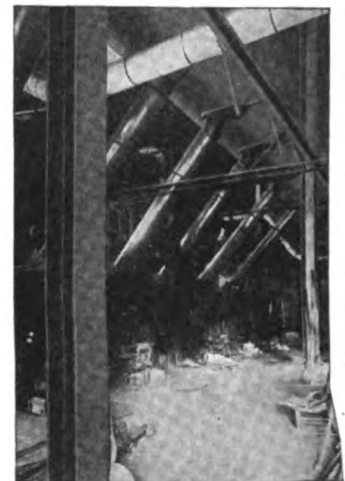


WEIGHING LARRY

Steel Suspended Bins and Stoker Spouts.

Steel suspended bins are designed to suit the boiler room conditions and the storage capacities desired.

Gates spaced at intervals under the bins regulate the flow of coal into the stoker spouts. See Boiler House Bulletin 7.



STOKER SPOUTS

CONVEYORS CORPORATION OF AMERICA

FORMERLY AMERICAN STEAM CONVEYOR CORPORATION

Conveyor Engineers

326 West Madison Street
CHICAGO, ILL.

110 West 40th Street
NEW YORK, N. Y.

ENGINEERING SALES OFFICES IN ALL PRINCIPAL CITIES

Products.

AMERICAN STEAM ASH CONVEYORS.

Also manufacturers of Ash Pit Doors, Locomotive Cinder Pit Ejectors, Locomotive Sand Handling Systems, Marine Ash Ejectors, Special Hard Metal Castings. For Overhead Trolley Carriers, see page 695.

Scope of Use.

For the economical handling of ashes, combustion ashes, soot, blast furnace dust, coal siftings, etc., from boiler or furnace room to any point desired.

Construction and Operation.

An American Steam Ash Conveyor consists of a heavy pipe line made of hard new pig iron and special patented fittings with removable hard metal wear parts. This pipe line is installed in the boiler house and ash intakes are located at the most convenient points. The installation requires only enough space for a 6-in. or 8-in. pipe line.

Systems are made in units, 4, 6 and 8 in. in diameter. 6-in. diameter and smaller sizes are used for conveying soot from economizers, breechings, combustion chambers of boilers, and coal siftings from stokers.

One man rakes the ashes into an intake conveniently located. He turns a valve, the suction of a steam jet shoots the ashes through a pipe, 100 ft. up if required, 100 to 300 ft. away, to pit, pile, overhead hopper, car, wagon—anywhere desired.

Advantages.

Old and new plants, hand and stoker fired, are easily equipped with American Steam Ash Conveyors. Little space is

required and installation in every condition can be met. Delivery of ashes may be vertical, horizontal, or around corners to any point desired.

The use of an American Steam Ash Conveyor releases from 1 to 6 men to engage in labor more productive to their employer.

Cost.

The first cost is low. Installation is simple, and valuable space is not taken up. The steam consumption is inconsiderable and the stamina of the conveyor is such that repairs or replacements of parts are seldom necessary and entail very little work, which can be quickly and easily done under the direction of the house engineer.

Service.

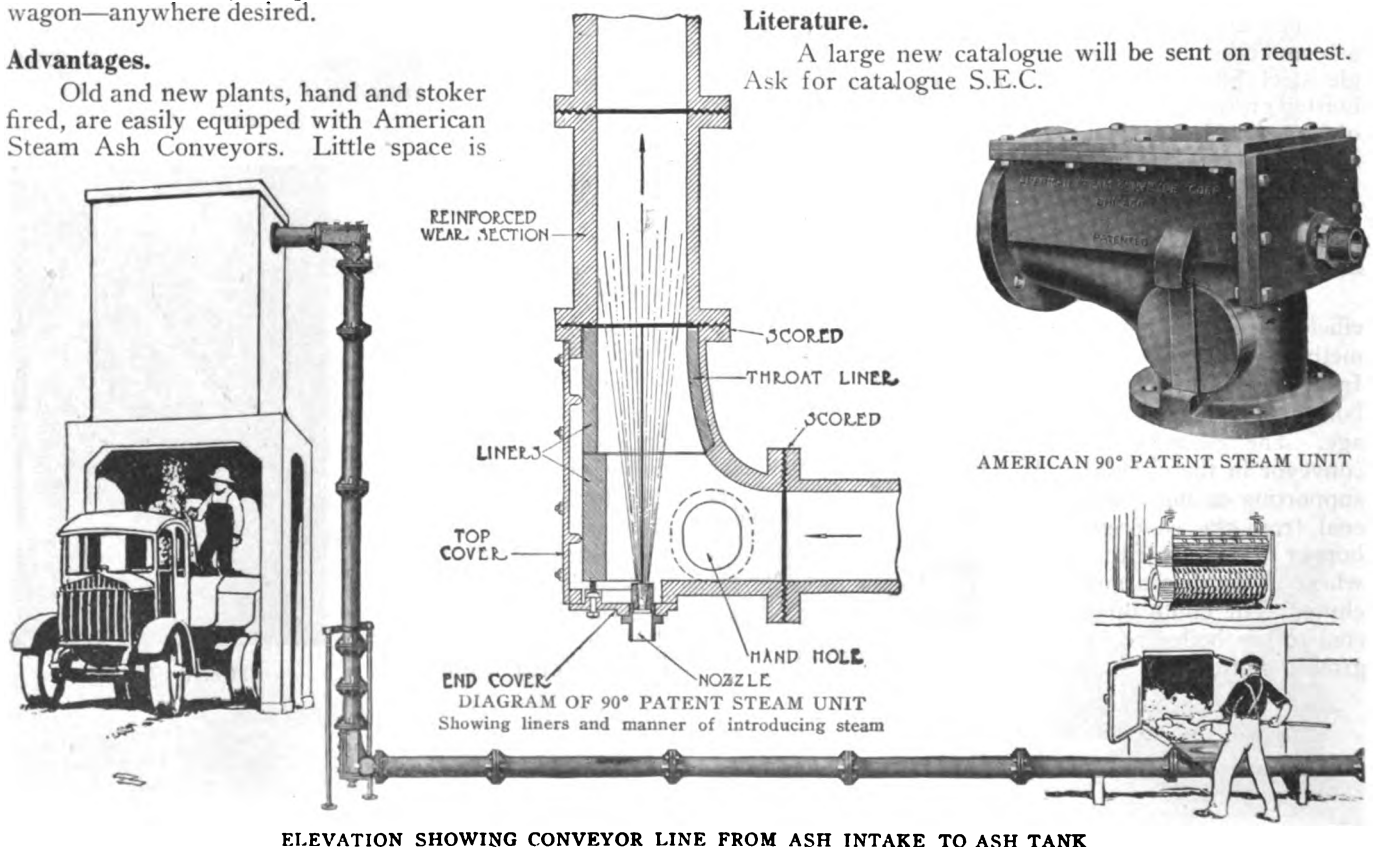
The great success of American Steam Ash Conveyors is the direct result of scientific experiment and exhaustive tests by the engineers of this corporation. Experts in ash handling give each contract personal attention.

Installations.

1000 American Steam Ash Conveying Systems are in daily use in this country and Canada. One of these plants is located near you, and the address will be furnished to those interested.

Literature.

A large new catalogue will be sent on request. Ask for catalogue S.E.C.



ELEVATION SHOWING CONVEYOR LINE FROM ASH INTAKE TO ASH TANK

M. H. DETRICK COMPANY

Manufacturers of Steam Jet Ash Conveyors

155 East Superior Street
CHICAGO, ILL.

DISTRICT SALES OFFICES

NEW YORK, N. Y.
PITTSBURGH, PA.
PHILADELPHIA, PA.
CINCINNATI, OHIO
INDIANAPOLIS, IND.

CLEVELAND, OHIO
CHICAGO, ILL.
BOSTON, MASS.
HAZLETON, PA.

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NEW ORLEANS, LA.
HOUSTON, TEX.
DENVER, COLO.
MONTREAL, QUE.

SEATTLE, WASH.
SAN FRANCISCO, CAL.
ATLANTA, GA.
DETROIT, MICH.
HAVANA, CUBA

Product and Service.

DETRICK-HAGAN STEAM JET ASH CONVEYOR.

The Engineering Department, which is experienced in the solution of ash handling problems, makes a study of each individual requirement and specifies fittings from a standard list which can easily be duplicated without delay when the necessity for renewal parts arises.

For Detrick Flat Suspended Fire Tile Arches see page 775.

Description.

The steam jet ash conveyor is the simplest type of ash handling equipment, requiring practically no labor. The Detrick-Hagan steam jet ash conveyor is the simplest of this type, being composed of the fewest number of standard parts and interchangeable wherever possible.

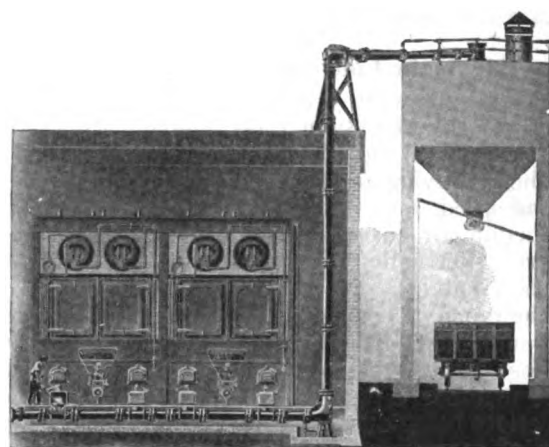
The system consists of a pipe line through which ashes are first drawn and later pushed through to the tank or car by means of steam issuing at a high velocity from a specially designed nozzle.

The Detrick-Hagan piping and elbows are cast from a special white iron developed in the Detrick-Hagan foundry and used exclusively by them. This special white iron has the highest resistance to abrasion of any material now being used in the making of fittings for steam jet ash conveyors.

The pipe connections are made by solid flanges bolted together by means of a flange coupling entirely separate from the pipe, which is cast in two pieces to form the girth of the pipe. The coupling is made airtight by means of a round rubber gasket inserted in a groove provided in the flange. This coupling—a special Detrick-Hagan feature—permits the pipe to be turned any number of degrees desirable to offset wear, due to the abrasion of the ashes.

With other systems it is customary to connect the pipe flanges direct with bolts. This makes it possible to move the pipe only the distance between drill holes. Also it makes such a rigid connection that the cast pipe often breaks, due to expansion and contraction.

Detrick-Hagan elbows are furnished with special reversible and interchangeable backs necessitating the stocking of the fewest possible repair parts. The Detrick-Hagan target box is provided with a special impact pocket in which the first ashes carried through the conveyor lodge and act as a wearing back for those that follow. This gives this particular fitting practically the lifetime of the entire system.



A TYPICAL DETRICK-HAGAN INSTALLATION

Information About Steam Consumption and Labor Cost.

The Detrick-Hagan steam jet ash conveyor catalogue shows complete charts which will give the cost in steam consumption of any system that might be required.

It also shows sample installations of the Detrick-Hagan steam jet ash conveyor with the aid of which you can practically estimate what would be required.

Users.

Aluminum Co. of America, New Kensington, Pa.
American Shipbuilding Co., Cleveland, Ohio
American Woodworking Machinery Co., Rochester, N. Y.
Bethlehem Steel Co., Steelton, Pa.
Blake-Knowles Pump Works, East Cambridge, Mass.
F. Blumenthal & Co., Jersey City, N. J.
Brooklyn Navy Yard, Brooklyn, N. Y.
Brown Hoisting Machinery Co., Cleveland, Ohio
Cambridge Electric Light Co., East Cambridge, Mass.
Cleveland City Railways Co., Cleveland, Ohio
B. F. Goodrich & Co., Akron, Ohio
Hills Bros. Co., Brooklyn, N. Y.
Hinde-Dausch Paper Co., Sandusky, Ohio
National Carbon Co., Cleveland, Ohio
Pennsylvania R. R. Co., Mt. Carbon, Pa.
Pennsylvania R. R. Co., Pittsburgh, Pa.
Pennsylvania R. R. Co., Erie, Pa.
Pennsylvania R. R. Co., Kane, Pa.
Pennsylvania R. R. Co., Renovo, Pa.
Philadelphia & Reading R. R. Co., Skillman, N. J.
Philadelphia & Reading R. R. Co., Philadelphia, Pa.
Philadelphia & Reading R. R. Co., South Bethlehem, Pa.

THE DUST RECOVERING & CONVEYING CO.

Pneumatic Conveyors

Engineers Building
CLEVELAND, OHIO

BRANCH OFFICE: Boston Building, DENVER, COLO.

Product.

DRACCO PNEUMATIC CONVEYING SYSTEM for transporting Coke, Sand, Coal, Grain, Fertilizer and all Dry, Granular Substances.

For "Perfecto" Filters, see pages 830-31.

Dracco Pneumatic Conveyor.

Several noteworthy features contribute to the success of the Dracco system. The unloading operation is quick, economical, broom-clean.

The conveying and elevating are accomplished with ease and speed.

Suction air currents take away all material from grinders, effectually preventing any dust about the grinders.

The range of possible uses for the Dracco system is almost unlimited. There are scores of operations in any plant that can be done better and more economically by Dracco methods.

Besides being dustless from end to end, the Dracco system of conveying is so simple and adaptable that it can be applied to almost any *existing* factory layout with the minimum of re-modeling, or sometimes with none at all.

The intake pipes, terminating at the lower end in flexible steel hose, together with intake nozzles make it possible to unload more than one car without switching. These steel pipes lead to, and are connected with, a receiver where all coarse particles are settled by a reduction in air velocity.

The extremely fine dust which, under no circumstances could be collected by ordinary method, passes upward into filter units of our "Perfecto" type, placed directly on top of the receiver. These filters clean themselves singly in rotation. This settling and filtration collects all the material which is constantly discharged through a specially designed lock, as fast as it is unloaded.

The air which has been entirely cleaned by its passage through the filters, is then sucked through the high efficiency vacuum pump. The operation depends upon a high vacuum which may be anywhere from 5 to 25 in. of mercury, according to distances, material, capacity, etc.

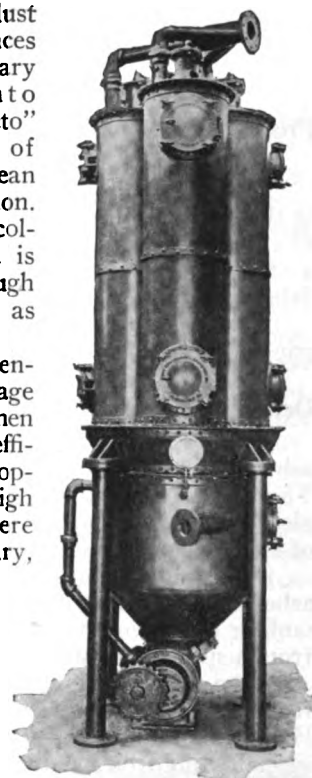
It is highly essential that the air be cleaned to the last degree of cleanliness, as any grit entering the pump would make its life very short.

The Dracco system has introduced a new era of economy, speed and dustlessness in the conveying field. Its constantly widening range of success is due to the correctness of principles which are the exclusive features of Dracco equipment, and above all to our policy of adapting each installation to the peculiarities of the case.

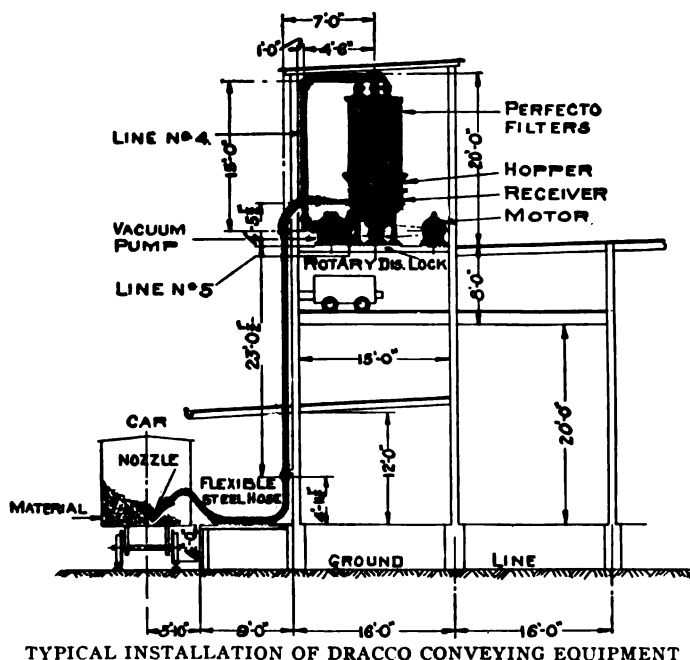
Successful Installations.

Unloading graphite from cars as it is received, moving it a distance of 113 ft. to raw material bins at an elevation of 53 ft.; making it possible to use the same air-suction equipment to take ground material from grinders, conveyors, etc., and raise it up and put it into bins—that is an achievement of the Dracco system. And all this is done with minimum cost, minimum manpower, no dust and no waste.

Successful operation of pneumatic unloading plants by various fertilizer manufacturers has again demonstrated the adaptability and worth of the Dracco system, just as similar equipment has accomplished the clean, efficient and economical unloading of coke, sand, arsenic, soda ash, cement and various dry, granular substances.



"PERFECTO" FILTER



TYPICAL INSTALLATION OF DRACCO CONVEYING EQUIPMENT

Facts Required for Inquiries.

Definite and complete inquiries are necessary in order that we may answer intelligently as to the usefulness of Dracco pneumatic conveying in solving any specific problem. Concerns who are interested in greater economy, simplified operation, dustlessness and the solution of labor problems which we offer, are therefore urged to phrase their inquiries with reference to the following desired facts; or, on application, we will mail a questionnaire covering the points herewith enumerated.

- (1) Name of concern. Date.
- (2) What is the material? (Sample should accompany answer. A pint sealed against moisture and mailed by parcel post is usually sufficient.)
- (3) Sample sent—date, amount, method of sending.
- (4) Had you considered using same equipment for any alternate material? (Sample of each material required.)
- (5) Range of size of material and weight per cubic foot.
- (6) Percentage of moisture it contains. (Material must be dry or nearly so.)
- (7) Is material loose, or does it pack hard in bins or under transit?
- (8) Do conditions vary from time to time as to fineness, moisture or other qualities?
- (9) Route or course on which material must be conveyed or elevated. (Sketch or drawing of plant should accompany answer, with care in presenting distances, elevations, obstructions, angles, etc.)
- (10) Drawing sent. Enclosed? Separate cover? Date?

(11) From where and to where is material to be conveyed (from bins, cars, mills, etc.)?

(12) Is equipment relied upon for continuous operation?

(13) Rate of operation in tons per hour, or in cars per day or week.

(14) Is the rate of operation to be practically uniform, or do conditions require intermittent operation? Describe fully.

(15) Would conditions permit, or preclude, working of conveying apparatus more hours per day than plant works?

(16) How are you now handling material?

(17) How many men are required in present operation? At what wages?

(18) Gross cost per ton of present conveying operations?

(19) What is your *principal* reason for desiring a change?

(20) What is the usual wage of laborers in the vicinity?

(21) Of hoisting engineers?

(22) Of millwrights?

(23) The length of working day.

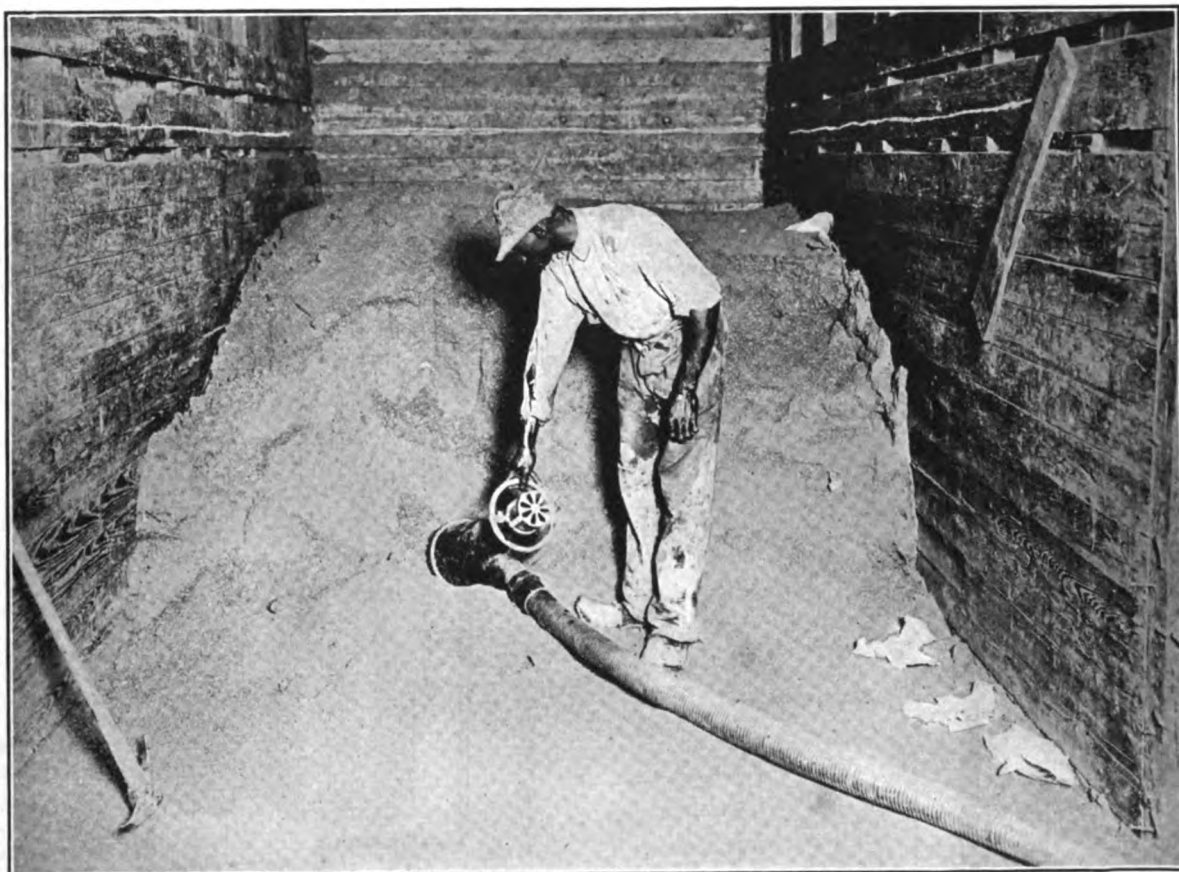
(24) Source of power.

(25) If motors are used, state voltage, cycle, phase.

(26) What does power cost per h.p.h. or kw.h.?

(27) Have you facilities for providing a small quantity of compressed air?

(28) Give further facts that will enable us to see the problem in its true light.



UNLOADING FERTILIZER WITH DRACCO CONVEYING EQUIPMENT

GIRTANNER ENGINEERING CORPORATION

The Standardized Steam Ash Conveyor

1400 Broadway
NEW YORK, N. Y.

Product.

GIRTANNER STANDARDIZED STEAM
ASH CONVEYOR.

What It Does.

The Girtanner Standardized Steam Ash Conveyor removes ashes from boiler room to ash pile, overhead hopper or railway car. The fireman simply rakes ashes into Intake Tee in front of each boiler, opens a valve and the steam automatically carries the ashes to destination without rehandling. It does away with ash wheelers, thus reducing ash removal cost from around \$1.50 a ton to about 15¢ per ton.

Standardization.

This ash conveyor is the first to be completely standardized. It is built up of a number of standard fittings and standard pipe lengths, developed through years of experience by the original inventors of the steam ash conveyor. No special pipe lengths are necessary either for installation or subsequent replacement after long service.

Intake Tee.

A special feature of the tee (patents pending) makes it possible to locate the intake at the proper point in front of the boiler without the use of odd pipe lengths. The opening is out of center 3 in., so that by turning the tee end for end it can be brought to the desired position. Should this fail, the cover plate, the opening of which is also out of center, can be reversed, permitting any adjustment within 1 in. at any part of 6 ft.

The intake cover is level with the floor when in place. Inside surface is curved, and concentric with the pipe, eliminating pockets.

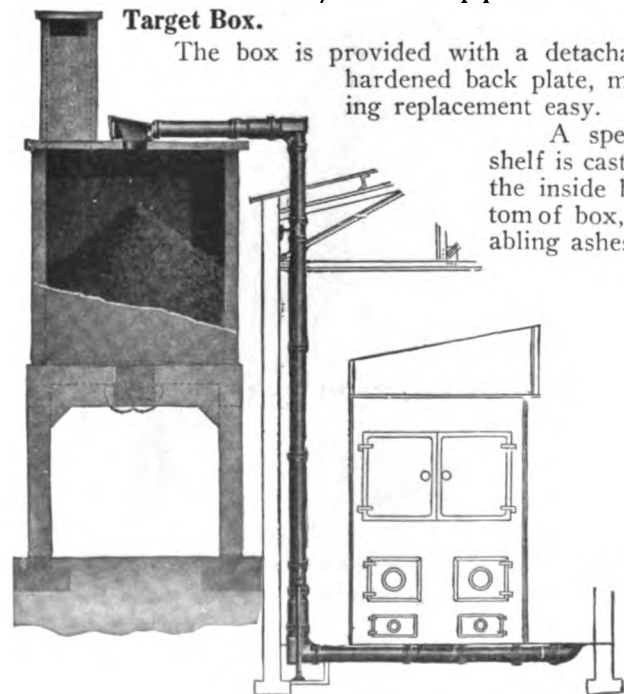
Air Intake.

The gross area of the air intake is 100% larger than the pipe, insuring ample supply of air. An iron grating prevents foreign materials from falling in. This leaves a net area in excess of 50% over the pipe area.

Target Box.

The box is provided with a detachable hardened back plate, making replacement easy.

A special shelf is cast on the inside bottom of box, enabling ashes to



GIRTANNER STANDARDIZED STEAM CONVEYOR



pile up against target plate, and there form an admirable protection against the erosive force of impinging ashes.

This system greatly reduces dust and increases life of back plate.

Liners.

The special carbo-metal liners act as a protection to the pipe, eliminating the necessity for constant replacement of pipes.

These liners are guaranteed to stand 5,000 tons of ash, and usually last for 10,000 tons or more.

All vertical and horizontal liners are respectively interchangeable and are easily replaced through the intake tees or 90° steam units.

Pipe.

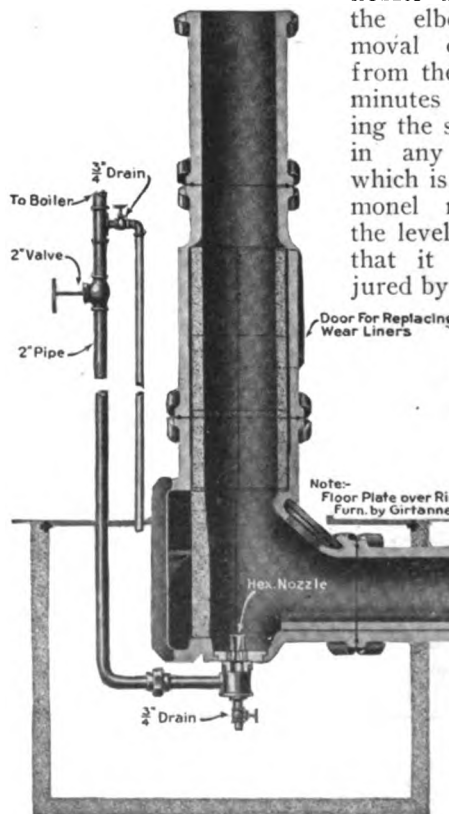
All white metal pipe is used throughout, furnished in standard lengths of 18, 24, 30, 36, 48, 60 and 72 in. Special flanging and gasket grooving make installation a simple matter, and eliminate all leakage.

90° Steam Units and Wear Section.

This 90° unit furnishes the support of the vertical columns of pipe. It is entirely lined with glass-hard liners made of brake shoe insert metal, which protects the fittings for 4 ft. above nozzle. Fitted with 2 upright columns held by bolts in fitting on upper pipe section, being supported on a suitable foundation. If it becomes necessary to remove the lower sections or the elbow, the riser section is slightly lifted and section removed.

Lower rear door gives access to the steam

nozzle at the bottom of the elbow. Nozzle removal can be effected from the inside in a few minutes without disturbing the steam connections in any way. Nozzle, which is made of genuine monel metal, is below the level of the liners, so that it can not be injured by the passing ashes during operation. It is carefully machined and tapped so that it is always on the exact cen-



SECTION OF 90° STEAM UNIT AND WEAR SECTION

ter line of conveyor.

Special automatic drain and cleaner are incorporated in design, enabling the nozzle and basin in the pipe to be completely drained before starting up.

BARNEY & COMPANY

Manufacturers of Ash Lifts and Hydraulic Elevators

141 West 36th Street
NEW YORK CITY

CHICAGO OFFICE, 304 South Dearborn Street
REPRESENTATIVES IN PRINCIPAL CITIES

Products and Services.

BARNEY ASH LIFT; HYDRAULIC TYPE PLATFORM LIFTS.

ENGINEERS and CONTRACTORS.

Description and Operation.

The Barney ash lift is designed to raise a loaded ash can at a speed of 150 ft. per minute. Power is used for the lifting stroke only. The telescoping crane post is raised into position by power. It is automatically locked and remains stationary during operation. This type of lift is also furnished adapted to handle bales of cotton, cakes of ice, bundles of automobile tires, trunks, etc.

The platform lifts are designed in capacity of 500 lbs. and 1000 lbs.

To operate the standard models of these lifts, any of the following means may be employed:

Water pressure from house mains.

Water pressure from roof tanks.

Steam pressure from present steam plant.

Compressed air from existing lines.

Distinctive Features.

The Barney ash lift and platform lifts are semi-portable. Erecting the ash lift consists of bolting the machine into position against wall, and making connections to house piping by flexible hose, if you choose. Erecting the platform lift consists of bolting machine against wall, floor and ceiling and connecting to house piping. Both machines raise the load to above the level of the sidewalk to eliminate lifting by hand, serving motor truck or ash cart as desired.

Prices.

Barney ash lift, standard models, f. o. b. shop, New York or Chicago, \$350.00.

Barney ash lift, electric type, from \$600 up.

Barney platform lift, standard models, 500-lb. capacity, f. o. b. shop, New York, \$450.00; 1000-lb. capacity, f. o. b. shop, New York, \$600.00.

Discounts and prices on sidewalk doors, automatic sidewalk door opening and closing mechanism, and automatic electric signaling device on request.

Patents.

The Barney lifts are fully protected by United States and Foreign patents.

Information to Give When Making Inquiries.

When making inquiries please send correct answers to the following:

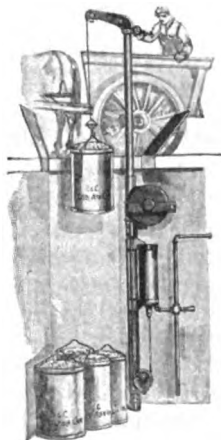
Depth of basement.

Lift above sidewalk.

Kind of power to be used.

Pressure available.

Distance from curb



BARNEY ASH LIFT,
TYPE B

Specifications for Type A Ash Lift.

(1) Hoisting equipment for handling ash cans shall be of the type known as Barney Ash Lift, manufactured by BARNEY & COMPANY, New York, N. Y.

(2) Ash lift shall have capacity to raise a fully loaded standard BARNEY & COMPANY ash can at a speed of 150 ft. per minute.

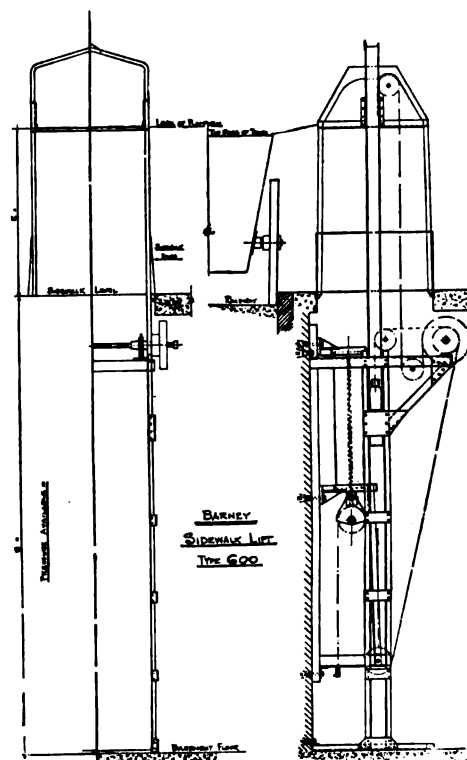
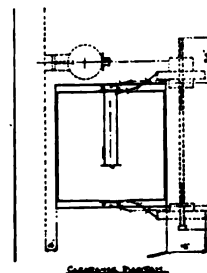
(3) Ash lift shall have disappearing crane post, which shall automatically be raised into operating position by first stroke of machine. Crane post shall remain stationary, after the first stroke, while hoisting is done.

(4) Machine shall operate satisfactorily at the minimum pressure of lbs. of water [compressed air] [steam].

(5) Ash lift shall raise ash cans from the level of the basement floor to level of sidewalk.

Service and Guarantee.

Selection of the model best fitted for requirements rests with the BARNEY & COMPANY engineering department. The details of manufacture are in charge of mechanical experts. Every machine is fully guaranteed as to material and workmanship.



BARNEY PLATFORM LIFT, TYPE 600

CHAS. K. ERNST SPECIALTY CO.

Manufacturers of Ash Hoisting Specialties

998 East Ferry Street
BUFFALO, N. Y.

Products.

ERNST TELESCOPIC ASH HOISTS; ERNST AUTOMATIC SAFETY-GUARDED SIDEWALK DOORS; COMBINATION TELESCOPIC ASH HOIST and SAFETY-GUARDED SIDEWALK DOOR with DOOR OPERATING MECHANISM; ERNST PERFECTION CELLAR WINDOW ASH ELEVATOR; ERNST SELF-RAISING SIDEWALK ELEVATOR, Hand Power and Motor Driven.

Also manufacturers of Ernst Type "A" Light Side-walk Elevators.

Ernst Combination Telescopic Ash Hoist and Side-walk Door with Door Operating Mechanism.

The opening, closing and locking of the sidewalk door is automatically taken care of, when the hoist extension arm is moved in a single operation by operator at cellar floor level.

The automatic guard rail completely encloses the open hatchway to avoid danger of the open door when hoist is being used.

The sidewalk door opens towards the building and is made of a one-piece 3 by 2-in. angle iron frame and checkered steel plate, flush with sidewalk. Furnished in 3 ft. square and 4 ft. square sizes.

Makes one of the best appearing doors made.

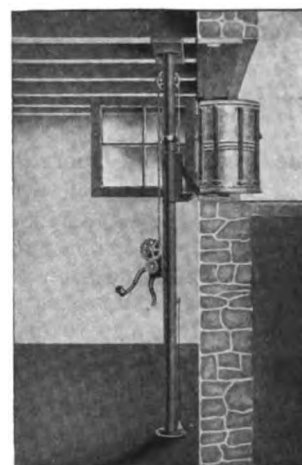
Telescopic Ash Hoist is operated entirely by one man from sidewalk level. The opening, closing and locking of sidewalk door is done by same operator from cellar floor level. The hoist is equipped with an automatic gear shifting device and brake to lower empty cans to cellar by brake, ball bearings on main shaft supporting loads, machined cut gears, and steel safety ratchet, automatic clutch pin, steady pin, $\frac{3}{8}$ -in. steel cable, cable grooved drum.

Hoist operates at a speed of 30 ft. per minute. From 4 to 5 ash cans can be hoisted to grade, before

operator has to leave the sidewalk. Capacity, 500 lbs.

Ernst Perfection Cellar Window Ash Elevator.

This inexpensive, handy and compact elevator makes use of any cellar window 28 in. square, or larger, to hoist and swing ash cans, etc. directly to the sidewalk by operator in the cellar. Made entirely of metal. Platform lowers on floor, requires no pit. 300 lbs. capacity. Hoisting speed, 15 to 25 ft. per minute.

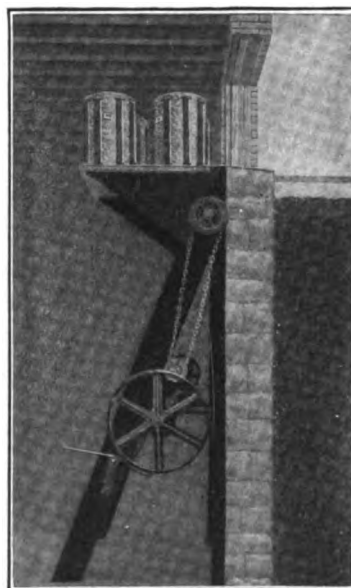


PERFECTION ELEVATOR

Provides a means of access to grade level where no outside areaway has been provided. Shows elevator with can hoisted and swung out of window

Ernst Self-raising Sidewalk Elevator.

Makes one of finest hand power or motor driven lifts made. Lift can be installed in areaway under sidewalk or through cellar window. It has a counterbalanced platform which allows empty platform to rise automatically to grade saving one-half of time and labor to crank lift up. Has two lifting chains while cranking mechanism is of endless chain type. Capacity 1000 lbs.

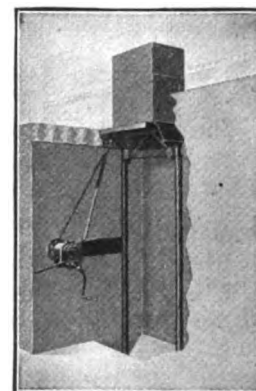


SELF-RAISING ELEVATOR

Elevator installed at 3-ft. cellar window with 4 cans of ashes at grade ready to be removed. Eliminates outside areaway and allows one man to operate elevator. Used with or without pit, inclined but 2 ft. 5 in.

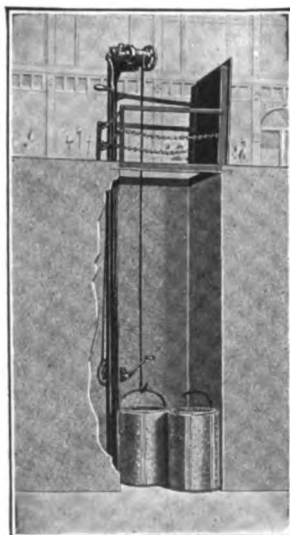
Ernst Type "A" Elevator.

A strong, dependable, fast operating sidewalk elevator that can be easily and economically installed in any areaway. Constructed entirely of metal. Made in 500 lbs. capacity, platform any size to 3 ft. square and 750 lbs. capacity, platform to 4 ft. square. Low platform construction—but 14 in. high—allows lift to be used with or without pit.



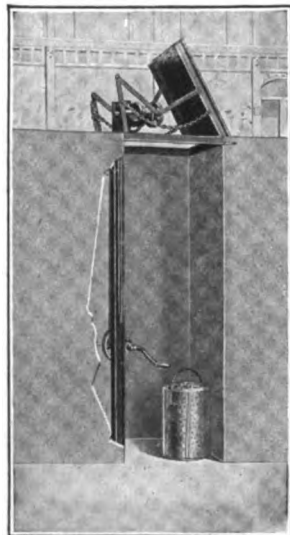
TYPE "A" ELEVATOR

Shows platform at sidewalk level; cranking mechanism bolted to wall. Gives ample room for operator



Door Opening Completely Safety-guarded on 4 Sides

From 4 to 5 ash cans hooked on, hoisted, swung and deposited on sidewalk before operator has to leave sidewalk



Partly Opened

Shows how door is automatically opened or closed in a single operation by operator turning the telescopic crank from cellar floor level

COMBINATION TELESCOPIC ASH HOIST AND SIDEWALK DOOR

THE COHOES IRON FOUNDRY AND MACHINE CO.

Elevator Equipments

COHOES, N. Y.

Products.

ELEVATORS for all purposes:

Electric Passenger and Freight Elevators; Electric and Hand Power Garage Elevators; House Elevators; Belt Driven Elevators.

Also Hand Power Freight Elevators, Dumb-waiters, Sidewalk Lifts; Automatic Gates and Hatch Doors for hoistways.

Efficiency, Facilities, Shipment and Materials.

During thirty years of study of problems in all kinds of elevator work, these products have been developed to high efficiency.

A competent force of engineers is maintained and the company is prepared to make complete layout of plans or to act in an advisory capacity.

Quotations on jobs installed complete or made up according to specifications and shipped f. o. b. our siding, for installation by customers' experts.

Materials used by us are of highest grade only and can be depended upon for absolute reliability.

Information Required for Estimate.

For All Types—Capacity, speed, number and height of floors, size of car, or size of hatchway, location of winding engine, steel or wood for guides and sheave beams, style of car, value of cage, method of control, gates or hatchway doors if required, grating under sheaves.

For Electric Driven Types—State whether current is direct or alternating and give voltage: if alternating, give phase and cycles. State type of winding engine, whether direct connected, chain driven, or single belt driven.

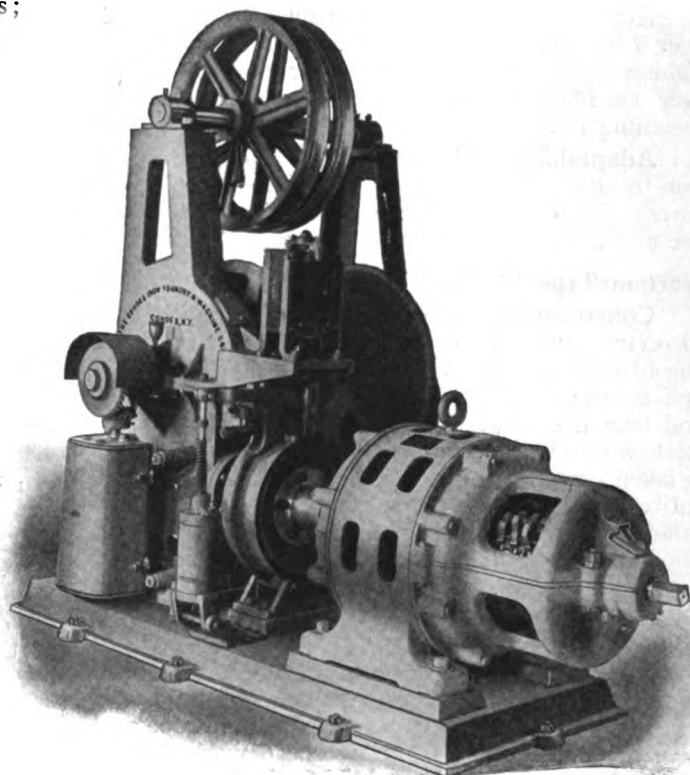
For Belt Driven Types—State whether winding engine is to be driven from line shaft, countershaft, or other source of power. Give location of power with reference to hatchway.

If possible, send a sketch or blue print, showing hatchway, its location in building, entrances to car, and location or space prepared for the winding engine.

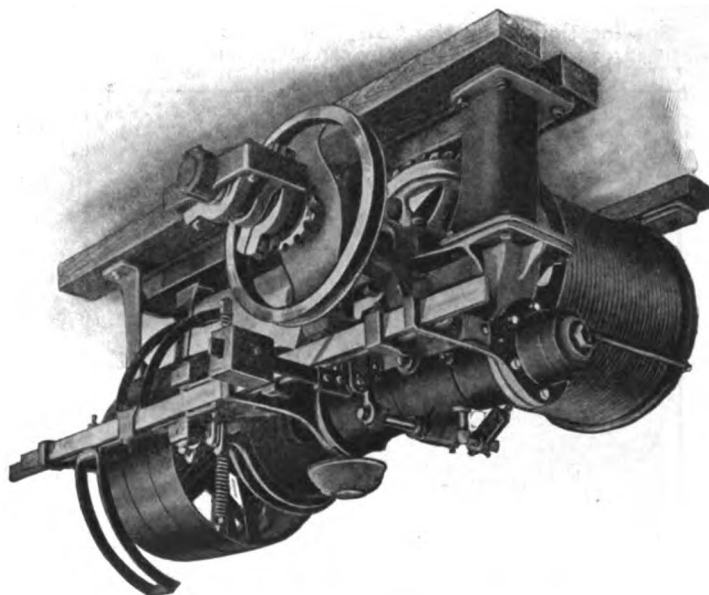
Detail Sheet—On request we will be glad to send our detail sheet, which gives a complete list of the information required for an accurate estimate.

Estimates.

Estimates are gladly furnished, and specifications submitted on any equipment.



DIRECT CONNECTED ELECTRIC CONTROL PASSENGER CRAB



BELT DRIVEN ELEVATOR CRAB

GRAVES ELEVATOR CO., INC.

426 Exchange Street
ROCHESTER, N. Y.

NEW YORK OFFICE, 113-117 Cedar Street

Products.

Manufacturers of PASSENGER and FREIGHT ELEVATORS; ELECTRIC TRACTION ELEVATOR MACHINES, for overhead or basement installation.

Electric Traction Elevators.

Construction—In the construction of Graves traction elevators, passenger and freight, the tractive force is exerted directly on the car cables by passing same over a driving sheave, without any attachment thereto. Cables, anchored in car, pass over sheave, then down over an idler, thence down to counterweight where fastening is made.

Adaptability—Height of car travel bears no relation to size of drive sheave; therefore, the Graves elevators, freight and passenger, are adapted for efficient use in all kinds of buildings, high or low (Fig. 2).

Traction Type Elevator Machines.

Construction—Simple and durable; built compact, to occupy small space; all working parts are accessible for adjustment and oiling; driving sheave shaft is short and bearings are large, giving strength, great rigidity and long life; a phosphor bronze gear is used, with a steel worm cut integral with worm shaft; worm thrust is taken care of on one end of worm shaft, permitting entire thrust bearings to be removed without disturbing balance of machine. Thrusts are S.K.F. Special (Fig. 1). Machines are built in two types and different sizes to suit requirements and service—straight worm geared for passenger and high speed freight service, and compound geared for slow speed freight service.

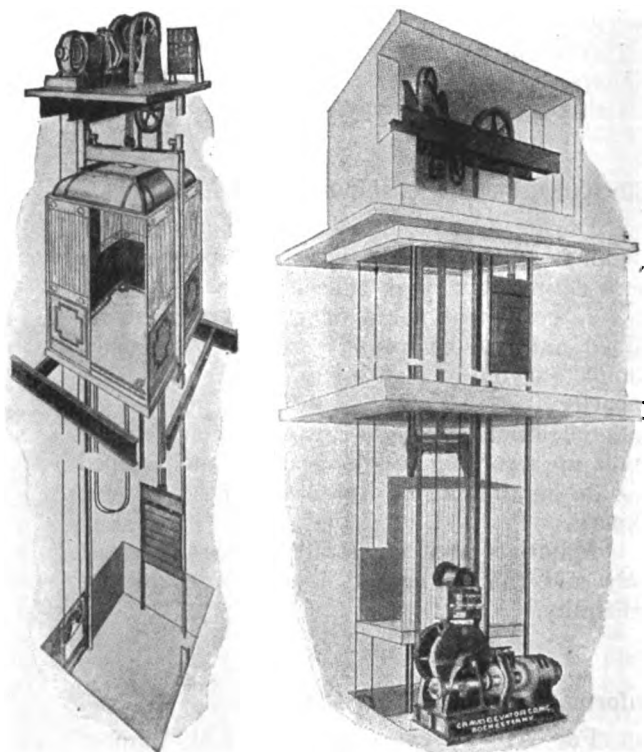
Operation—These machines provide for operation of the elevator quietly on direct or alternating current, either with push button, car switch or hand rope control. Elevator can not travel into overhead work, being prevented by reason of the special design of the traction feature. The service is efficient, with economical operation.

Specification Data for Engineers—Depth of pit and overhead clearance is governed by car speed, and is specified in

State requirements. Size of hatch for wood guides is approximately 18 in. wider post-wise and 2 in. wider front to back than car size. Size of hatch for steel guide is approximately 15 in. wider post-wise and 2 in. wider front to back than car size.

Co-operative Service.

Estimates and specifications for complete traction elevators which prospective purchasers propose to install will be furnished on application.



Passenger Type, Overhead

Freight Type, Basement

FIG. 2. GRAVES TRACTION ELEVATORS

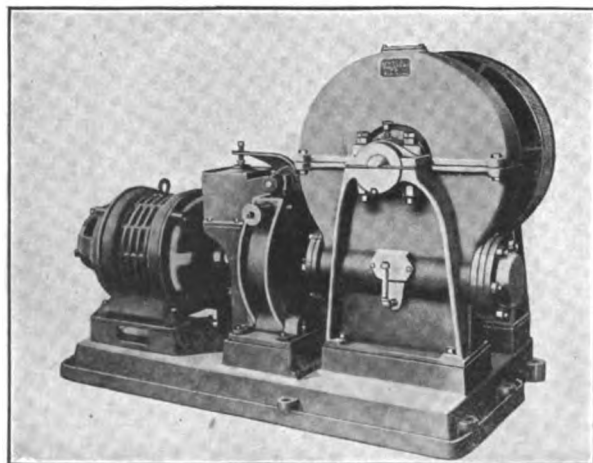
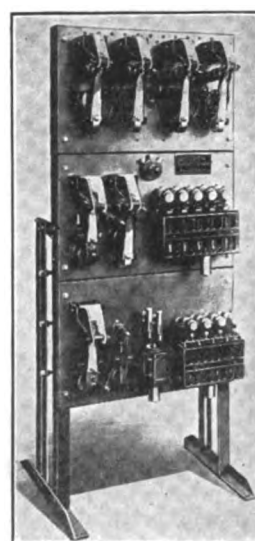
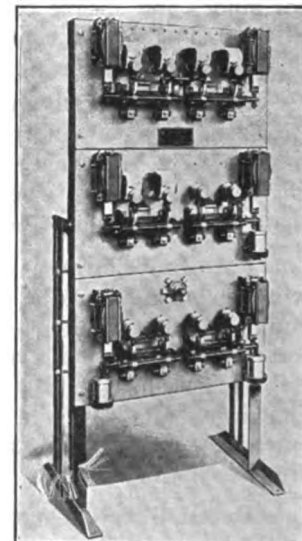


FIG. 1. DIRECT CONNECTED ELECTRIC WORM GEARED V-GROOVE TRACTION ELEVATOR MACHINE

Equipped with electric brake. For either overhead or basement installation. Mechanically and electrically correct



Two-speed, Full Magnet Dynamic Brake, Direct Current



Full Magnet Controller, Alternating Current

FIG. 3. THE GRAVES MAGNET CONTROLLERS

KAESTNER & HECHT COMPANY

Electric Elevator Builders

OFFICES AND WORKS

503 South Throop Street
CHICAGO, ILL.

TELEPHONE:
HAYMARKET 6840

BRANCH OFFICES IN LEADING CITIES

Products.

Manufacturers of K & H ELECTRIC ELEVATORS for Passenger, Freight or Package Service, including those types controlled by Operators and also by Automatic Push Buttons.

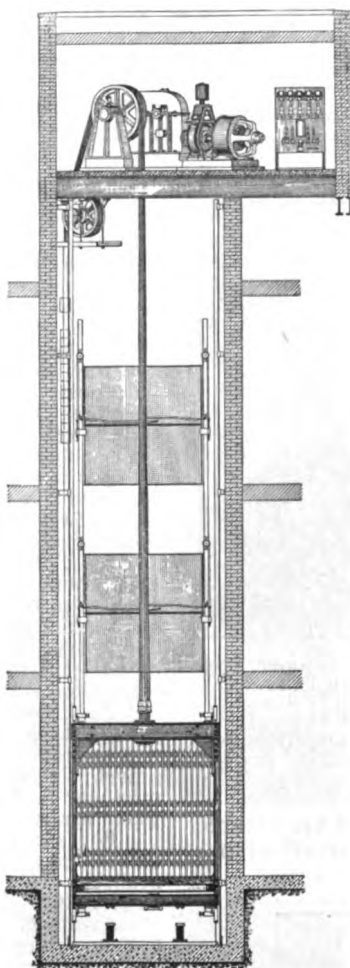
Also manufacturers of Electrically Controlled Hydraulic Lifts, Electric Dumbwaiters.

Service.

Each elevator installation is a separate problem in itself. Each



TRADE-MARK



K & H product is carefully engineered to meet the specific requirements of the individual job.

The broadest possible co-operation is offered to engineers, architects and owners in connection with *all vertical lifting problems.*

Specific data furnished by the KAESTNER & HECHT COMPANY Engineering Department for all types of vertical lifting devices.



REAL ESTATE
EXCHANGE
BUILDING

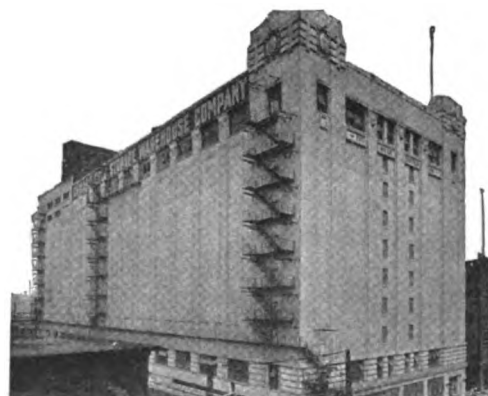


WRIGLEY BUILDING

A RECOMMENDATION FOR INDUSTRIAL SERVICE.



KELLOGG SWITCHBOARD CO.



CHICAGO COLD STORAGE WAREHOUSE CO.

F. S. PAYNE CO.

Elevator Manufacturers

GENERAL OFFICE AND WORKS

Richdale Avenue
CAMBRIDGE, MASS.

BOSTON, MASS.

BRANCH OFFICES
LOWELL, MASS.

NEW HAVEN, CONN.

Products.

ELECTRIC and HYDRAULIC PASSENGER and FREIGHT ELEVATORS; ELEVATOR CONTROLLERS for operation by hand rope, lever car switch, push button and dual control, adapted for any make of machine; Patented HYDRAULIC ASH HOISTS. Also manufacturers of Dumbwaiters.

Electric Elevator Machines.

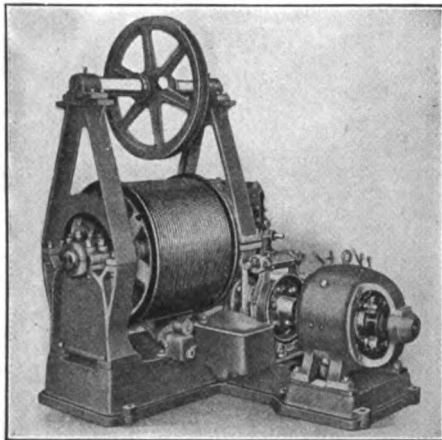
These machines are adaptable for use on any electric current and have a wide range of duty as regards capacity and speed.

All safety devices of the latest type are a part of the equipment and have met with the approval of representative architects, engineers and insurance companies.

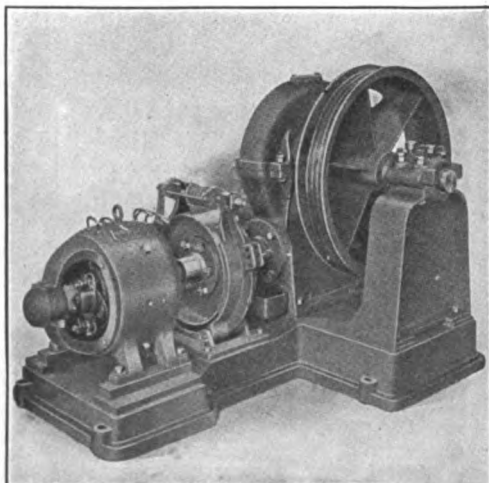
State and city requirements are complied with in all installations.

Conservative engineering principles have been adhered to in the design of all Payne products which have resulted in most efficient and satisfactory installations.

Prompt deliveries and a refined product are assured by our policy of standardizing the design of all our machines.



PAYNE DIRECT CURRENT DIRECT CONNECTED ELECTRIC WORM GEAR DRUM MACHINE



PAYNE DIRECT CONNECTED ELECTRIC WORM GEAR TRACTION MACHINE



TRADE-MARK

Hydraulic Elevator Machines.

Hydraulic plunger elevators which can be adapted to meet any requirements are manufactured by this company.

Information Desired for Estimates on Elevator Machines.

The opportunity to co-operate with architects, engineers and owners will be appreciated either in furnishing preliminary plans and specifications or comparative costs of electric and hydraulic equipments.

To avoid delay and to insure intelligent response to inquiries the following information should be furnished:

Travel of car: Distance between bottom and top landings.

Maximum load to be carried. If a freight elevator, materials to be carried. Approximate speed desired.

Size of car required or size of hoistway provided.

Construction of hoistway: Brick, concrete, steel or wood.

Number and size of openings at each floor, and side or sides of hoistway where openings are located.

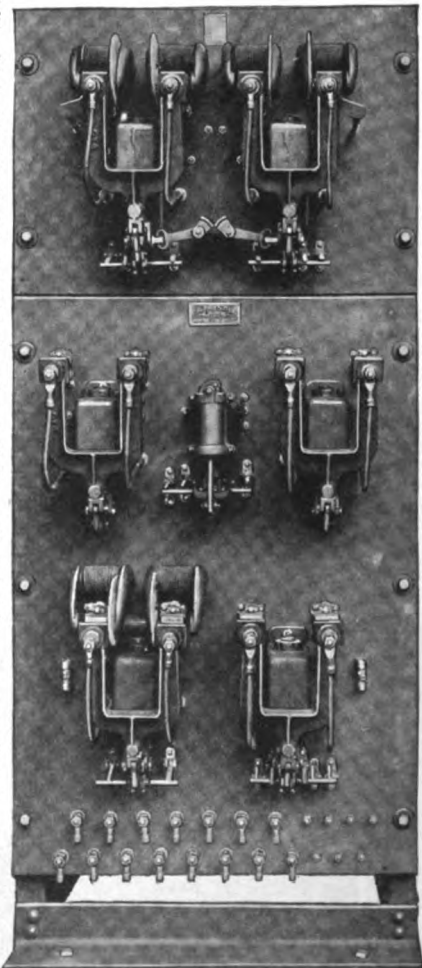
If electric elevator, state location of space provided for machine: in pent house over hoistway or adjacent to hoistway at lowest landing.

If hydraulic plunger elevator, advise nature of soil: gravel, sand, salt marsh or rock. Give water pressure.

For electric elevators give current available, whether D. C. or A. C. If D. C. state voltage. If A. C. state voltage, phase and cycles.

As there is considerable difference in cost between wood and steel guides, a preference should be designated or a request made for price of each.

Where wooden freight elevator gates are required, state number and type: full automatic or semi-automatic; also if gates are to be single or double bar or slatted.



PAYNE ELECTRIC ELEVATOR CONTROLLER

Payne Patented Hydraulic Ash Hoists.

Designed for use wherever differences in grade necessitate the use of a hoist for the removal of ashes.

SMITH ELEVATOR CO., INC.

OFFICE AND WORKS
BUFFALO, N. Y.

Products.

Builders and designers of ELECTRIC ELEVATOR EQUIPMENT for Passenger and Freight Service.

Service.

Architects have at their command, through the SMITH ELEVATOR CO., INC., an organization of experts with extensive experience in the planning of passenger, freight and sidewalk elevators.

Various Types of Elevators.

Both passenger and freight elevators of this company's manufacture are of standard types and there is every facility here for perfectly meeting every condition.

Careful study is made of their application and the installations are planned and carried out to exactly meet particular conditions and to perfectly accomplish desired results.

Specialists in Freight Elevators.

This company specializes in freight elevators and has developed an elevator machine for very heavy and severe service which is shown in an illustration on this page.



TRADE-MARK

Typical Installations.

There are 35 elevators of this company's design and installation in the Larkin buildings, including the equipment for the largest terminal warehouse in the world.

The Pierce-Arrow Motor Car plant is equipped with Smith elevators, as is the home of Shredded Wheat and hundreds of

other well-known industries including the following:

Armour & Co., Westfield, N. Y.
American Agricultural & Chemical Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Jacob Dold Packing Co., Buffalo, N. Y.
Detroit Valve & Fitting Co., Detroit, Mich.
Empire Auto Sales Co., Glens Falls, N. Y.
Ferro Machine & Foundry Co., Cleveland, Ohio
H. H. Franklin Mfg. Co., Syracuse, N. Y.
General Electric Co., Schenectady, N. Y.
Wire Wheel Corporation of America, Buffalo, N. Y.
International Salt Co., Ithaca, N. Y.
New Process Gear Corporation, Syracuse, N. Y.
Niagara Electro Chemical Co., Niagara Falls, N. Y.
Pratt & Lambert, Buffalo, N. Y.
Syracuse Buick Co., Syracuse, N. Y.
U. S. Light & Heating Co., Niagara Falls, N. Y.
Union Carbide Co., Welland, Ontario
Wells Fargo & Co., Express, Buffalo, N. Y.
White Co., Cleveland, Ohio
Rudolph Wurlitzer Mfg. Co., North Tonawanda, N. Y.



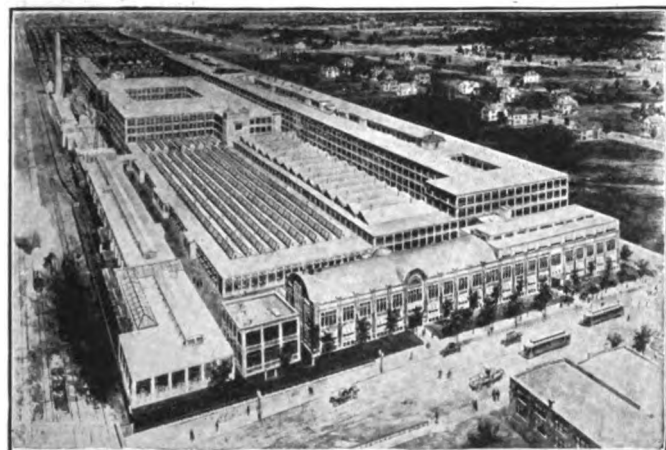
LARKIN & COMPANY'S TERMINAL BUILDING

The various Larkin buildings, including the world's largest terminal building, are equipped with 35 Smith elevators



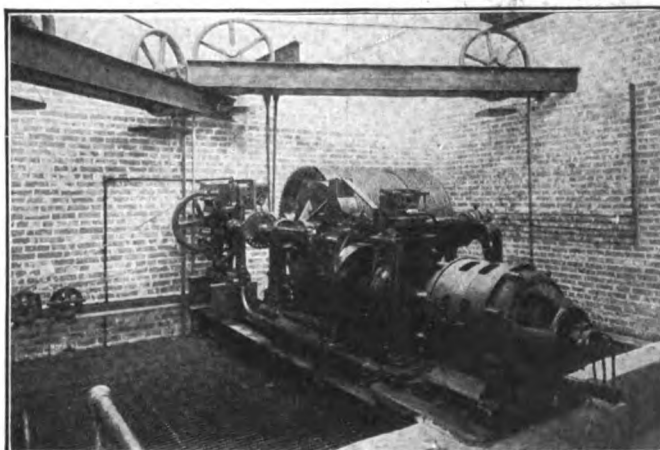
THE HOME OF SHREDDED WHEAT

Equipped with Smith passenger and freight elevators



PLANT OF THE PIERCE-ARROW MOTOR CAR CO.

Lockwood, Green & Co., Architects
Equipped with 10 Smith elevators



SMITH ELEVATOR MACHINE FOR HEAVY DUTY AND SEVERE SERVICE

AMERICAN CHIMNEY CONSTRUCTION CO.

(Not Incorporated)

Radial and Common Brick Chimneys

TELEPHONES:

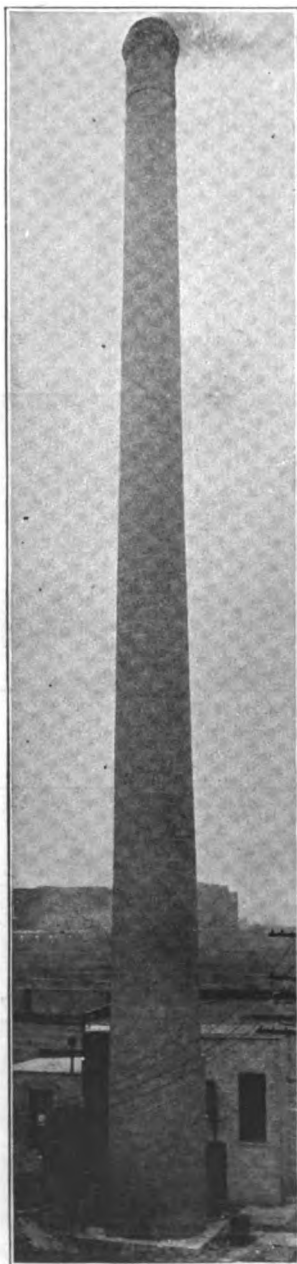
FRANKLIN 2594, 2595

118 North La Salle Street
CHICAGO, ILL.

Products and Services.

PERFORATED RADIAL and COMMON BRICK CHIMNEYS, Designed and Constructed for all purposes, and of all sizes.

OLD CHIMNEYS EXTENDED, REPAIRED, STRAIGHTENED, and POINTED while in operation; REPORTS and RECOMMENDATIONS on condition of old chimneys; STEEL STACKS LINED.



CHIMNEY 140 FT. HIGH
FOR CHICAGO JUNCTION
R. R. CO.

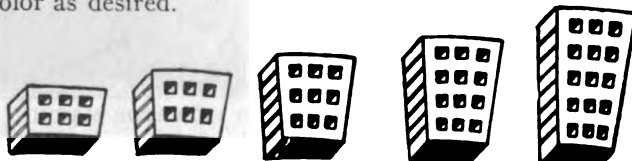
Engineering Service and Facilities.

Reliable information and recommendations will be given by our engineers regarding the proper dimensions of chimneys with full consideration of the purpose for which they are designed. Advice will be given as to boiler arrangements, and other conditions.

Twenty-five years' experience in building chimneys in all parts of the world enables us to render the most efficient and economical service in all the details involved.

Perforated Radial Chimneys.

The purest materials only are used in making the radial blocks and are chosen for their great refractory qualities and high crushing strength. These materials are so combined in the proper proportions as to insure a chimney with the maximum resistance to strains of every nature to which it may be subjected. Radial bricks can be furnished in red or light buff color as desired.



PERFORATED RADIAL BLOCKS

Common Brick Chimneys.

The AMERICAN CHIMNEY CONSTRUCTION Co. also builds round common brick chimneys of inside top diameter from 3 ft. 6 in. and larger.

These chimneys are just as good looking and durable as the radial brick chimneys; they have been in use for many years and have given universally good results and satisfaction.

Data Required for Chimney Designs and Estimates.

Give all possible information regarding place, transportation, dimensions of chimney required, boiler horsepower, probable temperatures, etc.

State nature of soil where chimney will be erected.

Give local prices for necessary building material.

In accordance with the above information, designs and lowest estimates of the chimney needed will be submitted.

Chimney Repairing.

Chimneys extended with no interference to operation of plant.

Dimensions of chimney are desired or a plan of it.

Old chimneys repaired, straightened, pointed and banded while in operation.

Inspections made on the condition of old chimneys and reports furnished.



CHIMNEY 150 FT. HIGH FOR
B. KUPPENHEIMER & CO.,
CHICAGO, ILL.

AMERICAN CHIMNEY CORPORATION

Designers and Builders of Chimneys

TELEPHONE:
STUYVESANT 3735, 5741

147 Fourth Avenue
NEW YORK, N. Y.

BRANCHES

PHILADELPHIA, PA., Stephen Girard Building
CHICAGO, ILL., 1101 Security Building

CLEVELAND, OHIO, 919 Ulmer Building
BOSTON, MASS., 141 Milk Street

Products.

PERFORATED RADIAL BRICK CHIMNEYS; COMMON BRICK CHIMNEYS for boiler operation, smelter plants, chemical plants (acid gases), crematories, incinerators (high temperatures).

Also manufacturers of Ornamental Chimneys.

Perforated Radial Brick Chimneys.

The AMERICAN CHIMNEY CORPORATION constructs their chimneys of special bricks which are perforated and are shaped to the circular and radial lines of the chimney, producing, when in place, smooth and true inner and outer surfaces.

The perforations in the brick permit a thorough burning. In the wall they form insulating dead air spaces which reduce radiation, resulting in fuel economy.

The mortar extends into the perforations, thoroughly bonding the bricks together and adding greatly to the stability of the chimney.

Steel bands are provided for in the wall as safeguards against cracking.

Joints are broken in every course, horizontally and vertically.

The chimneys are built from inside without scaffolding, greatly reducing the cost and time of erection.

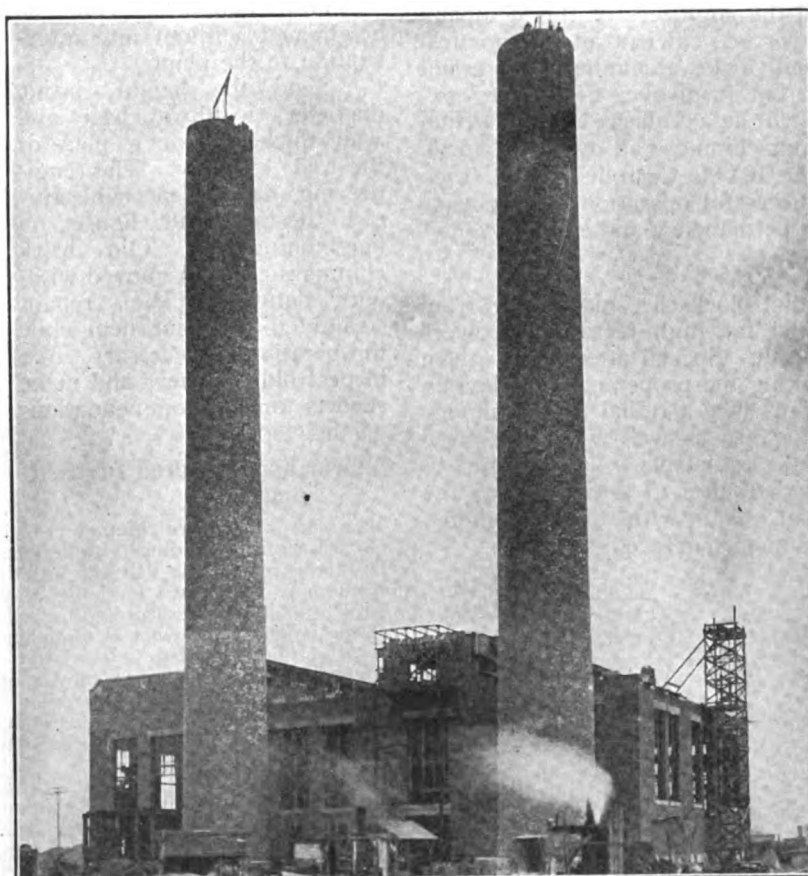
Common Brick Chimneys.

The AMERICAN CHIMNEY CORPORATION is prepared to erect chimneys of common brick, round, square or octagonal, to suit special architectural requirements.

Estimates.

When asking for information or estimates, kindly advise on the following points:

- (1) Intended use of chimney (boiler furnace, smelter, chemical plant, incinerator).
- (2) Height above foundation and diameter or boiler horsepower or number and dimensions of boilers.
- (3) If a bid is desired on foundation, give character of soil.
- (4) Does chimney stand independent of building? If it is a part of the building, state for what height.
- (5) Give hauling distance from purchaser's railroad siding or nearest railroad freight yard.
- (6) If possible, give approximate prices of building materials and wage scale of local common labor.
- (7) Color of bricks desired.



TWO CHIMNEYS BUILT FOR UNITED STATES GOVERNMENT, FRANKFORD ARSENAL, BRIDESTOWN, PA.
200 ft. high, 12 ft. clear diameter at top

ALPHONS CUSTODIS CHIMNEY CONSTRUCTION CO.

TELEPHONE:
CORTLANDT 8428

Bennett Building—95 Nassau Street
NEW YORK, N. Y.

CABLE ADDRESS:
"CUSTOS, NEW YORK"

ATLANTA, GA., Healey Building
BALTIMORE, MD., Equitable Building
BOSTON, MASS., 51 Ellery Street
CHICAGO, ILL., Marquette Building

AMERICAN BRANCH OFFICES
CLEVELAND, OHIO, Guardian Building
DETROIT, MICH., Moffat Building
MILWAUKEE, WIS., Wells Building
PHILADELPHIA, PA., Pennsylvania Building

PITTSBURGH, PA., Empire building
PORTLAND, ORE., 222 Pine Street
RICHMOND, VA., American National Bank Building
SEATTLE, WASH., Colman Building

MONTREAL, QUE., 10 Cathcart Street

CANADIAN BRANCH OFFICES

TORONTO, ONT., 1011 Kent Building

Products and Services.

Designers and Builders of PERFORATED RADIAL BRICK CHIMNEYS, with FOUNDATIONS and FLUES, of all sizes, for boilers, furnaces, crematories and ovens; CHIMNEYS for smelters, hotels and office buildings; ACIDPROOF CHIMNEYS for paint works and chemical plants; HIGH TEMPERATURE CHIMNEYS for garbage destructors and incinerators; KILNS, BOILER SETTINGS, etc.

Specifications, plans, designs and data furnished free on request.

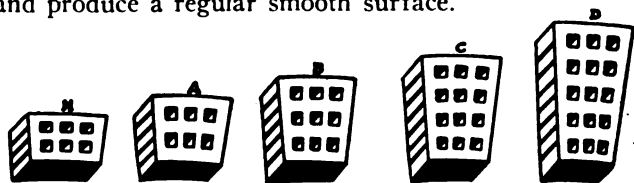
The ALPHONS CUSTODIS CHIMNEY CONSTRUCTION Co., through its fifty years of experience, is equipped to give expert advice as to the size and shape of any kind of a chimney, for any purpose, as well as make recommendations through its engineers regarding boiler layouts, size, shape and design of flues.

The boilers, the coal used, temperatures, gases generated, geographical location and many other conditions affect the determination of the most economical and efficient size of a chimney. State conditions and the results desired, and the engineers of this company will promptly give the correct, efficient and economical size of chimney, and will make recommendations, not from theoretical tables, but from over fifty years' experience and unpublished data collected from actual working conditions of our chimneys all over the world.

The fact that over 10,000 Custodis radial brick chimneys are now in successful operation is conclusive proof of their efficiency, permanency and economy.

Description.

The perforated radial blocks are made only from the purest clays, selected for high refractory powers and high crushing strength. Special attention is given in the brickyards to making the proper mix of clays in the right proportion to produce a radial brick chimney which will resist heat strains, as well as strains from weight and wind. All the radial blocks are formed to suit the circular and radial lines of each part of the chimney, so that they can be laid with thin, even joints and produce a regular smooth surface.



PERFORATED RADIAL BLOCKS

Manufactured in sizes and shapes suitable for all chimney diameters

The blocks are larger than common bricks, making the number of mortar joints in a radial brick chimney one-third of those in a common brick chimney of the same size. Moulded with vertical perforations, as shown in the illustration, the radial blocks are most thoroughly



and uniformly burned, increasing, to a marked degree, their density and strength. The

perforations form a dead air space around the chimney, insulating the hot column of rising gases on the inside from sudden changes of temperature of the outer air, resulting in a maximum draft under all conditions.

Flues and Kilns.

This company designs and constructs flues and furnaces. It makes a specialty of building kilns of all kinds. Steel stacks, etc., lined.

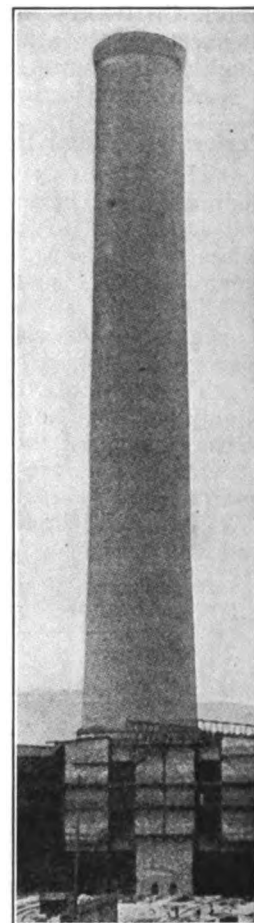
Remodeling and Repairing.

Old chimneys can be heightened without any interruption to the plant.

Send the height, inside diameter, width at base and wall thickness, or a plan of the old chimney. The engineering department will furnish design, and figure on heightening it. Old brick chimneys can be removed without danger. We repair, straighten and point them while in operation, if necessary. We inspect old chimneys and make reports and recommendations on their condition.

Information Required for Estimates.

- Name of place where chimney is to be erected.
- On what railroad siding is same located.
- Distance from siding delivery to chimney site.
- Is chimney to be used for boiler drafts or other purposes.
- Give probable temperatures of the flue gases.
- If for boiler draft, what is total horsepower.
- Kind of fuel or coal to be used.
- Amount consumed per horsepower or total per hour.
- Dimensions of chimney required—diameter; height.
- Is arrangement for overhead or underground flue.
- Give dimensions and shape of flue opening desired in chimney.
- Give height of same above or below foundation top.
- What is nature of soil where chimney will stand.
- What is estimated safe load per square foot.
- What depth of excavation is necessary to reach good soil.
- What is latest date allowed for erection of chimney.
- Sketch showing arrangement of building, boiler and chimney.
- Local prices—red brick, lime, cement and sand.



TALLEST AND LARGEST CHIMNEY IN THE WORLD BUILT FOR ANACONDA COPPER MINING COMPANY, ANACONDA, MONT. Height above grade, 585 ft. Inside diameter at top, 60 ft. Built in 1918

THE HEINE CHIMNEY CO.

Engineers and Builders of Radial Brick and Concrete Chimneys

30 Church Street
NEW YORK, N. Y.

123 West Madison Street
CHICAGO, ILL.

Products.

Engineers and builders of RADIAL BRICK and CONCRETE CHIMNEYS.

Also Concrete Tanks and Towers for all industrial purposes.

Services.

THE HEINE CHIMNEY CO. have a skilled and experienced organization for the designing and construction of chimneys, tanks and towers. As a result of close application for many years in radial brick and concrete construction, our engineers are in a position to render a most valuable consulting service to engineers and others who are intending to build either chimneys, tanks or towers. A vast accumulation of data in our possession, and which is not ordinarily available, is at the disposal of our engineers for their use in determining the most efficient type and size of chimney required to meet any existing conditions. We are prepared to undertake contracts for the construction of either brick or concrete chimneys in any part of the world.

Heine Radial Brick Chimneys.

Heine radial brick chimneys are built with perforated radial brick, manufactured from clays specially selected for high refractory qualities and crushing strength.

Heine Concrete Chimneys.

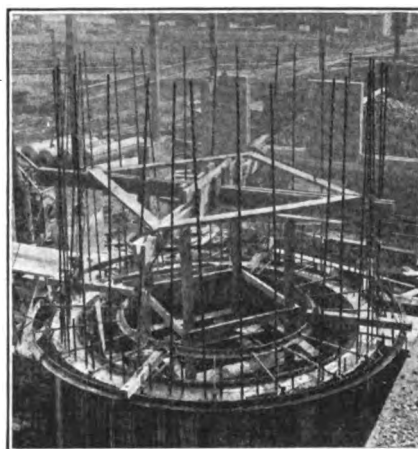
Heine concrete chimneys are constructed with all steel outer and inner forms, covered by patents, assuring a true and concentric chimney with uniform taper. They are built with a wet mixture, and reinforced with steel bars and triangular wire mesh as manufactured by American Steel & Wire Company.

Some Representative Clients.

U. S. Government (Army and Navy)
Knickerbocker Portland Cement Co.
National Malleable Castings Co.
Standard Oil Co.
Morton Salt Co.
New York Central Railroad
Pennsylvania Railroad
Barrett Co.
H. J. Heinz Co.
United States Steel Corporation
General Motors Corporation
Stone & Webster Corporation
Harry M. Hope Engineering Co.
Jas. Stewart & Co.
American Car & Foundry Co.
General Electric Co.
Pressed Steel Car Co.
United Gas Improvement Co.
Jas. A. Doherty Co.
Vacuum Oil Co.
Godchaux Sugars, Inc.
American Hominy Co.
Electric Bond & Share Co.
American Sugar Refining Co.
Washington Pulp and Paper Co.,
Port Angeles, Wash.
Pacific Power and Light Company,
Astoria, Ore.
Peet Brothers Manufacturing Co.,
Berkeley, Cal.



HEINE RADIAL BRICK CHIMNEY
CONSTRUCTED FOR THE DENVER
UNION WATER WORKS



VIEW LOOKING DOWN ON STEEL FORM
IN PLACE FILLED WITH CONCRETE



HEINE CONCRETE CHIMNEY CON-
STRUCTED FOR THE KNICKER-
BOCKER PORTLAND CEMENT CO.

H. R. HEINICKE, INC.

Builders of Radial Brick Chimneys

147 Fourth Avenue
NEW YORK, N. Y.

BRANCH OFFICES
BALTIMORE BOSTON CHICAGO CLEVELAND INDIANAPOLIS PHILADELPHIA RICHMOND
BIRMINGHAM BUFFALO CINCINNATI DETROIT NEW ORLEANS PITTSBURGH ST. LOUIS
FACTORY: NEWCOMERSTOWN, OHIO

Products and Services.

Specialists for 20 years in the design and construction of PERFORATED RADIAL BRICK CHIMNEYS and accessory structural members, including Foundations, Boiler Setting and Brick Furnaces.

Manufacturers of PERFORATED RADIAL BRICK.

Also, Grain Elevators, Tanks and Silos.

Rush work a specialty. Material always ready for immediate shipment from the factory.

Heinicke Radial Bricks and Chimneys.

Heinicke chimneys are constructed of specially formed perforated bricks manufactured by Heinicke themselves. These bricks are shaped to the circular and radial lines of the chimney, producing, when in place, smooth and true inner and outer surfaces.

They are hard burned, regular in shape, sound ringing, weatherproof and acidproof. Produced from selected, chemically tested and carefully proportioned refractory fire clay and shale.

The perforations permit of thorough burning of the bricks, assuring a product which is highly resistant to acids, heat, weather and other deteriorating influences.

Our brick plant is run as a part of this business and not as a separate enterprise. It is the only brick plant in the United States which makes a specialty of radial bricks. Radial bricks are produced by other brick makers simply as a side line in connection with their regular business and, of course, the same care and attention can not be given.

The Heinicke bricks are superior to the brick ordinarily used and are made by this company to maintain a high standard of excellency.

Since we manufacture the brick and erect the chimneys by our own organization, full responsibility is assumed for results without question or argument.

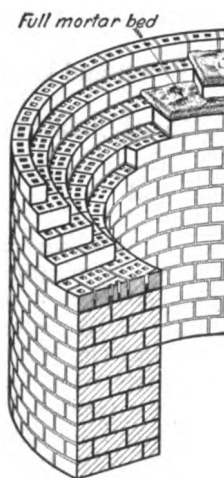
Heinicke chimneys are bonded in every direction at all courses. This with the concealed reinforcement employed enables us to absolutely guarantee chimneys against cracking, except from unusual cause or abuse.

Heinicke design chimneys have been erected in Europe and America and thousands are in operation today as examples of their success. As specialists in the engineering and designing of chimneys, this company's experience is available to engineers, architects, contractors and owners.

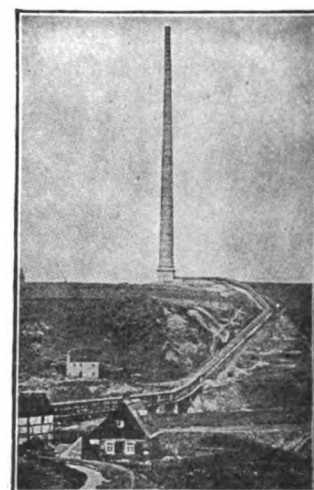
Features of Design and Workmanship.

(A) Perforations in radial bricks form insulating dead air spaces in wall of chimney, which reduce radiation and prevent sudden temperature changes within chimney, resulting in a considerable saving in fuel. Mortar slightly extends into perforations, forming an anchorage that adds greatly to stability of chimney.

(B) Concealed steel bands are used in reinforcing chimney; these add materially to strength in resisting stresses due to expansion, and insure safety against cracking.



SECTIONAL DETAIL OF CHIMNEY, SHOWING HEINICKE BOND



HEINICKE CHIMNEY SERVING A SMELTER

Height, 460 ft.; clear diameter at top, 8 ft.

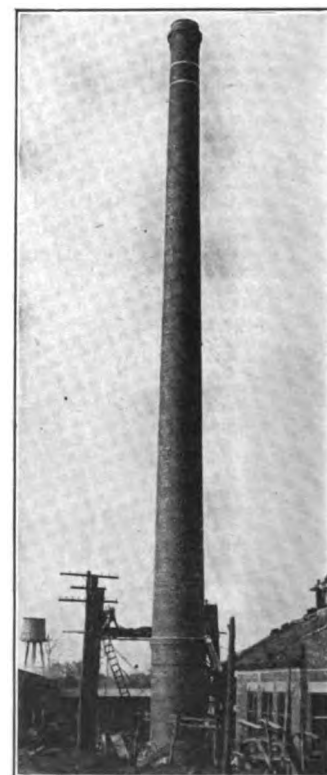
(C) The Heinicke system of bonding provides for breaking of joints between courses, so that no vertical joint is higher than one brick. Every course is thoroughly bonded through use of bricks varying in length from 4 to 10 in. (See sectional detail.) This method of bonding gives greater compressive strength and resistance to lateral stresses than other systems; the increase in strength over the common bond amounts to about 300%.

(D) Erection of chimney is done from inside, doing away with outside scaffolding and eliminating accompanying dangers to workmen as well as unnecessary cost.

Estimates.

Please advise us on the following points:

(1) Distance from nearest railroad siding or team track. (2) Intended use of chimney (boilers, furnaces, incinerators, smelters). (3) Height and diameter, or boiler horsepower, or type, number and dimensions of boilers. (4) Kind of fuel to be used. (5) Character of soil for foundation. (6) Approximate price of cement, lime, sand, gravel, crushed stone and common hard brick, delivered at chimney site.



PASSAIC METAL WARE CO., PASSAIC, N. J.

Height, 125 ft.; clear diameter at top, 3 ft.

THE RUST ENGINEERING COMPANY

Designers and Builders of Chimneys

PITTSBURGH, PA. WASHINGTON, D. C. BIRMINGHAM, ALA.

Products.

PERFORATED RADIAL BRICK and REINFORCED CONCRETE CHIMNEYS, with FOUNDATIONS and FLUES, for powerhouses, furnaces, factories, smelters and ovens.

Also Acidproof Chimneys for chemical plants.

For Reinforced Concrete, Brick and General Construction, see page 24.



Service.

The design and construction of tall chimneys call for special care and special methods. Nothing in the line of large construction calls for greater exactitude. It is an art in itself; and efficiency, combined with safety and economy, is assured only where the work is managed by highly specialized engineers.

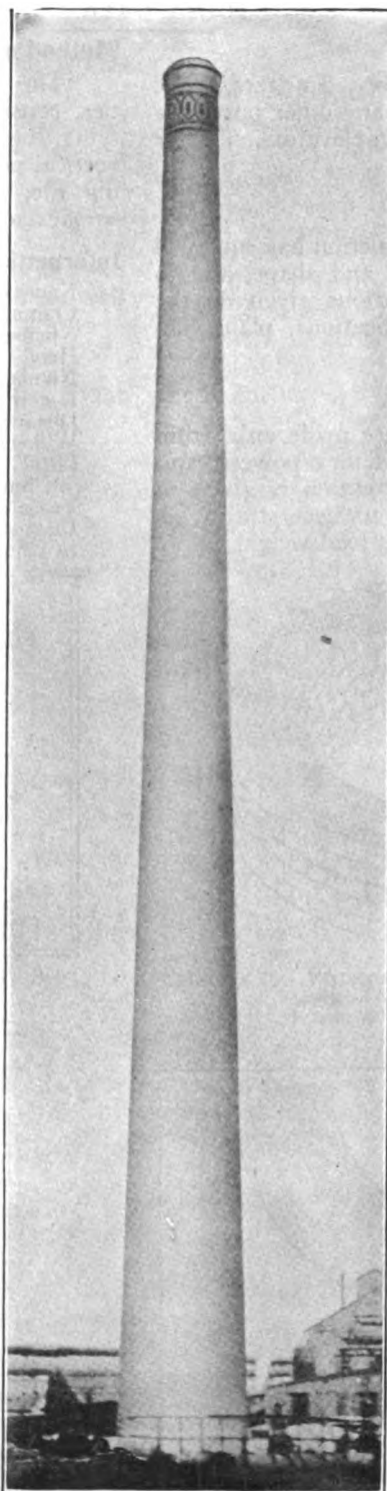
THE RUST ENGINEERING COMPANY possesses every facility for the successful design and construction of tall chimneys. With offices located at convenient points throughout the United States, with complete construction plants immediately available, with office and field forces ready to act on instant notice, this company is prepared to undertake the design and construction of chimneys any place in the United States, Canada and Cuba.

The design is prepared by expert chimney engineers. Efficient and economical proportions are determined through a rigid mathematical investigation which takes into consideration the fuel, method of firing, boiler layout, outside temperature, elevation and geographical location.

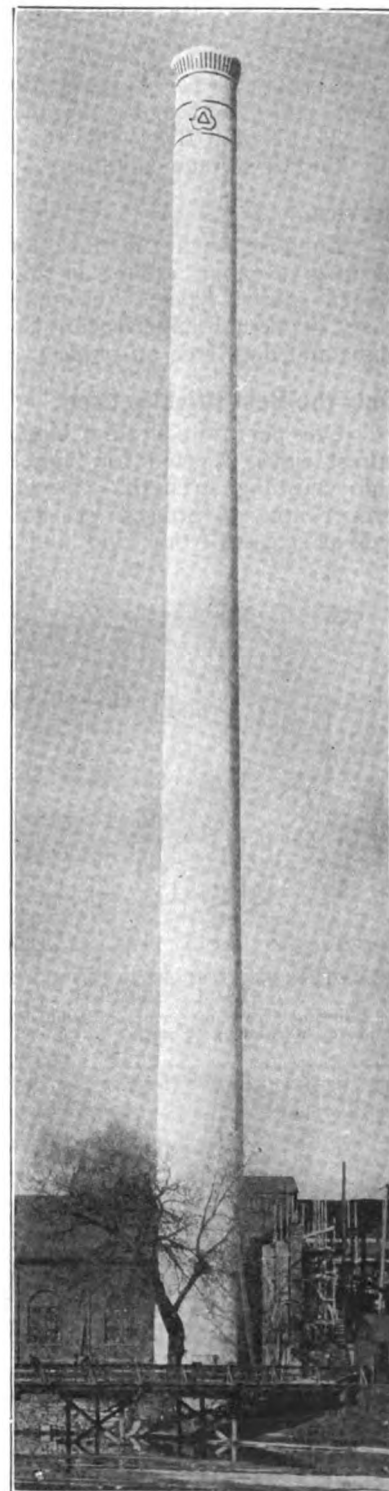
Construction is in charge of trained field superintendents; and in consequence, the finished chimney is in strict conformity with the plans and specifications.

The wide experience of THE RUST ENGINEERING COMPANY in chimney design and construction, together with the consistent use of first grade materials, insures results that are practical and uniformly satisfactory.

Correspondence invited.



PERFORATED RADIAL BRICK CHIMNEY, BETHLEHEM STEEL CO., SOUTH BETHLEHEM, PA.
250 ft. high, 9 ft. diameter



REINFORCED CONCRETE CHIMNEY, DENVER GAS & ELECTRIC CO., DENVER, COLO.
300 ft. high, 12 ft. diameter

HOOSIER STACK AND CONSTRUCTION CO.

GENERAL OFFICES
Pythian Building
INDIANAPOLIS, IND.

BRANCH OFFICES

CHICAGO, ILL., 115 South Dearborn Street
NEW ORLEANS, LA., 847 Baronne Street
CINCINNATI, OHIO, 1758 Central Avenue
NEW YORK, N. Y. DETROIT, MICH.
DENVER, COLO.

PITTSBURGH, PA., Union Arcade Building.
ST. LOUIS, MO., Bank of Commerce Building
CLEVELAND, OHIO, Leader-News Building.
TOLEDO, OHIO KANSAS CITY, MO.
TULSA, OKLA. GREENVILLE, S. C.

Products.

CHIMNEYS for Boilers, Furnaces, Smelters, Coke Ovens and Chemical Plants, or for any other purposes.

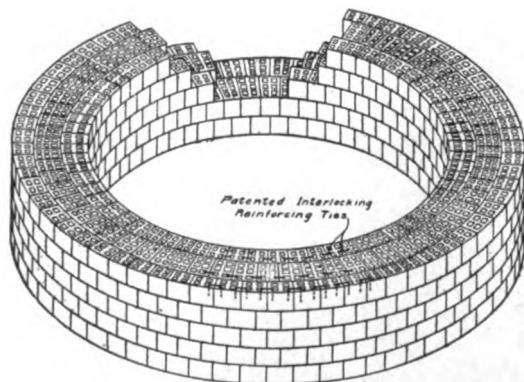
Also Radial Brick Tile for grain elevators, silos, or any kind of storage containers.

Service.

Long experience in stack construction has equipped us to give expert advice as to size and shape, and to design special types. Recommendations given on the basis of actual experience. Specifications, plans, designs and data free on request.

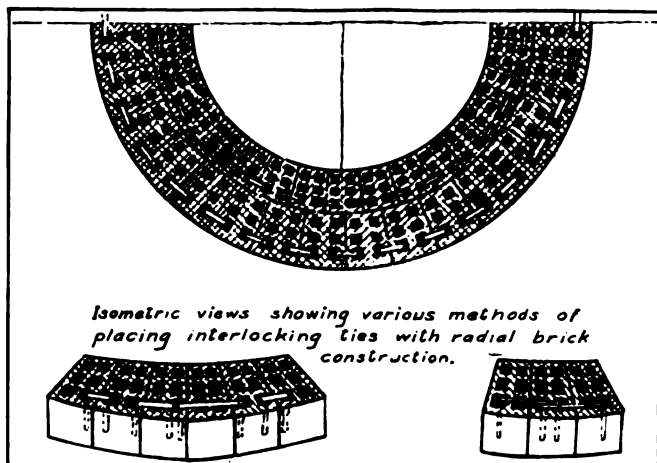
Only the Best Brick is Used.

Our perforated radial blocks are made only from purest clays, selected for high refractory powers, and high crushing strength. Special attention is given to proper mix, to produce resistance to heat strains, as well as stresses from wind, and dead load weight.



ISOMETRIC SKETCH SHOWING CONSTRUCTION OF HOOSIER STACK FOR HIGH TEMPERATURES

Showing 3 rows of perforated radial brick. A most durable, serviceable form of chimney or stack



HALF PLAN, SHOWING METHOD OF INCORPORATING INTERLOCKING TIES INTO HOOSIER RADIAL BRICK STACK CONSTRUCTION

Illustrating method of locking and interlocking individual masonry units, developed by the Hoosier Stack and Construction Co.

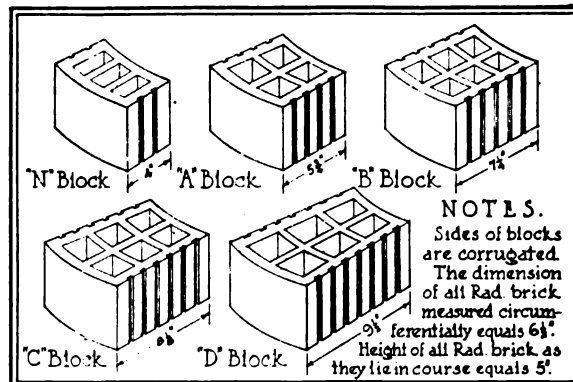
SWEET'S CATALOGUE

Method of Construction on New Chimneys.

The Hoosier system of interlocking reinforcing ties, consisting of "U" shaped metal bars, is used for tying together and reinforcing masonry units having vertical perforations, such as radial brick, hollow building tile, etc., which are used in the construction of smokestacks, grain elevators, silos, etc.

Information Essential for Preparing Estimates.

Name of party and place of erection.
Chimney to be built in open or within building.
Number and total horsepower of boilers.
Height and diameter of chimney.
Number of flue openings.
Is chimney to be used for boiler, drafts or other purposes?
Distance from railroad track to chimney site.
Will purchaser unload brick?
Local prices for following material delivered at job:
cement, lime, sand, gravel and stone.
Probable temperature of flue gases.
Distance from grade to bottom of flue opening.
Is chimney arranged for overhead or underground flue?



TYPES OF BLOCKS USED IN HOOSIER RADIAL BRICK STACK CONSTRUCTION



HOOSIER STACK BUILT FOR BOARD OF EDUCATION, EAST CLEVELAND, OHIO

Continued on next page



BLACKFORD WIND-
DOW GLASS CO.,
VINCENNES, IND.

Stacks Repaired By This Company.

The ease and speed of our repair work on the many installations we have made for others is in evidence in the accompanying illustrations.

Note how we repair stacks with our outside scaffolding, without interfering with the operation of the plant. No great big expense for scaffold from the ground up.

New Chimneys Can Be Made Out of Old Ones.

The use of our circular steel braces, together with the fact of our long experience in chimney and stack repair, such as re-pointing, overcoming structural defects, etc.,

enables us in many cases to make an old stack as good as new, and incidentally add years to its life, as well as restore its initial efficiency.

Stack Repair Without Interference With Plant Operation.

The large illustration on this page gives a good idea of the method employed by the HOOSIER STACK AND CONSTRUCTION CO. in repairing stacks, without interfering with the operation of the plant.

Importance of Regular Chimney Inspection.

In these days of enforced economies in operation of all manufacturing and power plants, no one can afford to overlook the tremendous waste which comes from inefficient smokestacks.

If a chimney has developed seams or cracks—

faults that are often discernible only to the trained eye—it admits cold air, which rushes in, interfering with the draft, chilling fires, cutting down efficiency of operation, and running up coal bills.

Every smokestack, therefore, needs regular expert inspection at regular intervals, to detect the flaws that always slow up production.

Menace of Loose Lightning Rods.

Then again, even though the masonry be solid, the lightning rods might have become disconnected, through the vibration of wind pressure, or from corrosion.

If such is the case, these loose lightning rods, instead of being a protection to the stack, actually act as a positive menace.

A rod properly installed is a safeguard; if not correctly anchored, it is a source of perpetual danger.

Our organization is particularly well equipped to make speedy repairs of this nature.

We assume all risks as well.

Repairs Pay for Themselves in a Short Time.

Our work on an old stack will positively pay for itself in a very short time, and in a few months begin to leave net profits that will accrue from the higher efficiency of operation it is possible to get out of the plant.

We have done it for others; we can do it for you. It costs nothing to investigate.

Correspondence is solicited.



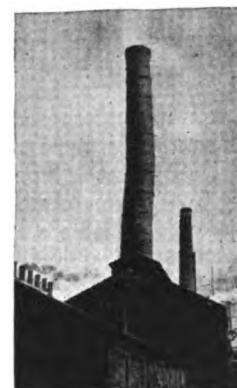
MICHIGAN COP-
PER & BRASS
CO.,
DETROIT, MICH.



STANDARD BRICK CO., EVANSVILLE, IND.



BRAZIL CLAY PROD-
UCTS CO., BRAZIL,
IND.



COLUMBIA CHEMI-
CAL CO., BARBER-
TON, OHIO

THE M. W. KELLOGG COMPANY

Manufacturers of Perforated Radial Brick Chimneys

140 Cedar Street
NEW YORK, N. Y.

BRANCH OFFICES

BOSTON, MASS. PHILADELPHIA, PA. CHICAGO, ILL. PITTSBURGH, PA. SAN FRANCISCO, CAL.
LOS ANGELES, CAL. MONTREAL, TORONTO, WINNIPEG, CAN., CANADIAN KELLOGG CO., LTD.

Products.

PERFORATED RADIAL BRICK CHIMNEYS.

Service.

THE M. W. KELLOGG COMPANY has erected some of the finest chimneys in the United States during the last seventeen years, and is ready to share the results of that experience with engineers and architects who are engaged in problems where chimney construction is required.

This company's engineers will be glad to advise on types, sizes, shapes, etc., of chimneys for any condition that may arise.

Kellogg Perforated Radial Brick Chimneys.

No artificially produced material for the construction of the modern factory chimney compares with refractory clay. This raw material is put through a variety of scientific treatments by skilled hands and especially designed machines before it comes from the kilns in the form of perforated radial brick ready for shipment, and for use in chimney construction.

Each brick is formed to occupy a certain position in the circular and radial lines of the chimney, as shown by the drawing on this page, and is sound ringing, hard, well burned and free from checks.

Bricks are made to conform closely with the circular and radial lines of the shaft and are weatherproof and acidproof.

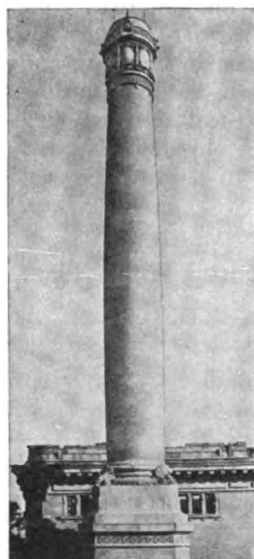
The total amount of perforations does not exceed one-fourth of the cross area of the brick, which are tested to a crushing strength of not less than 6000 lbs. per sq. in.

The perforations in the radial bricks form a dead air space about the core of the chimney. This has a marked effect in reducing amount of fuel used, in preventing sudden changes of temperature within the chimney, and in reducing radiation. Thus a uniformly maximum draft is maintained in any kind of weather.

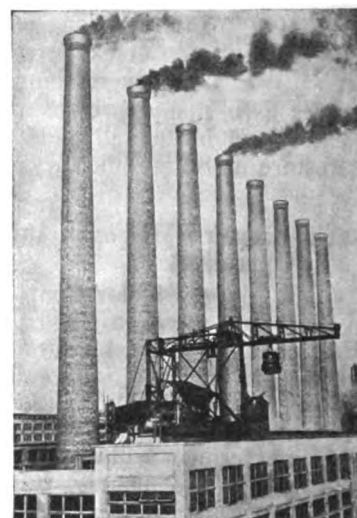
A trained superintendent of construction, familiar with all the details of the plans and specifications of the chimney, accompanies each shipment of radial brick, to supervise unloading and stacking in the order of their use. Throughout the entire construction the bricks of each tier reach their final place under his direction.

An expert mortar man supervises the preparation and use of all of the mortar. The tensile strength of the chimney, its ability to withstand heat and cold and to defy all sorts of weather from without and all sorts of gases from within, depend largely upon this mortar. Each brick is laid in so full a bed of mortar that the latter enters the perforations of the brick from 1 to 1½ in. The joints are struck both inside and out.

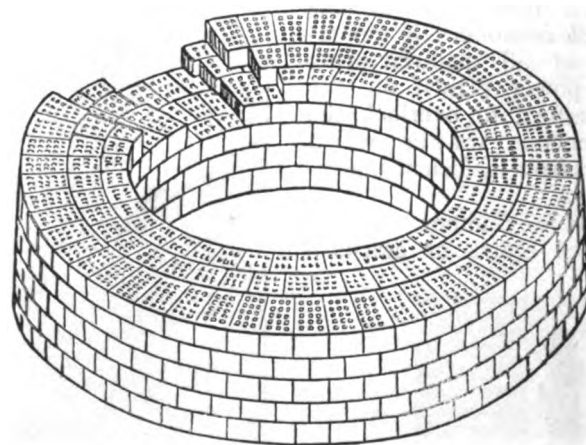
A crew of trained men in scientific chimney con-



QUEEN LANE FILTER
PLANT,
PHILADELPHIA, PA.



CORN PRODUCTS REFINING CO.,
ARGO, ILL.



METHOD OF USING M. W. KELLOGG'S PERFORATED RADIAL
BRICK IN CHIMNEY CONSTRUCTION

struction carry forward the erection of the chimney from start to finish, insuring careful construction and the proper grading and matching of brick throughout.

Standard Specifications for Perforated Radial Brick Chimneys.

Scope—The work included under this contract is to consist of all labor and material necessary for the erection complete of one radial brick chimney in accordance with this specification, which shall become a part of the contract. The proposal shall include all scaffolding, cartage, unloading of material and removal of rubbish necessary to leave the chimney in a first class condition ready for operation.

Delivery—The chimney will be built at.....
located on the.....
railroad.

Material may be unloaded on owner's siding, which is within.....of the chimney site.

Space—Sufficient storage room for chimney contractor's materials will be provided adjacent to chimney as well as unobstructed access from transportation delivery to the site of chimney for delivery and removal of materials and tools. At least one side of chimney will be left free and open by the owners for hoisting and working space until the chimney is completed.

Water—The owners will provide the chimney contractor with necessary water within 50 ft. of the site of the chimney free of expense to the chimney contractor. From this point the chimney contractor will make his own hose connections, if required.

Workmanship and Materials—All workmanship and materials shall be first class.

The chimney contractor shall furnish a competent foreman under whose supervision the chimney will be built. Chimney must be built in a thorough, complete and workmanlike manner.

Time of Completion—The chimney contractor shall state in bid the guaranteed number of working days in which he will finish the chimney after receipt of signed contract and approved drawings.

Foundation—Proper foundation will be built by the owner from plans and specifications to be furnished by the chimney contractor, who will, on completion, give in writing his approval of the foundation as being sufficient to sustain the chimney and fulfil the guarantee.

Note: In case, however, it is desired to have chimney contractor build the foundation, the following may be used:

The chimney contractor shall furnish a concrete foundation of proper depth and spread to safely sustain the chimney. The foundation shall not be loaded to more than.....tons per sq. ft., which is the safe bearing value as determined for this work.

Excavating shall be done by contractor for foundation.

The concrete shall be composed of cement, sand, stone or gravel in the proportion of 1 part cement to 2½ parts sand and 5 parts of stone or gravel. It shall be deposited in the forms in layers not to exceed 6 in. in thickness and thoroughly rammed into place. Concrete shall be a wet mixture.

Design—The design of the chimney shall conform to the following dimensions as shown on drawing attached:

Height above top of foundation.....ft.....in.

Minimum internal diameter.....ft.....in.

The wall of the column shall have one straight and true batter from top to bottom. The wall thickness and section lengths to be as shown on drawing. In case the contractor's standard wall thickness should not be exactly as shown, a variation of 3% will be allowed in either direction.

Base—If chimney is to be built with base and column construction, use the following:

The base of the chimney shall be built [here fill in shape of base] in shape.....ft. high, of the dimensions shown on drawing, of straight, hard, well burned, well shaped common building brick laid in full bed of cement lime mortar as herein specified.

Note: If round for the entire height, specify as follows:

The chimney shall be built of perforated radial brick for the entire height, as hereinafter specified.

Radial Brick—All radial brick shall be best quality, moulded from refractory clay, sound ringing, hard, well burned, well shaped, of reasonably even color and free from checks; made to closely conform with the circular and radial lines of the shaft, and shall be weatherproof and acidproof. They shall have a water absorption of not less than 5% nor more than 12% of their dry weight after immersion for a period of 24 hours; and shall have a crushing strength of not less than 6,000 lbs. per sq. in. The total amount of perforations shall not exceed one-fourth of the cross area of the brick. One cu. ft. of radial brickwork shall weigh not less than 120 lbs. The outside faces of the brick shall be of regular size, so that the general appearance of the brickwork will be neat and uniform.

Lining—The chimney shall have an expansion lining built of perforated radial fire brick 4¼ in. thick,ft. high from a point 2 ft. below the bottom of the flue opening. The lining prevents flue gases from coming in contact with the solid masonry of which the shell is built, and shall be separated from same by an air space of not less than 2 in.

The lining shall be built after the chimney is finished, and exceptional care must be taken to keep the air space clear and free of loose mortar and other dirt.

Rack out the shell of the chimney approximately 2 in.

above lining, to form a ledge for the purpose of diverting the falling soot when the chimney is in operation.

Mortar—All brickwork shall be laid in cement lime mortar, as hereinafter specified, with courses level and with full joints throughout. Face brickwork and backing to be laid up at the same time with joints of reasonably even thickness, not exceeding ½ in. The mortar to be used in the chimney shall consist of 1 part portland cement, 2 parts fresh burnt limp lime mortar and 5 parts clean, sharp sand. The cement to be added to the sand and lime mortar as the mortar is required, and no mortar having taken an initial set is to be used. The cement must not be added until the lime is cool. The sand shall be clean and sharp, free from loam, vegetable matter and large pebbles. If necessary, it must be both screened and washed.

Bond—All common brickwork shall have every fourth course a header course.

Radial brickwork shall be bonded every three courses.

Breeching Opening—One opening shall be provided in chimney. The opening to be lined on the reveals with refractory material. The masonry above the opening to be supported by heavy I-beams set on steel plates, with air spaces at each end for expansion. Under these I-beams a flat masonry arch shall be built to properly protect the beams from the effect of the gases. The flue opening shall be reinforced laterally by heavy tie rods and plates over the top and at the bottom.

Steel bands, ¾ by 3 in., to be placed in the masonry above and below opening.

The opening shall be.....wide by.....high, the bottom of which shall be approximately.....above foundation.

Reinforcing Rings—The chimney contractor shall place in the brickwork at every change in wall thickness steel bands ¾ in. thick by 3 in. wide.

If the contractor should furnish perforated radial brick having corrugated sides, these bands may be omitted.

Head—The head of the chimney shall be neatly corbeled out and fitted with a heavy annular retaining ring set in full bed of cement mortar.

Clean-out Door—Provide and place in base of chimney where directed by owner a cast iron clean-out door and frame properly hinged and fitted with latch. Said door to be approximately 24 in. wide by 36 in. high.

Ladder—Build on the interior of the chimney a ladder to consist of ¾-in. galvanized iron rungs, spaced approximately 15 in. center to center and securely anchored to the masonry from top to bottom. These ladder irons to be in the shape of a "U" with hooked ends.

Lightning Conductor—The lightning conductor is to consist of.....copper points, ¾ in. in diameter by 8 ft. long, with 1½-in. platinum tips. The points to be anchored to the top of the column and extend from the bottom of the corbeling upward. The lower ends of the points to be connected by a loop of copper cable encircling the chimney. From this loop there is to be 1½-in. 7-strand No. 10 Stubbs' wire gauge copper cable, carried down the side of the chimney and connected to copper ground plate of the 3-winged type as best for the proper distribution of charge. The points to be securely fastened to the top of the chimney and the cable to be anchored every 7 ft. in height with brass anchors, so designed that they will support the weight of the cable. The ground plate shall be buried by the contractor for the foundation when it is built.

Lettering (When Desired)—Work into the column on [one or two] sides as directed the letters [here insert the desired legend] to be made in permanently colored kiln burnt brick. Letters to be true to size and shape and to be in a true vertical line.

Trimings (If Any)—All necessary stone or terra cotta shown on drawing will be furnished without charge by the building contractor to the chimney contractor, who will set same. No one piece should weigh over 200 lbs.

Insurance—The chimney contractor shall carry at his own expense, during the entire period of construction, liability insurance, insuring the men in his employ and the public in general, in case of damage due to accidents.

Guarantee—The chimney contractor shall guarantee the chimney for a period of 5 years from date of completion. The guarantee shall cover any defects that may arise within this period due to faulty design, construction, material, weather, and the products of combustion up to 800° Fahr.; and shall further guarantee to make good at his own expense all defects that may arise from any of the above conditions within the specified period.

The chimney shall be designed for a wind velocity of not less than 100 miles per hour.

Note: The chimney shall be built according to THE M. W. KELLOGG COMPANY [or equal] system of construction.

WM. SUMMERHAYS & SONS

Designers and Builders of Radial Brick Chimneys

1 Exchange Street
ROCHESTER, N. Y.

MONTREAL, CANADA, 109 Place D'Youville

Products.

CHIMNEYS: Perforated Radial Brick and Common Brick.

BRICK BOILER SETTINGS, SPECIAL FURNACES and OVENS.

Sixty-five Years of Successful Chimney Building.

Summerhays brick chimneys embody the results of 65 years of successful chimney building and have gained for WM. SUMMERHAYS & SONS an enviable reputation. Their present day practice is the cumulative experience of three generations.

Stability of design and quality of workmanship and materials explain the long life of their chimneys and the large number of successful installations in the United States and Canada.

This organization employs only workmen skilled in the chimney building trade—men who have specialized in this line of construction.

Summerhays chimney experts will, without charge, submit recommendations, plans, estimates, etc., for proposed radial and common brick chimneys and foundations, based on the knowledge gained through their long experience in chimney building.

Perforated Radial Brick—These brick are made from a selected shale material moulded from dies of this company's own design in varying sizes and radii, to make a perfectly bonded wall and to conform to the circumference of the chimney for any diameter. They are hard burned to the point of vitrifica-

tion. The perforations insure an even and thorough burning of the entire brick, giving a material of maximum strength. The air pockets formed by these perforations, which are sealed with mortar, serve to insulate the hot flue gases from cooling by the atmosphere.

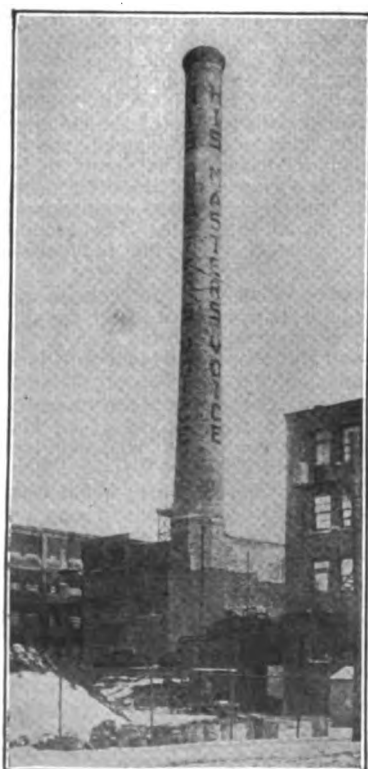
Typical Summerhays Chimneys—

Bausch & Lomb Optical Co.	Isco Chemical Co.
Berliner Gramophone Co., Limited	Merrill Silk Co.
Buffalo, Rochester & Pittsburgh Ry.—2	Mohawk Condensed Milk Co.—3
Canadian Connecticut Cotton Co.	National Carbon Co.—2
Curtice Bros. Co.—3	New England Box Co.
Curtiss Engineering Corp.	New York Cannery—6
Douglas Packing Co.—2	Oldsbury Electro Chemical Co.
Great Atlantic & Pacific Tea Co.	J. Hungerford Smith Co.—2
Hamburg Canning Co.—3	Standard Oil Co.—3
International Milk Products Co.—2	Taylor Instrument Co.
International Salt Co.—2	United Gas Improvement Co.—3
	Vacuum Oil Co.—5
	Worcester Salt Co.—4
	Yawman & Erbe Mfg. Co.

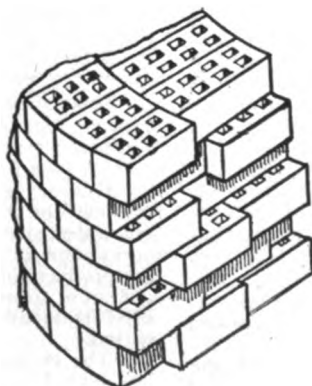
Brick Boiler Settings and Furnaces.

The fire masonry experts of WM. SUMMERHAYS & SONS are in a position to design and build brick boiler settings, also ovens and special furnaces for any purpose.

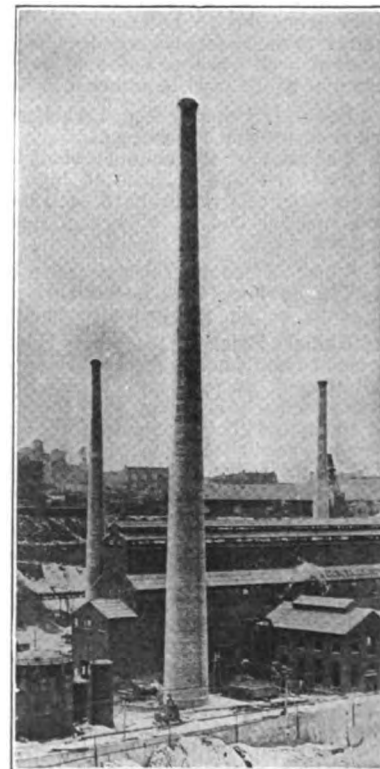
From the standpoint of economy and efficiency, it is suggested that estimates for the construction of the chimney include construction of the boiler settings.



BERLINER GRAMOPHONE CO., LTD., MONTREAL, QUE.



HOW SUMMERHAYS RADIAL BRICK ARE BONDED



ROCHESTER GAS & ELECTRIC CORPORATION, ROCHESTER, N. Y.

THE ARROW-CONDUCTOR & MANUFACTURING CO.

Manufacturers of and Contractors for Lightning Conductors

1536 West Adams Street
CHICAGO, ILL.

Products and Services.

Underwriter approved LIGHTNING CONDUCTORS for chimneys, towers and all types of high and exposed structures.

Also Electrical Grounding Terminals; Chimney Banding and Repairing.

Specification.

For the convenience of architects and engineers, a condensed specification is given for a safe and lasting system of lightning protection, approved and recommended by the National Board of Fire Underwriters, for power plant chimneys. This system includes lead armor in the gas and smoke zone to protect it against destruction by the metal eating gases.

Air Terminals—Preferably multiple reinforced type made of a special high heat resisting copper-bronze, main center point 6 in. long, $1\frac{1}{4}$ in. at base, tapering to $\frac{1}{2}$ in., then sudden sharp point. Five small points with reinforced tips 3 by $\frac{1}{8}$ in. set at an angle of 35° at base of large point. Main and small points to be sleeved with shell of pure platinum $\frac{1}{500}$ (.002) in. thick. Points mounted on solid copper bar $\frac{3}{4}$ in. in diameter. Round "V" bends between points and circuit cable conductor.

Cable Conductor—At least two cable down conductors after forming a cable circuit with round "V" bends, to be 99% pure copper, 280,000 C.M. cross section with all cable joints interwoven.

Lead Armor—To protect the system against acids and gases emitted through top of stack, all parts of system from platinum to 25 ft. below top of stack to be sleeved with chemically pure lead $\frac{1}{8}$ in. thick with all joints hermetically sealed.

Ground Terminals—At the end of each vertical cable, branching out in "V" shape, two pure perforated copper ground reservoirs 24 by 4 in. with No. 19 B & S gage wall metal, 4-in. bronze conical cap, tube center, and filled with pea size charcoal, should be attached.

Supports—Heavy copper-bronze, 2-bolt type anchors, lead coated in the armor zone, of the Arrow pegged anchor type, to be built in as the masonry progresses, 5 ft. apart vertically and 18 in. horizontally.

Lightning Indicator and Test Gage—An efficient instrument incased in aluminum with a regulating attachment on the face, so that it can be used for testing the system, should be attached to one of the cables without cutting the cable conductor.

Protection Pipes—To prevent theft, brass pipes 9 ft. above ground level and 1 ft. below, properly anchored to wall with heavy brass anchors.

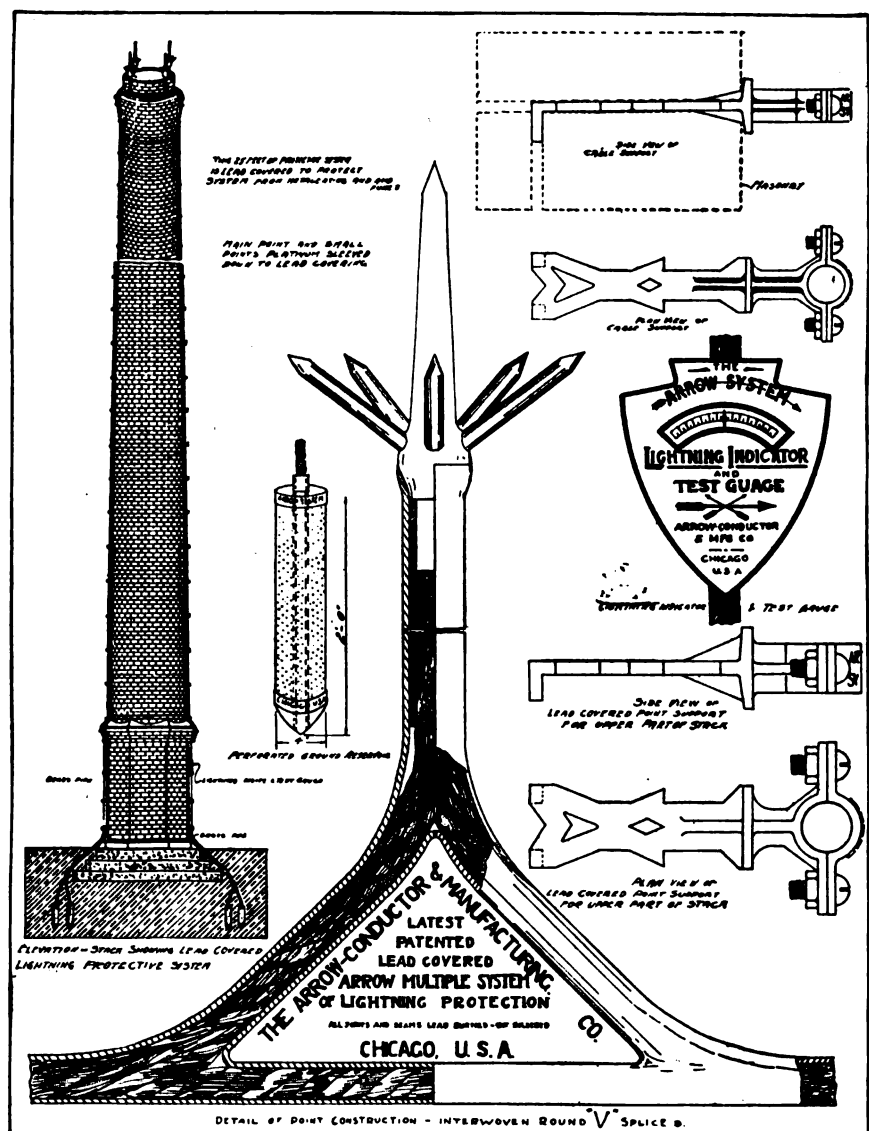
Underwriters Approval—Installation upon completion shall be inspected, labeled and approved by the National Board of Fire Underwriters.

Guarantee—The contractor to guarantee a structure equipped with this system against damage by lightning for a period of twenty-five years and assume liability for accidents and damages during installation.

Installations and Co-operative Service.

This installation is not a farm lightning rod. It is a perfected electrical installation that will last the life of the stack. Specified by government, state, municipal and industrial architects and engineers who have had costly experiences with other so called lightning protection.

A complete specification and other valuable information mailed free on request.



DETAILS ARROW SYSTEM LIGHTNING PROTECTION FOR CHIMNEYS

THE BABCOCK & WILCOX COMPANY

Manufacturers of Water Tube Boilers, Superheaters and Stokers

85 Liberty Street
NEW YORK, N. Y.

BRANCH OFFICES

BOSTON, 49 Federal Street
PHILADELPHIA, North American Bldg.
PITTSBURGH, Farmers Deposit Bank Bldg.
CLEVELAND, Guardian Bldg.
CHICAGO, Marquette Bldg.
CINCINNATI, Traction Bldg.

ATLANTA, Candler Bldg.
TUCSON, 21 S. Stone Avenue
NEW ORLEANS, 533 Baronne Street
DENVER, 435 Seventeenth Street
SALT LAKE CITY, 705-706 Kearns Bldg.
HONOLULU, H. I., Castle and Cooke Bldg.

SAN FRANCISCO, Sheldon Bldg.
LOS ANGELES, 404-406 Central Bldg.
SEATTLE, L. C. Smith Bldg.
HAVANA, CUBA, Calle de Aguiar 104
HOUSTON, Southern Pacific Bldg.
SAN JUAN, PORTO RICO, Royal Bank Bldg.

Products.

BABCOCK & WILCOX, RUST and STIRLING WATER TUBE BOILERS; MECHANICAL STOKERS; SUPERHEATERS. Also manufacturers of Steel Stacks.

Introduction.

Boiler practice has changed materially in the past 10 years. Higher pressures and higher superheat have come into every-day practice and with these changes have also come larger units and higher rates of combustion, due to better stokers and furnace arrangement, better methods of feed water treatment, improved coal and ash handling apparatus, and a better understanding of the care and operation of boilers. During this period great improvements have been made in the utilization of fuels other than coal. These developments have brought about a change in boiler room design and necessitate a much more careful study of the size of plant, service conditions, fuel water and class of boiler room help available. By reason of the different factors involved, the selection of a proper boiler unit is much more complex than in the past. Years ago this company manufactured a line of so-called "standard" boilers. These standards are still in existence, but the sale of a standard boiler today is a rarity, because operating conditions can not be even approximately standardized. Each boiler sale is approached by this company as an entirely new and independent engineering problem, the factors involved determining the particular type, size and setting of boiler offered.

Quality Boilers.

Each of our boilers is built in accordance with A. S. M. E. code, and a certificate of shop inspection by the Hartford Steam Boiler Inspection & Insurance Co. or other qualified inspection company will be furnished.

Over 24,000,000 h.p. of boilers manufactured by THE BABCOCK & WILCOX COMPANY are in use.

Babcock & Wilcox Boiler.

Heating surface of boiler is made up of drums extending longitudinally over the other pressure parts. To drums there are connected, through forged steel cross boxes at either end, sections made up of headers and tubes. At lower end of sections there is a mud drum extending entirely across boiler and connected to all sections. Connections between all parts are made by short lengths of tubes expanded into bored seats.

Headers into which tubes are expanded are of forged steel and of sinuous form so that tubes are in a staggered position when assembled. This staggering of tubes breaks up gases and causes them to impinge on every tube.

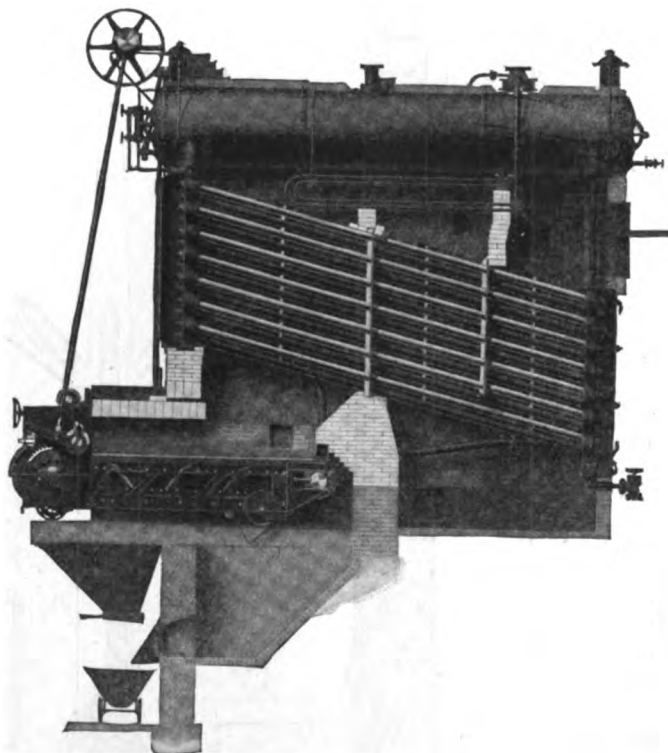
Opposite each tube end in headers there is a handhole of sufficient size to permit inspection, cleaning or renewal of tube. Handholes are closed by suitable handhole fittings.

Gases of combustion are caused to make three passes over heating surface by baffles constructed of special baffle brick and cast iron flame plates. Furnace is readily adaptable to fuel available whether solid, liquid, or gaseous. Boilers are suspended front and rear from wrought steel supporting frames, independent of brickwork. Patent

dusting doors permit keeping all heating surfaces free from soot and dust. Large doors in sides of setting give access to all parts for inspection and removal of soot.

Stirling Boiler.

The Stirling boiler consists of three transverse steam and water drums set parallel and connected to mud drum by three banks of water tubes curved to enter drum radially. Steam space of center drum, from which steam is taken, is connected to front and rear

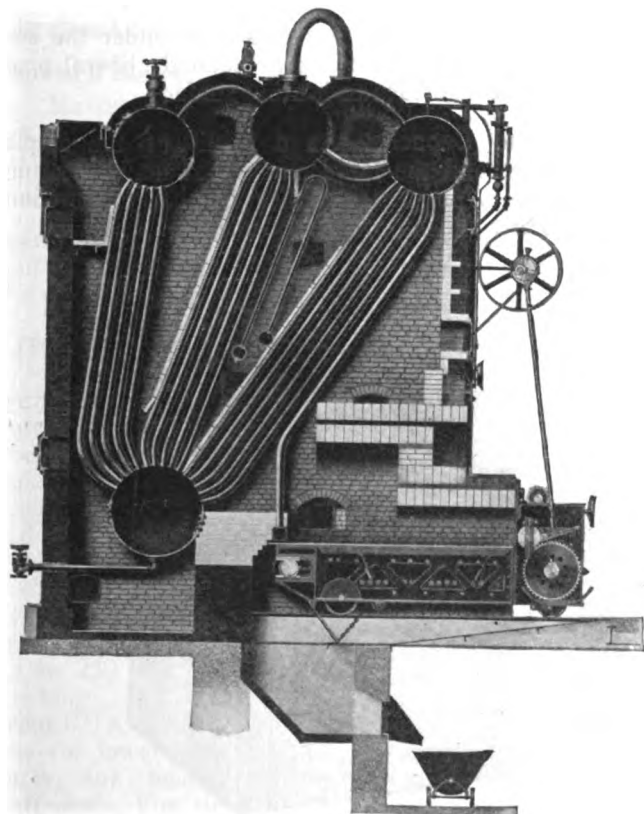


BABCOCK & WILCOX BOILER EQUIPPED WITH BABCOCK & WILCOX SUPERHEATER AND BABCOCK & WILCOX CHAIN GRATE STOKER

drums by steam circulating tubes and to front drum by water circulating tubes. Tubes are so shaped as to allow removal of any tube without disturbing any other tube or brickwork. Furnace is formed by a fire brick arch sprung across boiler setting in a triangular space formed by front wall and front bank of tubes. This furnace readily lends itself to installation of any stoker and burning of any class of fuel. Gases of combustion are led from furnace over heating surface by two baffles of fire brick tile, one resting on rear tubes of front bank and the other supported on rear tubes of second bank.

Boiler is supported on a wrought iron framework entirely independent of brickwork setting.

Large cleaning doors in sides of setting give ready access to all portions for cleaning, inspection and repair.



STIRLING BOILER WITH BABCOCK & WILCOX SUPERHEATER AND BAYONNE CHAIN GRATE STOKER

Rust Boiler.

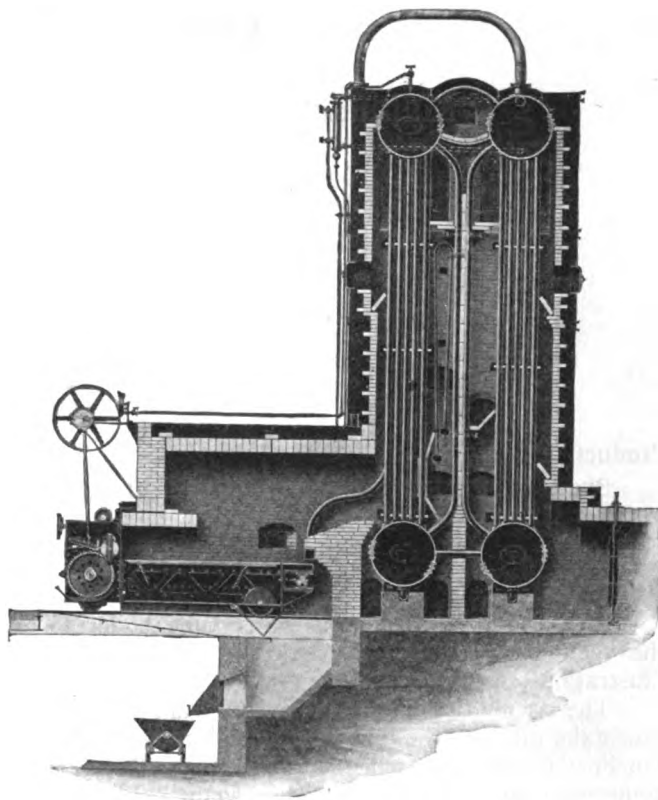
The Rust boiler has two transverse steam and water drums and two transverse mud drums. Each steam drum is connected to mud drum directly below it by five rows of straight tubes and one row of curved tubes. Steam drums are connected by curved steam and water circulating tubes and mud drums by water circulating tubes.

Tube sheets of all drums are pressed to form individual tube seats, thus permitting straight tubes to be expanded directly into cylindrical drums.

Tubes are staggered and so arranged that any tube may be removed without disturbing any other tube or boiler brickwork.

Furnace is of extension or Dutch oven type and any type of stoker or fuel can be used.

Gases are caused to make two passes over heating surface by a vertical fire brick baffle, built between, and held in position by central curved tubes. Horizontal baffle shelves cause all portions of heating surface to be swept by gases. Boiler is supported entirely free of brickwork on cast iron saddles under mud drums, saddles resting on masonry foundations.



RUST BOILER WITH BABCOCK & WILCOX SUPERHEATER AND BAYONNE CHAIN GRATE STOKER

Babcock & Wilcox Steam Superheater.

Built for installation in boilers of THE BABCOCK & WILCOX COMPANY'S manufacture, and are similar in design, location and operation. Construction is modified to meet specific requirements. Superheater consists of two headers into which tubes bent to a U-shape are expanded. These headers have handholes and forged steel handhole fittings, giving access to each tube end. No strains from contraction or expansion. Each superheater has an independent safety valve.

Superheater in all cases is located in direct path of products of combustion. Surfaces presented to gases are smooth, offer minimum resistance to passage of gases and the least opportunity for adhesion of dust.

Steam is taken from steam space of boiler through dry pipe, introduced into intake header and passes through superheater tubes to outlet header, to which superheated steam connection from boiler is made.

Babcock & Wilcox Chain Grate Stoker.

Consists of a grate in the form of an endless chain passing at front and rear of furnace over sprockets keyed to shafts carried by stoker frame. Grate passes through furnace continuously. Stoker is driven through a worm wheel on front sprocket shaft. Fuel is fed uniformly to front of grate under an adjustable stoker gate. Volatile gases are driven off on forward portion of grate under an ignition arch and are completely consumed in passing over incandescent fuel before striking heating surface. Combustion is truly progressive. Ash and refuse are discharged automatically and continuously as grate turns over rear sprockets. The form of grate links allows proper admission of air for combustion. Suitable side seals and a bridge wall water box (connected into water circulation of boiler and part of regular stoker equipment) prevent admission of large quantities of excess air.

Write for catalogues.

JAMES BEGGS & CO.

Manufacturers of Worthington Water Tube Boilers

OFFICE AND SALESROOM

42 Warren Street

NEW YORK, N. Y.

WORKS: SOUTH NORWALK, CONN.

Product.

BEGGS WORTHINGTON WATER TUBE BOILER.
For Grates, see page 805.

Description.

The Beggs Worthington water tube boiler is of the sectional type; the construction is shown in the illustrations.

The circulation is from the steam drum through the downtake tubes to the lower headers, through the tubes (inclined) to the upper headers, and thence through the connecting tubes to the steam drum again.

Circulation—Short tubes and headers produce rapid and positive circulation, which is recognized as the best method of preventing deposits of scale or sediment.

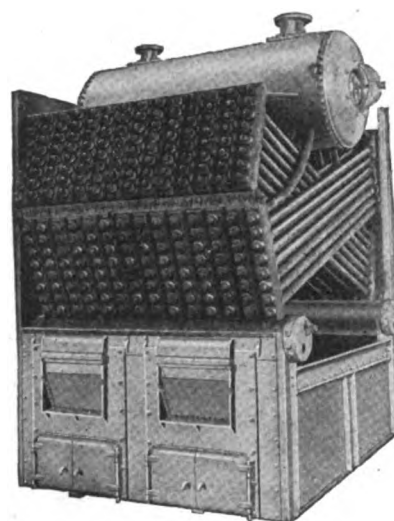
Compactness—As a result of grouping the tubes, a large aggregate of heating surface is concentrated in a small space. The boiler has therefore a great capacity per cubic foot of space.

Dry Steam—Each section has its own independent outlet discharging into the steam drum against a baffle. As a result of the separation obtained going around this baffle, priming is avoided and dry steam obtained.

Heating Surface—All tubes are in the fire and are exposed to the radiant heat of the fire; every square inch is therefore employed as heating surface.

Grate Surface—The grate extends under the entire heating surface, giving an exceedingly liberal proportion of grate surface to heating surface.

Overload Capacity—As a result of the ample grate surface and the large amount of active heating surface, the Worthington boiler is able to respond quickly to any sudden overload demands.



STEEL CASING REMOVED TO SHOW CONSTRUCTION



BEGGS WORTHINGTON WATER TUBE BOILER, FRONT ELEVATION

Points of Superiority.

Facility of Delivery—By reason of its sectional character, this boiler can be delivered in places inaccessible to many boilers. A boiler of 200 h.p. can be passed through an ordinary window or sidewalk opening.

Setting—The Worthington boiler is enclosed in a steel casing provided with doors to make the interior accessible for cleaning, etc. The casing is lined with non-conducting material which reduces the heat radiated to a minimum.

Cleaning—Openings are provided front and rear for the insertion of a steam nozzle between the vertical rows of tubes for the purpose of blowing the soot and dust from the outside of the tubes.

Adaptability—Special designs and settings can be made to fit any unusual requirements of space, stokers, or grates.

THE BROWNELL COMPANY

Manufacturers of Boilers, Engines and Feed Water Heaters

DAYTON, OHIO

SALES REPRESENTATIVES IN ALL SECTIONS OF THE COUNTRY

Products.

BOILERS: Horizontal Return Tubular, Locomotive Type Portable, Scotch, Vertical Tubular, Firebox Heating, Oil Country.

ENGINES: Automatic, Throttling, Fan, Variable Speed Duplex, Oil Country Drilling.

Also manufacturers of Feed Water Heaters, open and closed types.

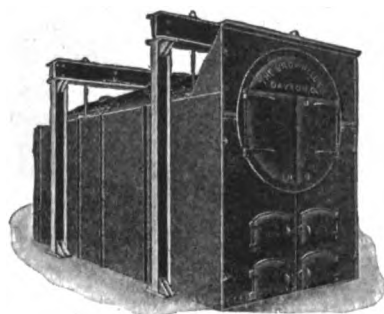
Brownell Boilers.

Material used is of the best quality—plate being open hearth steel, and tubes being A.S.M.E. standard, of best quality of American manufacture. Workmanship is the best and according to the latest known practice.

Brownell boilers are built to pass the most rigid inspection requirements. The company is prepared to build boilers according to the A.S.M.E. Code, or laws of the different states and municipalities.

Types of Boilers.

Horizontal Return Tubular Boilers—Designed with a factor of safety of 5; the longitudinal seams being butt jointed and double, triple, or quadruple riveted, according to the size and pressure carried. Where possible, rivets are driven by hydraulic pressure. Built in sizes from 15 to 250 h.p. for working pressures from 100 to 150 lbs., and for lower pressures for heating purposes. For details, refer to Bulletin B-1.



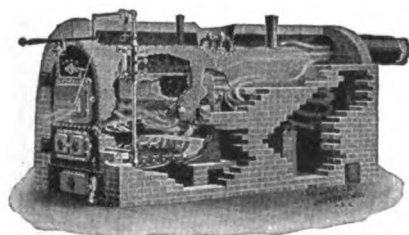
HORIZONTAL RETURN TUBULAR
BOILER, WITH BOX TYPE
STEEL CASING

BOX TYPE STEEL CASING—Steel casings entirely surround brickwork and thereby eliminate losses due to imperfections in brickwork, decrease radiation losses and insure maximum draft. They are, without doubt, the most satisfactory type of boiler setting. For other types of steel casings, see Bulletin B-4.

Firebox Heating Boilers—Smokeless firebox boilers are built with a down-draft furnace to meet the most rigid smoke ordinances. The down-draft furnace not only eliminates the smoke but increases the efficiency of the boiler.

Firebox boilers are built without down-draft furnace for use where no smoke ordinance is in effect.

Firebox heating boilers are suitable for heating all large public buildings, churches, schools, office buildings, factories, etc. Detailed information in Bulletin B-6.



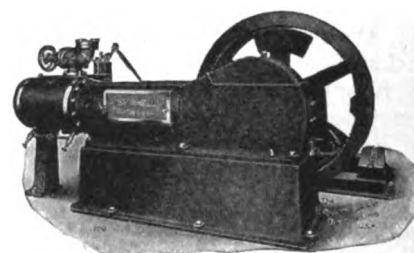
SMOKELESS FIREBOX HEATING BOILER

Brownell Side Crank Steam Engines.

The engines are well built throughout, only the best material being used in the construction. They are designed for severe and continuous service.

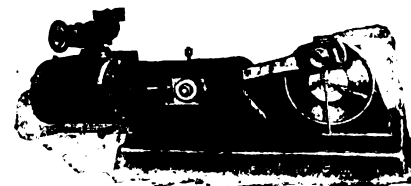
Types of Engines.

High Speed Automatic Engines—Built in either open or closed type. The automatic governor is of the inertia flywheel type, guaranteed to regulate the speed of engine within 2% from friction to full load. All enclosed automatic engines are furnished with quarter box main bearing. Open type automatic engines furnished in either angle or quarter box type main bearing when shaft is 6 in. in diameter, or less. On engines where shaft is over 6 in. in diameter, main bearing is always quarter box type. Further information in Bulletins E-1 and E-2.



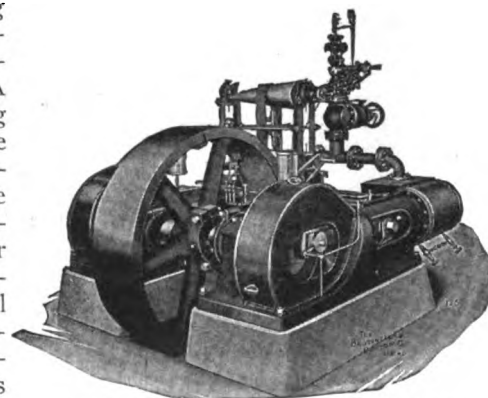
HIGH SPEED AUTOMATIC ENGINE

Fan Engines—Built in either open or closed type. Provided with hand adjustable *variable cut-off* device, when desired. Fan engines always have quarter box main bearings. Furnished with shaft extended for direct connection to fan or arranged for coupling to fan shaft. Additional information in Bulletin E-5.



OPEN TYPE FAN ENGINE

Variable Speed Duplex Engines—Especially designed for paper mill drive, giving long, dependable service, simple operation and perfect speed control. All variable speed engines have quarter box main bearings. A special speed limiting device prevents overspeeding. A special riding cut-off valve has been designed for use with these engines, in order to secure exceptional steam economy. Bulletin E-4 gives further information.



VARIABLE SPEED DUPLEX ENGINE

COATESVILLE BOILER WORKS

Manufacturers of Boilers, Steel Tanks and Heavy Steel Plate Construction

COATESVILLE, PA.

SALES OFFICES

NEW YORK, N. Y., 30 Church St.

PHILADELPHIA, PA., Morris Bldg.

Products and Services.

BOILERS for power purposes, including Horizontal Return Tubular Boilers, Water Tube Boiler Drums, Waste Heat Boilers, etc.

STEEL TANKS, including Tanks for High Pressure Work, Tanks for Storage Purposes, and Tanks for all Special Requirements.

HEAVY STEEL PLATE CONSTRUCTION, including Stills for Oil, Asphalt, and all Chemical Purposes; Dryers; Digesters; Blast and Open Hearth Furnaces; Stacks; Riveted Pipe, etc.

Shops are fully equipped for both Electrical and Acetylene Welding.

Foundry is equipped to manufacture all miscellaneous grey iron castings.

Coatesville Boilers.

Coatesville high duty return tubular boilers are built to the A.S.M.E. Code.

The following table gives our standard sizes, which are carried in stock at all times, ready for prompt shipment:

Diam., in.	Length, ft.	Number of tubes	Diam. tubes, in.	Working pressure, lbs.	Horse-power
84	20	108	4	135	246
78	20	88	4	145	204
78	18	118	3½	145	213
72	20	72	4	150	169
72	18	72	4	150	153
72	18	96	3½	150	177
72	16	96	3½	150	158
66	18	54	4	150	118
66	18	72	3½	150	137
66	16	54	4	150	105
66	16	72	3½	150	122
60	16	54	3½	150	94

**BOILERS
COATESVILLE
STEEL TANKS**

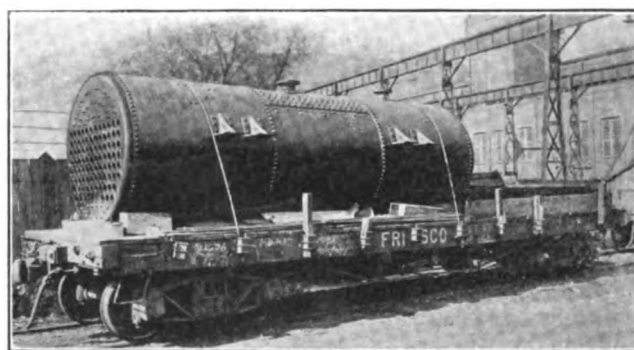
TRADE-MARK

Quality—The A.S.M.E. Boiler Code gives the necessary data for a high grade boiler. We have not only complied with every detail required by the code, but have, in a number of items furnished heavier material than actually required, so as to insure the best possible boiler for power

purposes.

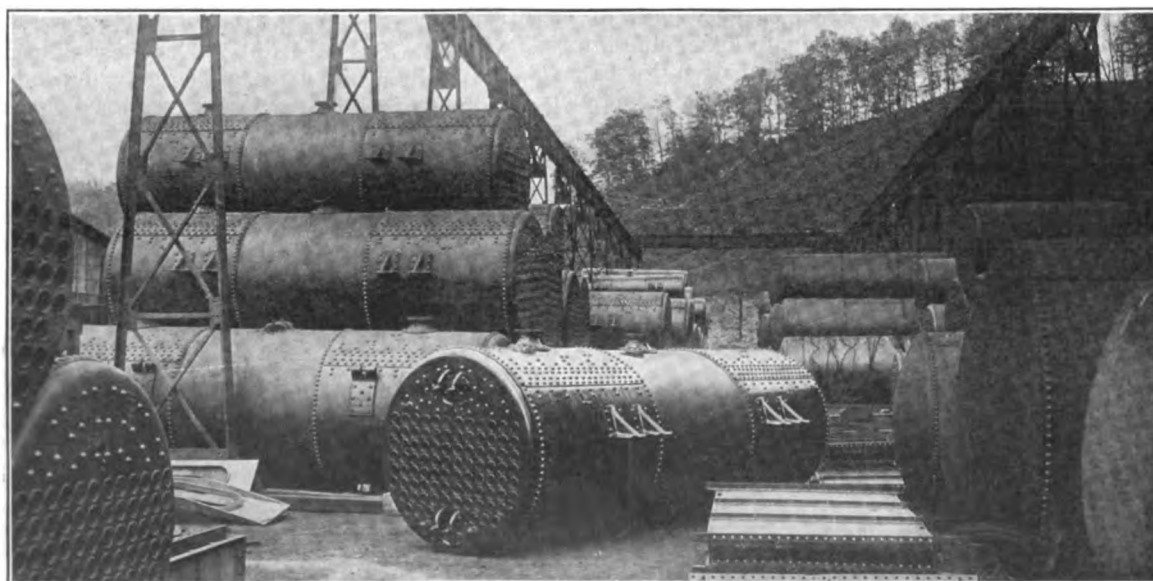
Thirty years' experience building high pressure boilers enables us to now manufacture the best possible A.S.M.E. boiler.

The fronts and miscellaneous castings furnished with the standard equipment are all heavy and of the best design.



200 H.P. COATESVILLE A.S.M.E. BOILER LOADED READY FOR SHIPMENT

Catalogue—Our General Catalogue No. 24, containing 96 pages, illustrates in detail "What We Make." A copy of this catalogue will be sent on request.



COATESVILLE STANDARD A.S.M.E. HORIZONTAL RETURN TUBULAR BOILERS READY FOR SHIPMENT

Steel Tanks and Heavy Steel Plate Construction.

We carry in stock 10,000-gal. steel tanks, 7 ft. in diameter by 35 ft. long, tested to 75 lbs.

Our experience in the construction of steel tanks for all purposes, and of heavy steel plate work, has been very extensive.

We are always pleased to have our sales engineers call and go over in detail your exact requirements, thereby enabling us to properly design tanks or special work to fill your requirements to the best possible advantage. Inquiries by mail will be given the best attention; however, a personal interview is recommended wherever possible.

Field Erection—The erecting organization is in charge of a thoroughly competent and experienced erecting engineer. We are therefore at all times fully equipped to carry to completion all orders for large tanks and miscellaneous heavy plate work which must necessarily be shipped knocked down and erected at destination, all such orders being completed under our personal direction and with our organization.

Our General Business Policy.

First of All, Quality—Best materials obtainable, coupled with strictly high grade labor. This establishes our reputation as regards the quality of our goods.

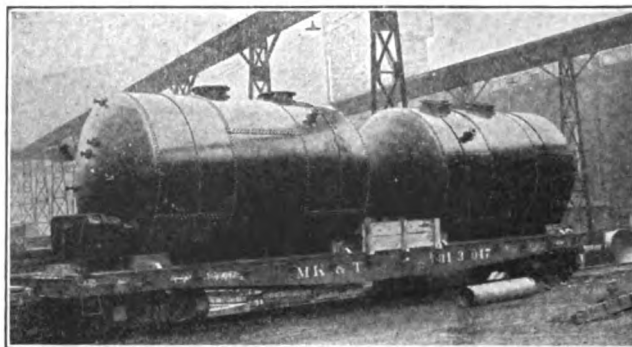
Service to Customers—You buy from us not goods but service. It is not the boiler but the service the boiler renders as to durability, capacity, and economy of operation, that counts. Also our sales engineers are at your service at all times to assist in planning and working out the details of your proposed power plant.

Lowest Possible Prices—Consistent with strictly high grade goods and adequate service to customers. Large output, standardization, duplication, specialization, efficient machinery operated at maximum capacity, and modern production and sales methods coupled with fair and conservative business dealings are all conducive to low cost of production without detriment to the quality of goods.

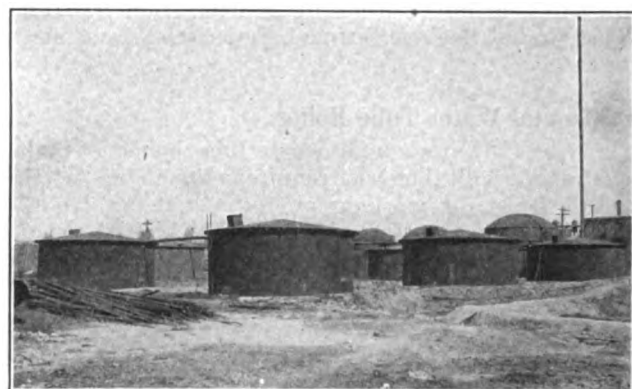
Your Inspection—We invite your inspection of our manufacturing facilities.

Strategic Location of Plant.

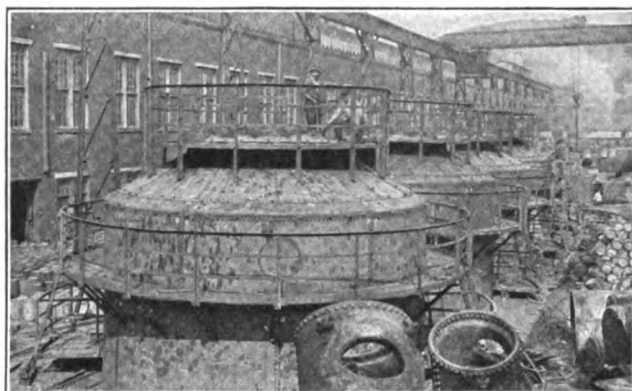
Shops are large and well equipped with machinery for fabricating heavy steel plate. They are next adjoining two plate mills, and we are able to make prompt shipment. There is not another steel plate metal shop in the United States so advantageously located.



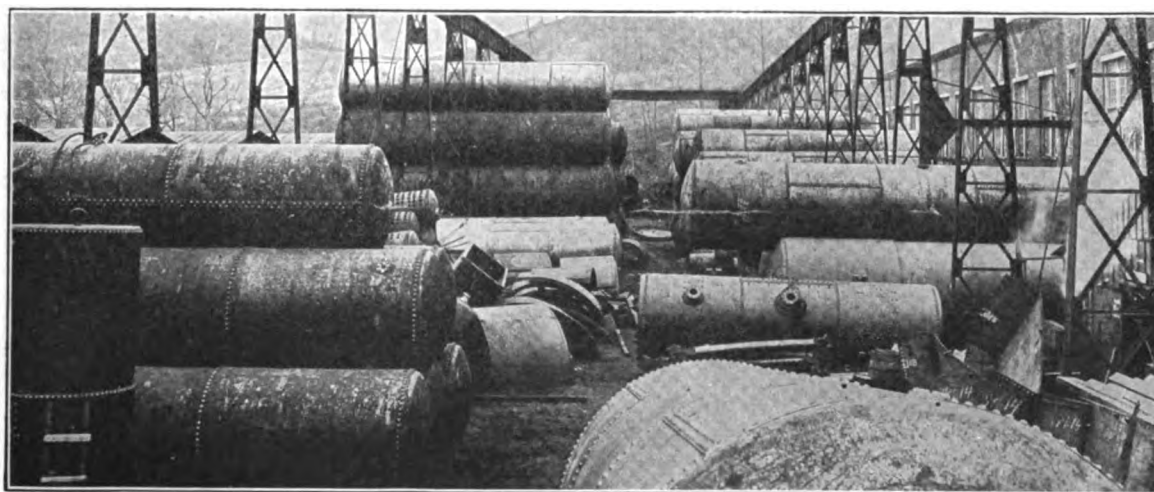
SPECIAL STILLS FOR CHEMICAL WORKS



OIL REFINERY STORAGE TANKS FURNISHED AND ERECTED BY COATESVILLE BOILER WORKS



FITTING UP HEAVY STEEL PLATE WORK IN ASSEMBLING YARDS



COATESVILLE STANDARD STEEL TANKS READY FOR SHIPMENT

THE CASEY-HEDGES CO.

Manufacturers of Water Tube and Tubular Boilers and Plate Work

MAIN OFFICE AND WORKS
CHATTANOOGA, TENN.

CHICAGO, ILL.,

NEW YORK, N. Y.

BRANCHES

NEW ORLEANS, LA.

HAVANA, CUBA

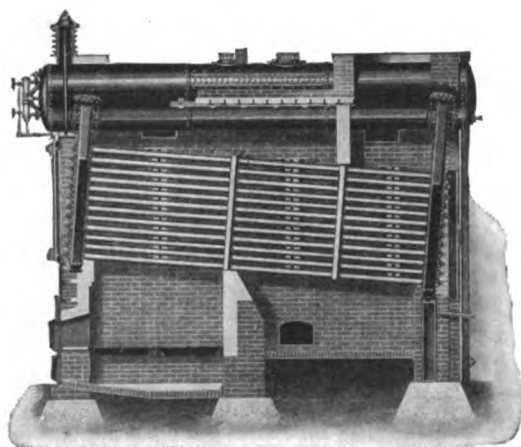
Products.

HORIZONTAL and VERTICAL WATER TUBE BOILERS.
RETURN TUBULAR BOILERS.
STEEL BOILER CASINGS.

Also manufacturers of Marine Boilers, Hollow Blast Grates, Bagasse Burners, Smokestacks and Breechings.

Horizontal Water Tube Boiler.

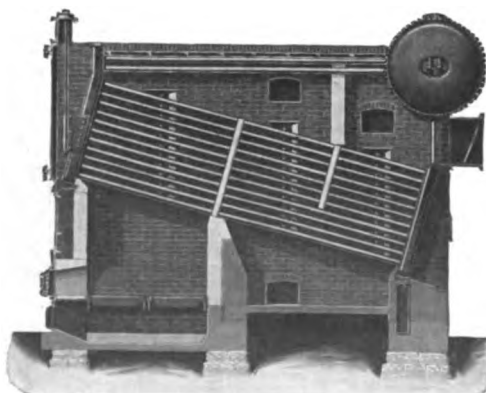
The C-H horizontal water tube boiler is built in accordance with the strict requirements of the A.S.M.E. code. Built for working pressures ranging from 160 to 300 lbs., in units from 100 to 1000 h.p. The construction is of all-steel throughout. The design is such that it can be adapted to any type of stoker. Arranged for burning oil, bagasse or any other fuel.



C-H HORIZONTAL WATER TUBE BOILER

Cross Drum Water Tube Boiler.

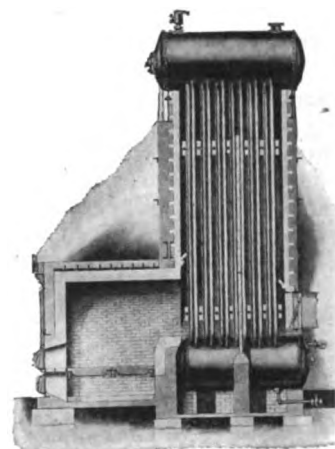
The C-H cross drum water tube boiler is built under the same specifications as the standard horizontal water tube boiler, but in sizes ranging from 100 to 1500 h.p., for any service or pressure.



C-H CROSS DRUM WATER TUBE BOILER

Vertical Water Tube Boiler.

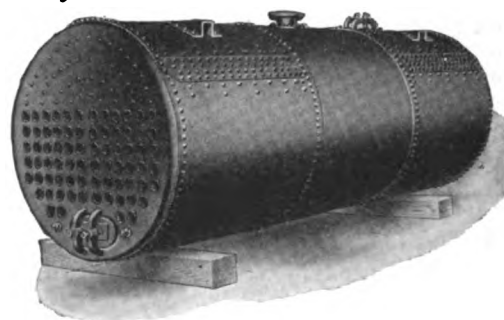
The C-H vertical water tube boiler is the simplest and most economical type of vertical water tube boiler on the market, supported from overhead beams and columns. The steam and mud drums set longitudinal. The arrangement of tubes and drums is such that there is no restricted circulation. Suitable for service with any kind of fuel.



C-H VERTICAL WATER TUBE BOILER

Return Tubular Boiler.

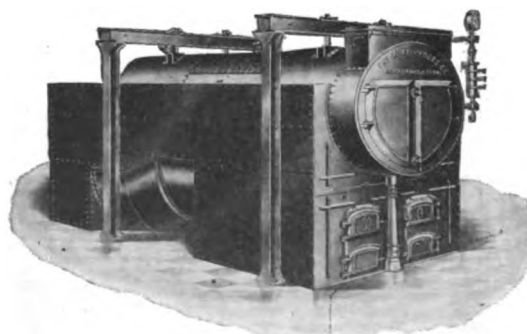
The C-H return tubular boiler is built strictly in accordance with A.S.M.E. code, or any other special inspection for working pressures from 125 to 150 lbs. In units from 25 to 300 h.p. Fronts and fixtures are extra heavy.



C-H RETURN TUBULAR BOILER

Steel Casing.

C-H steel casing eliminates all the inherent defects of the old-fashioned brick setting. It is airtight; presents a neat appearance and the maintenance cost is practically nil. It can be applied to old boilers, as well as to new. Furnished in standard or Dutch oven types.



C-H STEEL BOILER CASING

ESTABLISHED 1854

R. D. COLE MANUFACTURING CO.

Manufacturers of Boilers, Tanks and Steel Plate Work

NEWNAN, GA.

Products.

COLE-MANNING VERTICAL BOILERS; HORIZONTAL RETURN TUBULAR BOILERS.

STEEL TANKS AND TOWERS; STANDPIPES.

STEEL PLATE CONSTRUCTION: Steel Stacks, Acid Tanks, Storage Tanks, etc.

Cole-Manning Boilers.

Cole-Manning boilers are vertical fire tube boilers constructed in units up to 400 h.p. and for varying working pressures up to 200 lbs.

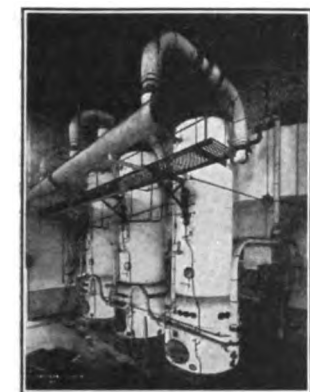
Very high efficiencies are obtained with Cole-Manning boilers due to the uniform distribution of furnace gases over the heating surface.

They occupy less floor space per horsepower than any other type of boiler on the market.

Cleaning on the crown sheet is taken care of by a series of handholes put in line with this crown sheet, making it very accessible.

All radiant heat is directly absorbed by the water heating surface, as there is no brickwork to absorb the heat, and, due to the absence of brickwork, maintenance is low, there are no infiltrations of air and radiation losses are reduced to a minimum.

Another feature of these boilers is their ability to deliver up to 50° or more of superheated steam, making



BATTERY OF COLE-MANNING BOILERS

them particularly adapted for turbines.

Boiler shell is supported on a 1-piece cast iron base which can be fitted with stationary or shaking grates. Smokebox is provided with removable cast iron cover and provided with connection for all standard soot-cleaning devices.

The evaporative performance, superheating qualities and small floor space per horsepower, contribute to make this type boiler a most desirable and economical unit.

Full information regarding Cole-Manning boilers may be had from this company's engineering department.

Horizontal Return Tubular Boilers.

Constructed in a most approved manner and of materials in full accordance with the A.S.M.E. code.

Standard settings can be provided with stationary or shaking grates and where increased efficiency and compactness are desired, standard steel casings can be provided for these settings.

These boilers are designed with liberal proportions of heating surface, steam space and grate area. Within the limits of their usefulness, they are unsurpassed as steam generators.

Constructed in units up to 250 h.p. and for steam pressure of 200 lbs. per sq. in.

Steel Tanks, Towers and Standpipes.

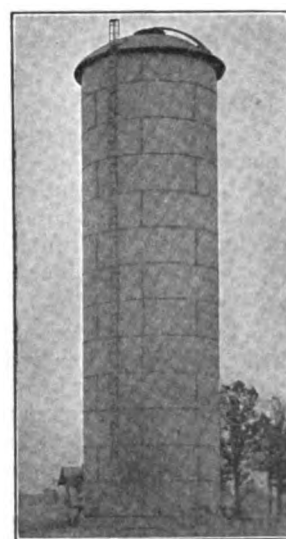
This company designs, fabricates and erects steel tanks and towers for sprinkler or general service, also standpipes.

Cole elevated tanks are correct in design. Their simplicity contributes to their low cost of maintenance. Sprinkler tanks and equipment are designed to incorporate the recommendations of all insurance authorities.

This company has been building tanks, towers and standpipes for over 20 years and its exceptional facilities, together with its large force of tank ex-



STEEL TANK AND TOWER

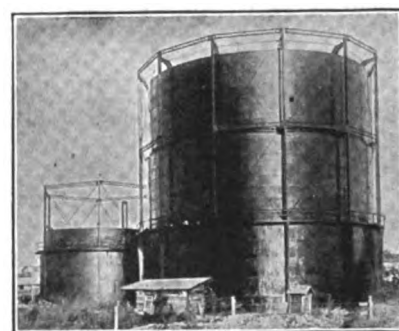


STANDPIPE

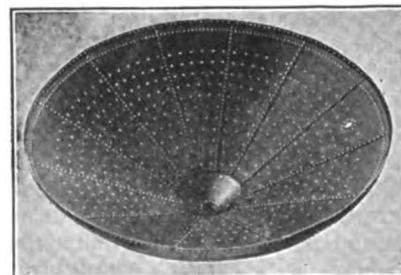
perts, insure reliable work and prompt delivery.

Steel Plate Construction.

The facilities of the R. D. COLE MANUFACTURING Co. provide for the design and construction of all forms of steel plate work, including smokestacks, acid and pressure tanks, structural frames and towers, etc. A large and experienced engineering department is at the service of prospective customers to assist in solving their problems.



GAS HOLDER



JACKETED KETTLE

ERIE CITY IRON WORKS

Manufacturers of Boilers, Grates and Steam Engines

ERIE, PA.

BRANCH OFFICES

NEW YORK, N. Y., 1360-62 Woolworth Building
PHILADELPHIA, PA., 2124 Land Title Building
CHICAGO, ILL., 1368 Peoples Gas Building
PITTSBURGH, PA., 1228 Park Building

CLEVELAND, OHIO, Citizens Building
BOSTON, MASS., 141 Milk Street
NEW ORLEANS, LA., Godchaux Building
SAN FRANCISCO, CAL., 67 Second Street

Products.

ERIE CITY VERTICAL and HORIZONTAL WATER TUBE BOILERS, IMPROVED "ECONOMIC" RETURN TUBULAR BOILERS, HORIZONTAL RETURN TUBULAR STATIONARY BOILERS; ERIE CITY "LENTZ" ENGINES; ERIE CITY SHAKING GRATES.

Also manufacturers of "Counter Current" Feed Water Heaters, Tanks and Steel Plate Construction.

Vertical Water Tube Boiler.

This boiler comprises two horizontal drums—one placed directly above the other—connected by a series of tubes, the combination being supported by heavy frame of steel beams. A wall of masonry surrounds boiler, and a frontal extension thereof, lined with fire brick and faced with metal front, forms the furnace.

Drums—Upper drum (the larger) carries body of water to the center of the drum, 10 and 12 in. of water being above the top row of tubes, and has at each end a steam storage compartment (patented), unequalled for production of dry steam. Lower drum is supported by tubes connected to upper drum.

Each drum has a manhole, giving ready access for installation and inspection.

Tubes—Curved to facilitate expansion and contraction. Spaces between different banks of tubes permit a man to enter. Each tube enters drum radial with center. Tubes readily cleaned by either air or hydraulic tube cleaner.

Material—Drum-shell plates, of best open hearth homogeneous flange steel. Tubes, of mild steel, are hot rolled and seamless. Rivets, of mild steel, conform to standard specifications.

General Construction—Shell plates are rolled to true circle; longitudinal seams, double butt-strapped; edges of plates, bevel planed; end of lap strip, scarfed on special milling machine; seams, calked inside and outside of shell; tubes so spaced as to leave ample alignment of metal; heads of drums, of same material as shell; steam and water openings in drums are reinforced with pressed steel nozzles, and flanges are thoroughly riveted and calked.

Furnace—Its location at front of boiler permits construction of arched roof of fire brick over fire—an anterior combustion chamber for the gradual liberation of gases and proper admixture of air through grate area, preliminary to the perfect utilization of products of combustion when in contact with tubes. Ample grate surface, for various forms and grades of fuel.

Steel Casing—To prevent entrance of uncontrolled air to furnace. Built with lining of 9-in. fire brick, and a dead air space between brick wall and metal casing (patented).

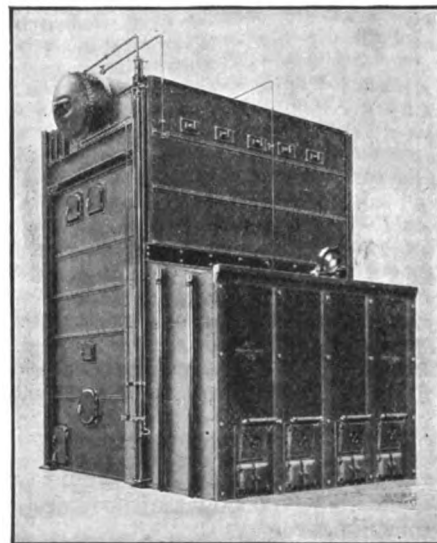
Circulation—Each tube, individually, is an independent steam producer, in nearly vertical position between both drums, without cross-over connecting pipes or any other restriction whatsoever, insuring rapid circulation. Water level is at center of upper drum, affording largest disengaging surface; ample depth of water over ends of tubes; water level steady; "spouting" eliminated—all these being signs of a scientifically designed boiler.

Blow-off—Two blow-off openings are provided on bottom of lower drum.

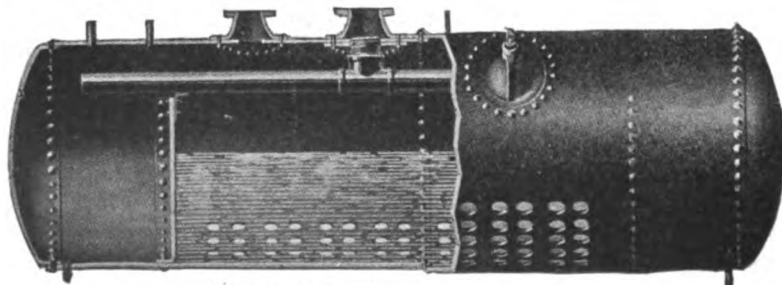
Cleaning—Two access doors located directly under horizontal supporting beams, and a third near floor line at side of setting, for cleaning and inspection purposes, removal of tubes when necessary, etc. A steam blower with pipe is furnished with each boiler.

Feed Inlet—Feed water, entering lower drum, is distributed through a double discharge and taken up through front bank of tubes, then down through tubes in middle and rear bank to lower drum, thence upward again in similar manner.

Dry Steam—Steam disengaging surface in upper drum is very large and steam outlet pipe (located near



ERIE CITY VERTICAL WATER TUBE BOILER



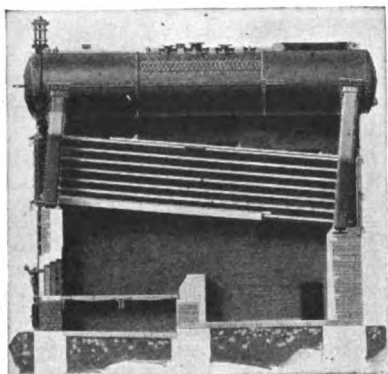
SECTIONAL VIEW OF UPPER DRUM
Showing steam compartments (patented)

top of drum) permits *steam only* to enter the main, in a dry state.

Erie City Horizontal Water Tube Boiler.

The ERIE CITY IRON WORKS has been building this type of boiler for many years, and recently placed on the market a new style horizontal water tube boiler in which is eliminated, as far as possible, the weak points incidental to this particular type of boiler.

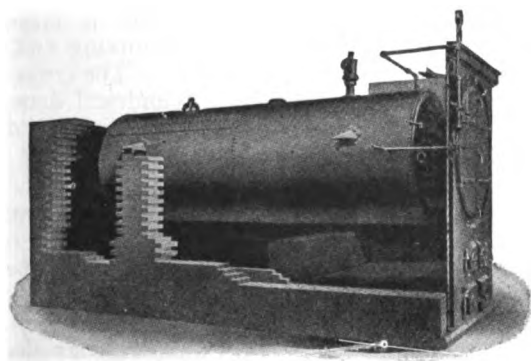
The illustration shows the ERIE CITY IRON WORKS latest design of horizontal water tube boiler. A description of this boiler will be gladly furnished on application.



ERIE CITY HORIZONTAL WATER TUBE BOILER

Erie City Horizontal Tubular Stationary Boiler.

Shell plates and heads made of open hearth homogeneous boiler steel. Shell up to 18 ft. long built in two courses; over 18 ft. long in two or three courses.

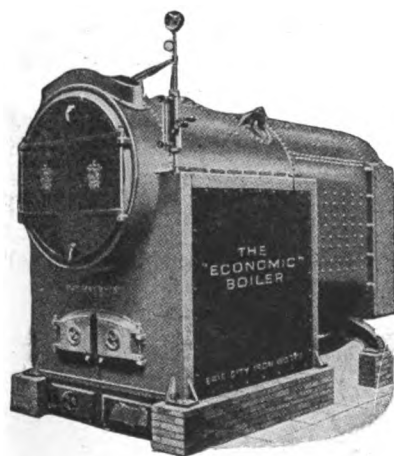


ERIE CITY HORIZONTAL TUBULAR BOILER

Rivets are driven by machinery. No steam dome. Boiler equipped with full arch front; and tested under water pressure 50% above proposed working pressure.

Erie City "Economic" Return Tubular Boiler

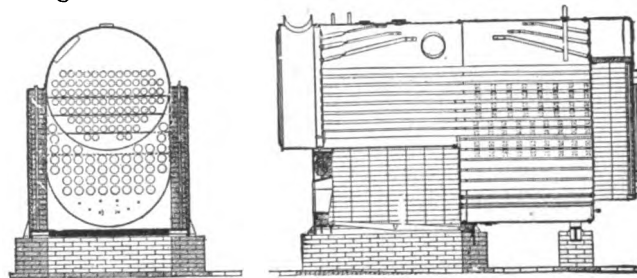
Shell and heads made of open hearth homogeneous steel; tubes and rivets, of mild steel. Boiler is self-contained, occupies small space and is a rapid steamer. No stay-bolted water sides to fill with mud and burn out, or flat crown sheets to be exposed by low water and cause explosions and loss of life.



"ECONOMIC" RETURN TUBULAR BOILER

Regularly built for 100 lbs. working pressure, and for higher pressures on order

Front and sides of furnace are lined with 9 in. of fire brick, with air space on outside wall next to steel casing.

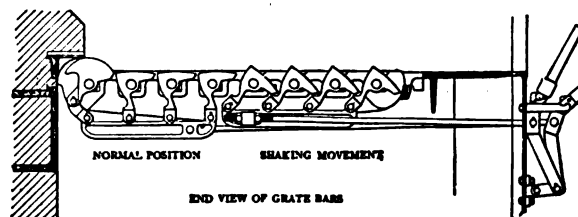
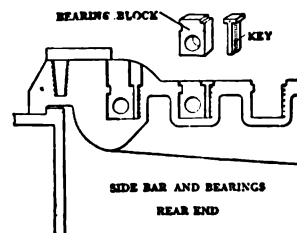


SECTIONAL VIEW OF "ECONOMIC" BOILER
Protected by patents

Erie City Shaking Grates.

Grates properly proportioned for majority of fuels used under steam boilers. Note bearing blocks in side bars and how held in place. Blocks and keys carefully fitted together.

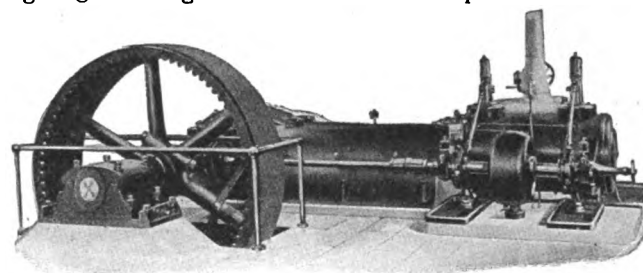
Worn bearing readily replaced, instead of renewing entire horizontal side bar. Individual bars designed to prevent loss of fuel through grates to ash pit while in shaking position. Note normal position and shaking movement.



SECTIONAL VIEWS OF GRATES

Erie City "Lentz" Engines.

Under the American rights secured, this company is now manufacturing the "Lentz" engine—a reciprocating engine designed for the use of superheated steam



"LENTZ" ENGINE

(at high pressures) and proved by experience, since 1899, to be the *most economical* prime mover that can be used.

Now used in almost every line of manufacture.

Special Features—Steam regulation is accomplished by varying a cut-off through a shaft governor and straight-shot eccentric instead of by throttling. Cylinders and beds made simple and compound, condensing or non-condensing, to meet conditions. Valves are of double seated poppet type, and are each actuated by a cam working on a roller running at side of engine. No elastic packing throughout engine, special cast iron rings being used in stuffing boxes, etc.

Full particulars sent on application.

HEINE SAFETY BOILER CO.

Manufacturers of Water Tube Boilers and Superheaters

5330 Marcus Avenue
ST. LOUIS, MO.

BRANCH OFFICES

NEW YORK, 11 Broadway
CHICAGO, First National Bank Building
PHILADELPHIA, Pennsylvania Building

CINCINNATI, Union Trust Building
PITTSBURGH, Park Building
BOSTON, 50 Congress Street

NEW ORLEANS, Godchaux Building
DETROIT, Dime Bank Building
CLEVELAND, Schofield Building

AGENCIES

DENVER, STEARNS-ROGERS MFG. CO.
SAN FRANCISCO, DORWARD ENG. CO.

DALLAS, SMITH & WHITNEY
CHARLOTTE, ALEXANDER & GARSE

HAVANA, CUBA, OSCAR B. CINTAS
YOKOHAMA, JAPAN, TAKATA & CO.

Products.

WATER TUBE BOILERS; SUPERHEATERS.
Also manufacturers of Steel Stacks,
Housings, Flues.

Facilities.

The HEINE SAFETY BOILER CO. has been building boilers since 1882. Due to its vast experience and to the exceptional facilities available in two plants—one at St. Louis, Mo., and the other at Phoenixville, Pa.—the Heine Company is in a position to build steam boiler equipment of the highest efficiency and capacity.

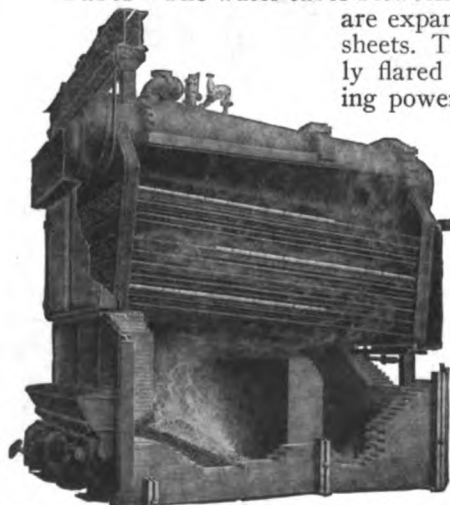
Heine Standard Longitudinal Drum Boiler for Land Service.

This boiler conforms in every particular to the requirements of the A. S. M. E. boiler code. The Heine standard boiler consists of three main parts:

Drum—The drum is a cylindrical shell 30 to 48 in. in diameter and 12 to 18 ft. long. It is closed at the end by a head riveted to the drum. The shell is fitted with reinforcements for manholes, steam outlets and other openings. Within the drum are the mud drum for purifying the feed water and the deflection plate for insuring dry steam at the outlet.

Waterleg—The waterleg is made of two steel plates and is riveted to the drum. The front and back plates of each waterleg are held together by hollow staybolts having holes large enough to permit the insertion of a steam pipe for blowing the soot and dust from the exterior of the tubes. Opposite each tube is a handhole giving access to the interior of the tubes.

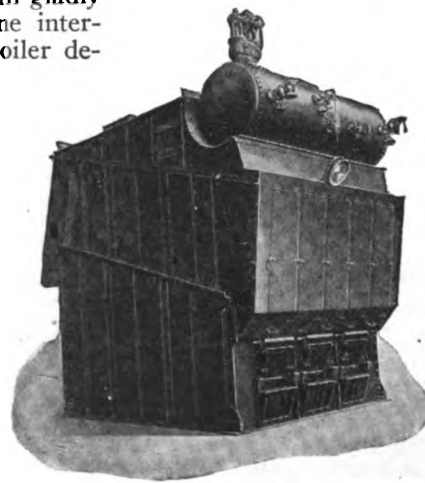
Tubes—The water tubes between the two waterlegs are expanded into the tube sheets. The ends are slightly flared to increase holding power.



HEINE STANDARD LONGITUDINAL DRUM
BOILER



HEINE CROSS DRUM WATER TUBE
BOILER



HEINE MARINE CROSS DRUM WATER
TUBE BOILER



TRADE-MARK

Heine Superheater.

The Heine superheater, if of one section, is located on one side of the boiler drum. If of two sections it is arranged so that one section is placed on each side of the boiler drum. The temperature of the superheat is automatically controlled by a thermostatic device attached to the damper which controls the flow of hot flue gases into the superheater chamber. The desired temperature can be maintained within 5° Fahr.

Heine Cross Drum Boiler for Land Service.

The Heine cross drum boiler for land service embodies the general advantages of the standard longitudinal drum boiler. The combustion chamber is large and affords ample space for the thorough mixing and complete burning of the combustible gases. The cross drum boiler has two simple headers, a cylindrical drum and straight tubes—ideal for obtaining free circulation and high efficiency. The boiler can be packed in the minimum space for shipment.

Heine Marine Cross Drum Water Tube Boilers.

These boilers have the general advantages of the other Heine boilers. For low and medium superheat temperature, Heine marine boilers are fitted with superheaters of the waste heat type placed in the base of the uptake. For higher temperatures superheater elements are built up of tubes passing through the main banks of water tubes just below the middle baffle.

Literature.

Heine longitudinal drum water tube boilers, Heine cross drum water tube boilers, Heine marine cross drum water tube boilers, Heine superheaters, steel stacks, housing, flues, etc., are fully explained in our catalogues, copies of which will gladly be sent to any one interested in modern boiler design or operation.

PAGE BOILER COMPANY

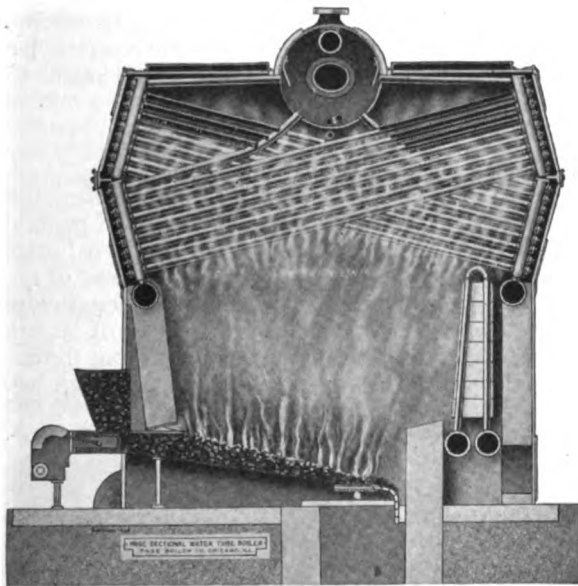
815-819 Larrabee Street
CHICAGO, ILL.

Product.

PAGE TWIN WATER TUBE SECTIONAL BOILER.
(Patents pending.)

General Construction.

The Page boiler consists virtually of two boilers in one. Half of the sections are arranged diagonally across the boiler in one direction and the other half in the opposite direction. Thus the heat passages are split up horizontally and vertically, causing more frequent contact of gases from tube to tube. There are no "baffles" in the ordinary sense, the tubes themselves taking the place of the baffles of ordinary boiler types. The Page accomplishes as much in its one and only pass as other types accomplish through the use of extensive baffling and three passes. Gases extend under entire heating surface. Proportion of grate surface to heating surface is liberal. Rated horsepower is easily developed with 13 lbs. of good coal per square foot of grate per hour.



SIDE ELEVATION OF PAGE BOILER, STOKER FIRED

Compactness.

Compactness is due to the cross tube system and to the elimination of brick walls. Since the Page is in effect two boilers in one, capacity in horsepower per cubic foot of space is practically twice as great as that of any other boiler.

Enclosure.

Entirely enclosed in an airtight steel casing which is insulated with 4 in. of non-conducting asbestos and lined with fire brick. This wall so effectively insulates the furnace that the hand may be put on any part of the casing without discomfort.

SWEET'S CATALOGUE

Accessibility.

Design and construction provide every convenience for inspection, cleaning, and repair.

Efficiency.

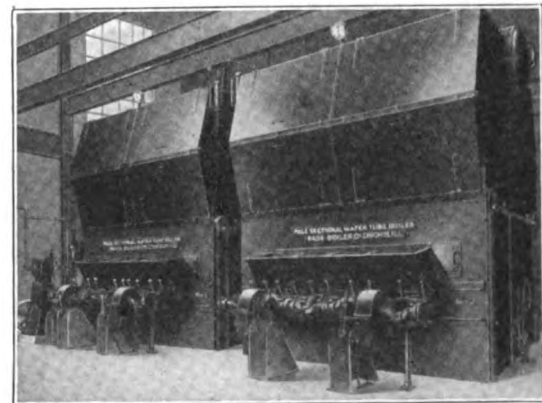
The efficiency of the Page boiler frequently runs from 72% to 75%. This high efficiency is due to the 2-in-1 boiler construction, the airtight enclosure, and the built-in oscillating soot blower which will blow the section in one minute and which does away altogether with soot accumulation. This soot blower is regular equipment of all Page boilers.

Sediment Removal.

All sediment can be quickly blown from the boiler. Removal of header plates is not necessary. A Page can be blown down, cooled off, and washed out in half the time required for boilers having brick settings.

Expansion.

Each section is free to expand independently of other sections. Each section has a separate water feed from upper drum and contains a separate intake to steam drum. These separate water feeds produce a most efficient and strong steaming boiler. A positive circulation assures that all pressure parts will be at the same temperatures at all times, preventing strains which result from unequal temperatures in many types of boilers.



TWO OF FOUR, 500-H.P. PAGE BOILERS INSTALLED AT
CHICAGO WASTE DISPOSAL POWER PLANT

Utilization of Waste Heat.

Page boilers, in service as waste heat boilers, have shown evaporations of 15% to 20% more than other types.

Marine Boilers.

Due to its light weight per horsepower and its compact construction the Page boiler has been used very successfully in marine service.

The new Page catalogue describes the boiler in greater detail and gives views of some of the many prominent installations.

INTERNATIONAL ENGINEERING WORKS, INC.

Boilers, Grates, and Steel Plate Construction

GENERAL OFFICES AND WORKS
FRAMINGHAM, MASS.

BRANCH OFFICES

BOSTON, MASS.

PHILADELPHIA, PA.

NEW YORK, N. Y.

SAN FRANCISCO, CAL.

Products.

SCOTCH BOILERS; WATER TUBE BOILERS; TUBULAR BOILERS; SHAKING GRATES; BOILER DOOR PROTECTORS; STEEL PLATE CONSTRUCTION.

Engineering Services.

The engineering department of this organization offers its services to those having boiler, grate and steel plate construction problems to solve.

The experts in this department have at their disposal the knowledge and accumulation of valuable data of many years of successful boiler, grate and steel plate construction, and co-operation with these experts insures the most efficient and the most economical solution for any particular requirement, without obligation.

Designs, recommendations and estimates will be submitted promptly on receipt of the necessary information regarding conditions.

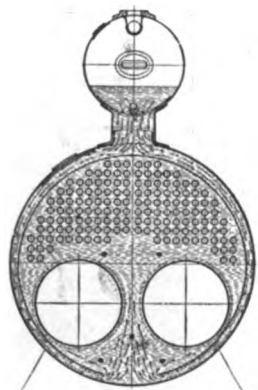
Brady Scotch Boilers.

Of the many types of boilers which have been used in marine service, none has attained the degree of all around efficiency shown by a well designed standard Scotch marine boiler.

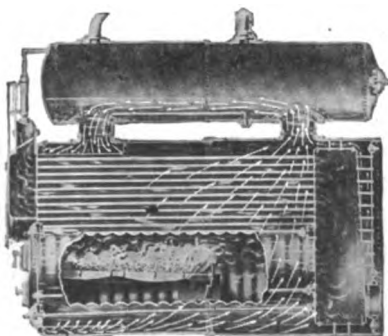
For stationary practice, the Scotch boiler is equally satisfactory. Its extremely small radiation loss due to the internal furnaces, its strength, economy, ability to stand hard service and the absence of troublesome brick setting appeal strongly to many engineers.

General Design—The Brady Scotch boiler combines the advantages of internal firing and self-contained construction, while overcoming all possible objections by providing positive, rapid circulation without a special pump or other device.

In the Brady Scotch boiler, positive rapid circulation is obtained by placing just below the front neck an annular ring or plate extending around the inside of the shell, with an opening in the bottom (see illustrations). This circulation overcomes the great difficulty in Scotch marine and dry back boilers, which ordinarily are not quick steamers because water remains cold at the bottom.



FRONT ELEVATION,
BRADY SCOTCH BOILER



BRADY SCOTCH BOILER

Unequal expansion is impossible in the Brady Scotch boiler, because the water circulates from the bottom of the shell along a definite path.

Internal Furnaces—No brickwork is necessary with the Brady Scotch boiler, as furnaces are internally fired. Radiation losses are practically eliminated and there is the highest efficiency of transmission of heat to water.

The efficiency of transmission with the internally fired boiler is higher than with the brick furnace, because the furnace of the former and all products of combustion are entirely surrounded by water heating surfaces, and the efficiency of combustion is not reduced by air leakage.

Cost of installation is also reduced with the Brady Scotch boiler, as there is no brickwork. The boiler is self-contained and ready for use as soon as piping and smoke flue connections are made.

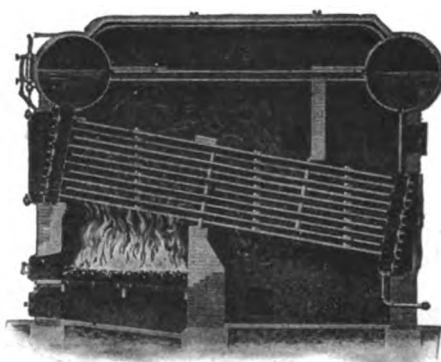
Compliance with Official Requirements—Brady Scotch boilers are built in compliance with the requirements of the A.S.M.E. Code, the Massachusetts Board of Boiler Rules, the laws of other states, British Board of Trade, Lloyds Registry and the various Canadian provinces.

Water Tube Boiler.

The design of this water tube boiler is the outcome of careful study of the principles of steam generation. A distinctive feature is the location of two horizontal cross drums and headers at the front and rear of a brick setting, with connecting tubes extending lengthwise.

The drums are connected by a series of superheating tubes that carry the steam from the front to the rear drum where it leaves the boiler. This design assures dry steam.

There are no dead ends or contracted passages to prevent the free circulation of the water. It is a boiler with a positive circulation, all areas of passages being designed to suit the flow of the column of water.



WATER-TUBE BOILER

Vertical Tubular Boilers.

Manning Type—Perfectly adapted to all requirements of the highest pressures and the largest units, because no plate subject to tensile strain comes in contact with the fire.

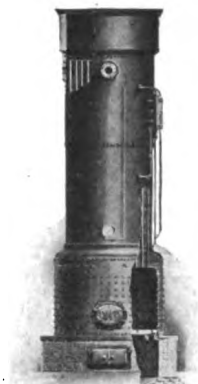
It is the best boiler for turbines on account of its ability to furnish steam superheated 25° to 50°. Amount

of superheat may be increased by lowering the water line or by using longer tubes.

It is well suited for any locality regardless of water conditions when made with the multiple plan of cleaning handholes, which give access to every part of the crown sheet. Additional facilities are provided for cleaning and inspection.

The economical evaporative performance is remarkable. All radiant heat from fuel bed is absorbed directly by water heating surface, distribution of furnace gases over heating surface is practically uniform, there are no losses due to the infiltration of air in the setting and stand-by losses are comparatively small, occupying less ground space per horsepower than other types.

Other Types—Straight shell and tapered course types of vertical tubular boilers are also built. Detailed information on request.



MANNING VERTICAL TUBULAR BOILER

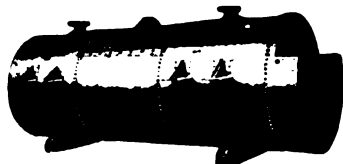
Horizontal Return Tubular Boilers.

Constructed in a most approved manner in full accordance with the rigid requirements of the A.S.M.E. code and the Massachusetts Board of Boiler Rules, the highest standard of efficiency being maintained.

Standard settings can be provided with stationary or shaking grates and where increased efficiency and compactness are desired, standard steel casings can be provided for these settings.

Designed with liberal proportions of heating surface, steam space and grate area. They are safe, most economical in fuel consumption, simple in design, cost less per horsepower than other types, require less repairs, and, when necessary, repairs are more easily made and less expensive.

Made in units up to 350 h.p.



HORIZONTAL RETURN TUBULAR BOILER

Special Boilers.

Special boilers of any size will be built for all conditions of service.

The engineering department offers its services for the most satisfactory solution of all boiler problems.

Macdonald Shaking Grates.

These grates perform all the proper functions of a shaking grate. Following are several of the reasons why they are the best shaking grates on the market:

They have unrestricted air passages and foolproof locking device. Fuel can not be wasted by shaking. Powerful leverage provided for shaking and breaking up small clinkers.

They may be repaired or renewed at small expense by replacing top sections only.



MACDONALD SHAKING GRATE
View with side supporting bar removed and operating lever thrown down

Detachable top sections may be changed to give any desired air opening or spacing of grate.

Proper distribution of metal gives the greatest strength possible in proportion to the weight of the material.

When shaken, the maximum irregularity or depth of vibration is given without opening a wide space between sections. A flat grate locked in position so that the surface can not be left uneven or with points projecting into the fire.

Gives more perfect combustion, saves fuel and increases the capacity of the boiler.

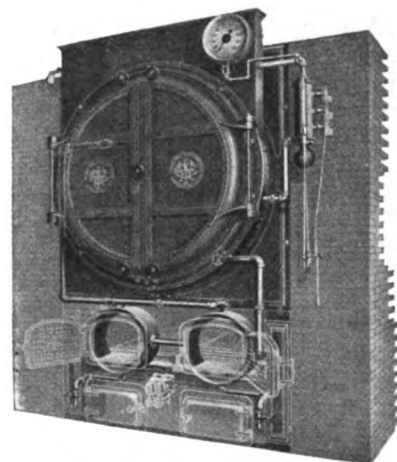
Further information on request.

Smith Boiler Door Protectors.

Smith door protectors are designed to eliminate the frequent repairs to the arches, side walls, dead plate and door linings of horizontal tubular and water tube boiler settings.

The water circulation carrying water from the boiler to the protector and back to the boiler insures a lower temperature around the door openings.

The protectors are made of firebox steel the same as that used in the boiler, and provided with a sediment chamber below the grate line, drained by blow-offs, which insures a life equal to that of the boiler as scale will not form under the most severe conditions. The protectors eliminate entirely the use of arches, cheeks and the standard dead plate.



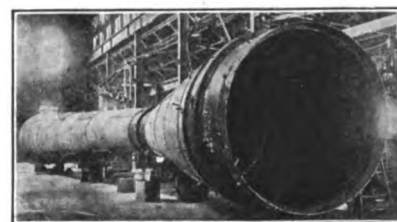
SMITH BOILER DOOR PROTECTORS

Steel Plate Construction.

Steel plate construction of every description for all industries, fabricated from this company's own designs or in accordance with purchaser's specifications.

The company's plant is the most efficient and best equipped steel plate construction plant in the East, and has exceptional shipping facilities.

The engineering department's services (see preceding page) are at the disposal of those having steel plate construction problems to solve.



VENTURI TUBE



RENDERING TANK



JACKETED MIXING TANK

ESTABLISHED 1864

E. KEELER COMPANY

Manufacturers of Water Tube and Return Tubular Boilers

WILLIAMSPORT, PA.

NEW YORK, N. Y.
PHILADELPHIA, PA.
BUFFALO, N. Y.BRANCH OFFICES
PITTSBURGH, PA.
BOSTON, MASS.
CHICAGO, ILL.NEW ORLEANS, LA.
PORTLAND, ORE.
RICHMOND, VA.**Products.**WATER TUBE BOILERS; RETURN TUBULAR BOILERS.
Built to A. S. M. E. Rules.**Standard Keeler Water Tube Boiler.**

The arrangement of furnace, tubes, headers and drums is correct, accessible and compact. The superior efficiency of the Keeler boiler rests upon correct proportions of heating and grate surface for the character of fuel to be burned, ample height of furnace, superior arrangement of baffle walls and perfect circulation.

Every portion of the heating surface is accessible for both external and internal inspection, making it impossible for soot or scale to accumulate undetected.

Wrought steel is used for every part of the boiler under pressure. This is the first requirement of reliability.

All tubes are straight. Boilers with bent tubes are accepted only as a compromise. Bent tubes are harder to keep clean and the interior can not be inspected. In the standard type all tubes are 4 in. in diameter and 16 or 18 ft. long. This is a standard carried in stock by dealers everywhere. A 4-in. tube is stiffer than a 3½-in. tube in the ratio of 1.52 or 1.04 (their section moduli); 3½-in. tubes sag and leak at the headers, 4-in. tubes do not.

The Keeler boiler is provided with vertical baffles. These support the tubes instead of being a dead weight. Vertical baffles insure a more perfect distribution of gases, need no repairs and do not collect soot.

The wrapper sheet in the header is flanged, and the header sheet straight. A wrapper, being small, can be flanged at one operation; while to flange a header it is necessary to heat it several times. This has a tendency to crystallize the metal and cause internal strains.

The Keeler boiler has its steam outlet at the center of a horizontal drum. This is out of the way of the violent agitation at the front header and insures dry steam.

The distance between the center line of tubes and underside of drum in Keeler boilers is 10¾ in. in front and 26½ in. to 28½ in. in rear. This large space between the drum and tubes gives ample room for expansion and contraction, without throwing strains on the throat connection. It also affords space for superheaters and facility for inspection of all parts of the drum.

Keeler boiler has a substantial and workmanlike flush front. This means there is no projection for

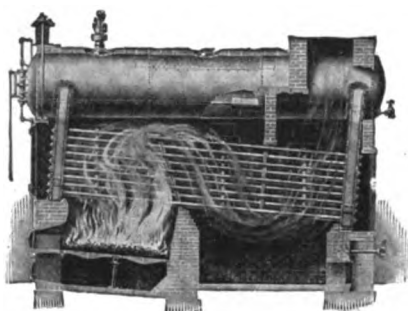
the fireman to come in contact with in coaling the boiler or cleaning the tubes.

The method of supporting the boiler meets the requirements of the most exacting specifications.

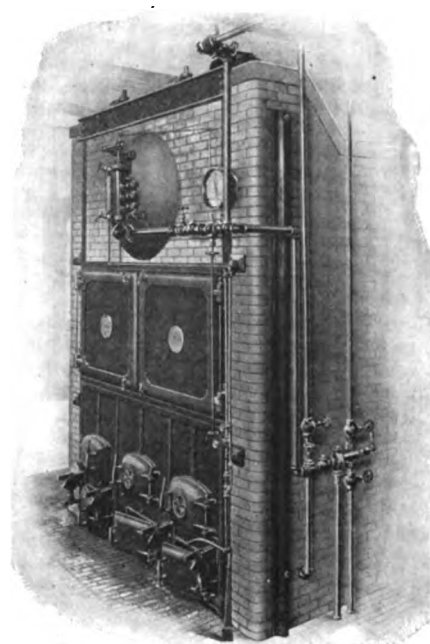
In the Keeler boiler the blow-off is in the bottom wrapper sheet of the rear header. The design is such that there are no obstructions of any kind; the dirt and sediment are drawn from boiler by gravity.

The rear header of the Keeler boiler is covered with a steel casing, supported by structural steel frame. This keeps the cold air away from the header.

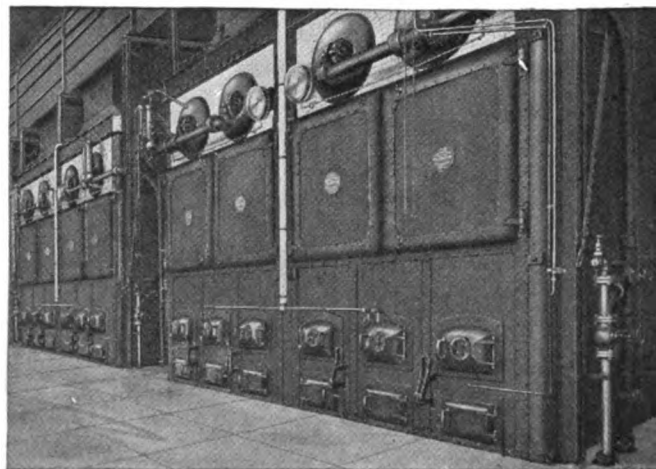
Unless otherwise specified, solid staybolts are used, with test holes drilled in each end. Where hollow staybolts are used a certain amount of cold air is admitted into the boiler setting. Hollow staybolts must be plugged. These plugs are seldom kept in place and have to be frequently replaced, which is an expense.



STANDARD WATER TUBE BOILER
Built in units from 75 to 1,000 h.p.



WATER TUBE BOILER, UNITED STATES
BUREAU OF STANDARDS, WASHINGTON, D. C.



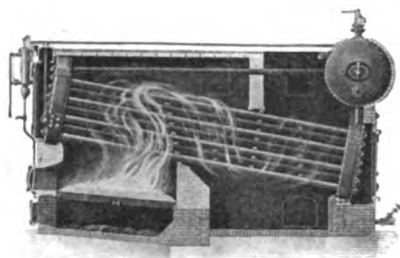
TWELVE 410 H. P. KEELER WATER TUBE BOILERS, ISTHMUS
OF PANAMA
Built for the United States Government

The Keeler boiler is cleaned from the side of the setting with a steam blower, through a small opening over each row of tubes.

Keeler Cross Drum Boiler.

The Keeler cross drum boiler is a modification of the standard design only in the length and location of the drum and the method of connecting it to the headers.

This type was designed to meet the demand for a high pressure water tube boiler that could be installed in office buildings, school-houses, churches, apartment houses, hotels, and in boiler rooms generally where ceiling height is limited, or where boilers must be introduced through narrow passageways or restricted openings. This type is in use in many of the new public schools in Philadelphia, in the Sheffield Scientific School, New Haven, Conn., and is used by the United States Government. This boiler is shipped knocked down, and will appeal especially to architects and heating and ventilating engineers as a logical water tube boiler for their requirements.



CROSS DRUM BOILER
Built in units from 60 to 600 h. p. Especially adapted for schools, etc., where there is lack of headroom

Ask for new Water Tube Catalogue.

TESTS OF KEELER WATER TUBE BOILERS

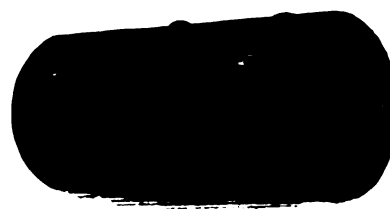
Location	Gatun Plant, Gatun Locks, C. Z.	United States Bureau of Standards, Washington, D. C.	Davis Coal & Coke Co., Thomas, W. Va.	Bureau of Engraving & Printing, Washington, D. C.
Engineer.....	Testing Dept. Mechan. Div.	S. Franklin Gardner	Mechanical Eng'ner of Co.	G. E. Reed & McRae Parker
Kind of fuel.....	Pocahontas coal run of mine	Anthracite, No. 1 buckwheat	Semi-Bituminous	Bituminous
Kind of furnace.....	Hand fired Ajax shaking grates	Hand fired Ajax shaking grates	Jones stoker	Crowe stoker
Grate surface, sq. ft. . . .	68.5	63	80	80
Heating surface, sq. ft. . .	4089	2526	5040	5018
Duration of trial, hrs. . .	10	18	8	18
Wt. coal as fired, lbs. . . .	16,811	19,380	13,125	47,250
Per cent of moisture in coal.	4.17	6.6	5.8	6.1
Wt., dry coal, lbs.	16,110	18,101	13,059	44,368
Wt., ash and refuse, lbs. . .	283.5	4904	3018	2434
Percentage ash in dry coal.	1.76	27.00		
Total water, lbs.	163,744	130,772	123,891	432,750
Water evaporated, corrected for moisture, lbs.	superheated	130,249	122,652	428,721
Factor evaporation.	1.1378	1.2168	1.0611	1.1867
Equivalent evaporation from and at 212° F., lbs.	186,308	158,487	130,146	509,950
Dry coal per sq. ft.	23.52	15.96	20.39	32.8
Equivalent evaporation per sq. ft. of heating surface per hour, lbs. . .	4.55	3.48	3.22	5.65
Grate surface, lbs.	193.24	121.05	147.4	123.16
Temperature of feed water, deg. F.	189.5	42.8	197	72.29
Temperature of escaping steam, deg. F. . . .	488.62	461.57	481	528
Drop in pressure, in. . . .	.836	.878	.79	.908
Per cent of moisture in steam entering superheater.	1.336	.004	1	.865
Per cent of superheat at 212° F.	106.81	0	0	0
Per cent of superheat at 212° F.	540	255	472	822
Per cent of superheat at 212° F.	410	253	500	500
Percentage of rated capacity developed.	131	100.7	94.4	164
Equivalent evaporation from and at 212° F., per lb. dry coal. . .	11.56	8.755	9.34	11.58
Equivalent evaporation from and at 212° F., per lb. combustible.	11.77	12.01	12.20	12.29

SWEET'S CATALOGUE

Keeler Tubular Boiler.

The Keeler tubular boiler embodies all this organization has learned of boiler building in 56 years. Every boiler which leaves the shop is regarded as a pledge of good faith.

The Keeler full flush front is of heavy, substantial design. All doors have a deep flange or roll. This feature prevents warping or cracking of edges and gives the front a rich and handsome appearance. Fire doors are of an extra heavy deep pattern, with a liberal space between the door and the perforated liner which preserves both castings. Fire doors close against inclined seats, so that they never stand away from the front. There is provision for expansion above the fire doors, which absolutely prevents cracks in the front at the corners of the openings under all ordinary conditions of service. All doors and seats are carefully fitted to a close bearing, and all fronts are assembled complete before shipment. The top of the front is finished with a handsome cornice.



RETURN TUBULAR BOILER
Built in units from 40 to 300 h. p.

The chief difference in the same type of boiler is the time and attention given to details. That is why one boiler costs more than another, where specifications are practically the same. If a cheaply constructed tubular boiler is bought it may have to be removed in a short time. Do not run the risk of having to charge off as a total loss the money spent for freight, hauling, labor, brick setting and erecting the stack. A cheap, carelessly constructed boiler entails the same expense for freight, installation and other requirements as the most reliable boiler that can be built.

Material and Workmanship.

All Keeler boilers are guaranteed to pass the inspection of any established boiler insurance and inspection company for the pressure specified.

References.

Fifty-six years of boiler building without a shut-down or an explosion is the reputation gained by this company. Following is a partial list of users of Keeler boilers :

NAME	LOCATION	NUMBER
Bureau of Engraving & Printing	Washington, D. C.	2-500 h.p.
Cook County Hospital	Chicago, Ill.	4-500 h.p.
Citizens Gas & Electric Company	Waterloo, Iowa	5-600 h.p.
Watertown Arsenal	Watertown, Mass.	8-150 h.p.
New York Shipbuilding Co.	Camden, N. J.	12-400 h.p.
Clifton Springs Distillery Co.	Cincinnati, Ohio	3-600 h.p.
P. Ballantine & Sons	Newark, N. J.	4-500 h.p.
Luzerne County Gas & Electric Co.	Plymouth, Pa.	9-500 h.p.
United States Government	Old Hickory, Tenn.	5-500 h.p.
Penn Public Service Co.	Johnstown, Pa.	8-500 h.p.
City of Fort Worth, Texas		3-500 h.p.
Keystone Steel & Wire Co.	Peoria, Ill.	3-500 h.p.
Quidnick-Windham Mfg. Co.	Quidnick, R. I.	2-300 h.p.
RETURN TUBULAR INSTALLATIONS		
Philadelphia & Reading Coal & Iron Co.	Shamokin, Pa.	10-150 h.p.
Bordens Condensed Milk Co.	New York, N. Y.	28-150 h.p.
Helvetia Milk Condensing Co.	Highland, Ill.	12-150 h.p.
Atlantic Pulp & Paper Co.	Port Wentworth, Ga.	4-250 h.p.
Great Southern Lumber Co.	Bogalusa, La.	24-175 h.p.
American Cotton Duck Co.	Baltimore, Md.	7-150 h.p.
Poole Engineering Co.	Baltimore, Md.	4-200 h.p.
Deemer Mfg. Co.	Philadelphia, Miss.	6-175 h.p.
E. Pritchard	Bridgeton, N. J.	6-150 h.p.
Newark Box Board Co.	Newark, N. J.	4-200 h.p.

SAMUEL SMITH & SON COMPANY

Boilers and Steel Plate Construction

TELEPHONE:
PATERSON 4200

PATERSON, N. J.

CABLE:
"SAMSMITH"

Products.

BOILERS: Horizontal Tubular, Locomotive and Vertical; STEEL PLATE CONSTRUCTION.

General.

For over 75 years, products of our shops have been giving satisfaction to an increasing number of users. Our success is due to no tricks, patents (although we hold them), or anything of the sort. It is due solely to the fact that we do work thoroughly well.

Horizontal Tubular Boilers.

Boilers are built to the A. S. M. E and State Codes, and are easily adapted to the use of any fuel, including bagasse.

Vertical Boilers.

Though not so generally used as the horizontal tubular type, there are conditions which often make the vertical boiler preferable. The Smith vertical boiler may be described as a Super-Manning. The illustration on the opposite page shows how accessible this boiler is for cleaning and inspection. This feature of accessibility eliminates the one big disadvantage from which

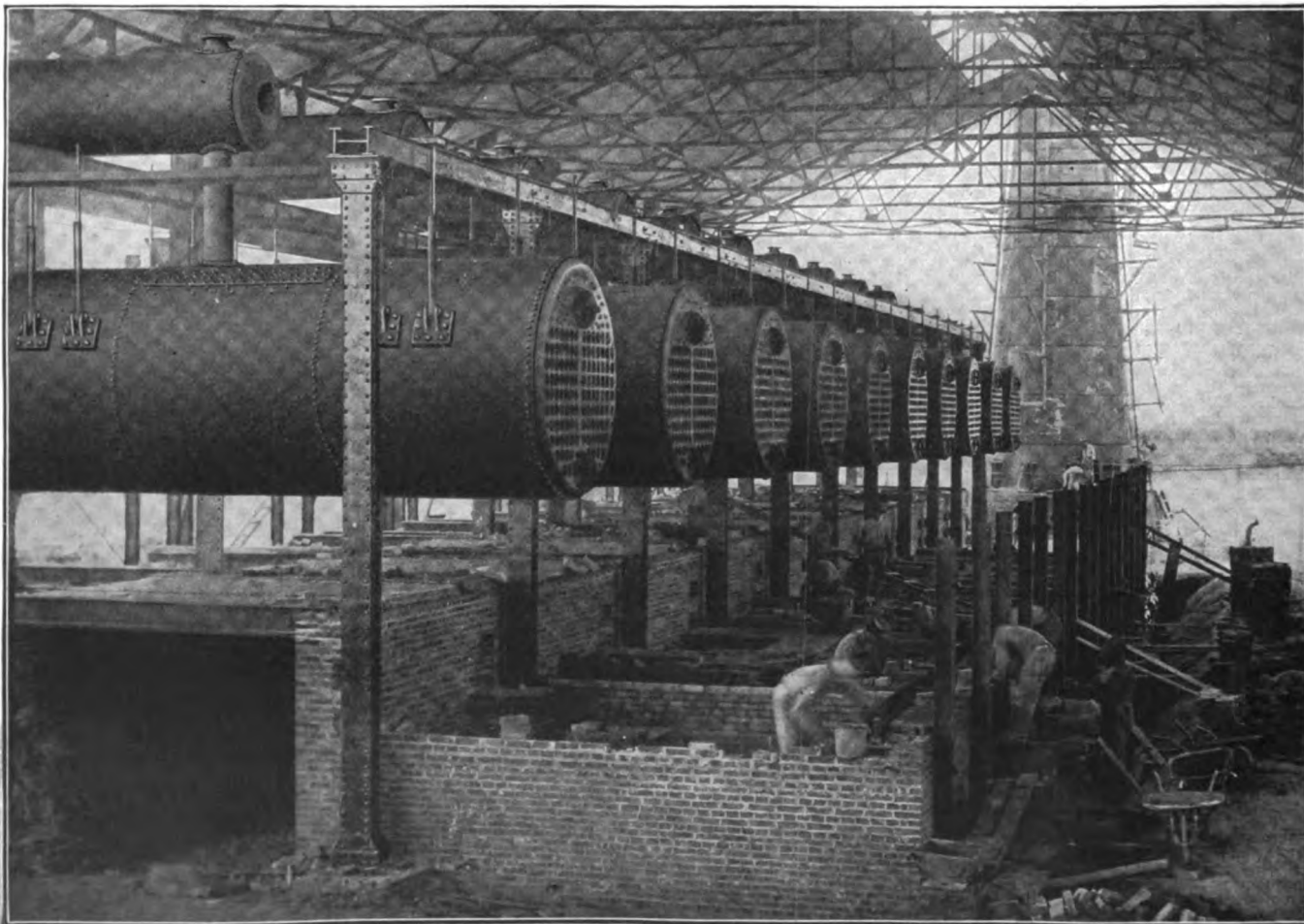
vertical boilers have suffered. The conical firebox permits large grate area, with stronger yet lighter superstructure of boiler. Distribution of air is equalized by having from 4 to 8 large sliding doors. Actual tests show from 50° to 100° superheat. The boilers are made in units from 100 to 500 h.p.; and for pressures from 125 to 200 lbs.

Steel Plate Construction.

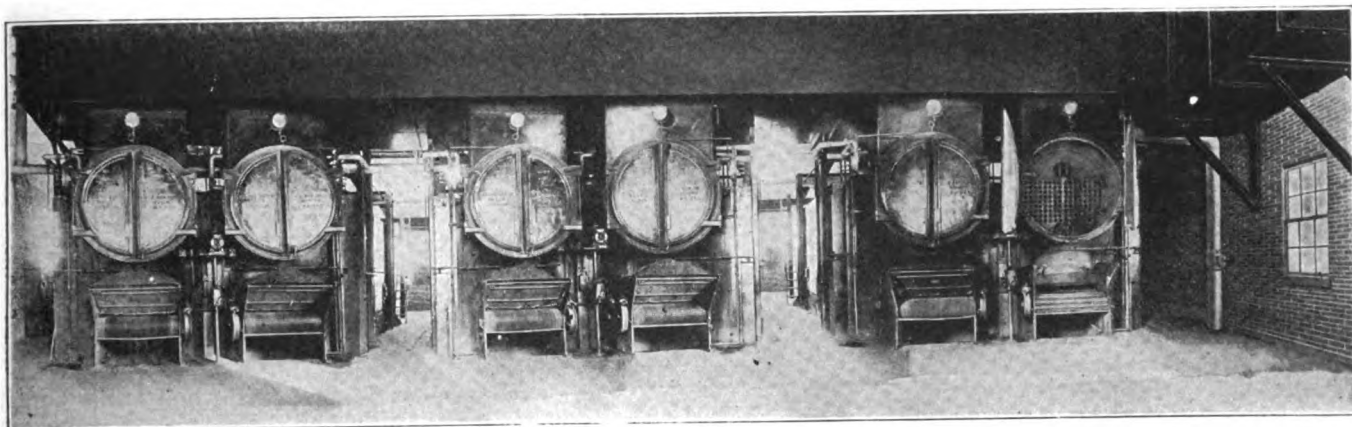
This organization is equipped to handle steel plate construction in all its forms. Steam boxes of all descriptions, vulcanizers, kiers, tanks, stacks, digesters, riveted pipe, are made as part of the regular line or to specifications. The shop is well equipped to handle this class of work rapidly and economically. Its location is most favorable, being within 15 miles of the world's greatest port (New York City) and lying between the yards of the Erie and the Delaware, Lackawanna & Western Railroads, with switching service from the former.

Consultation.

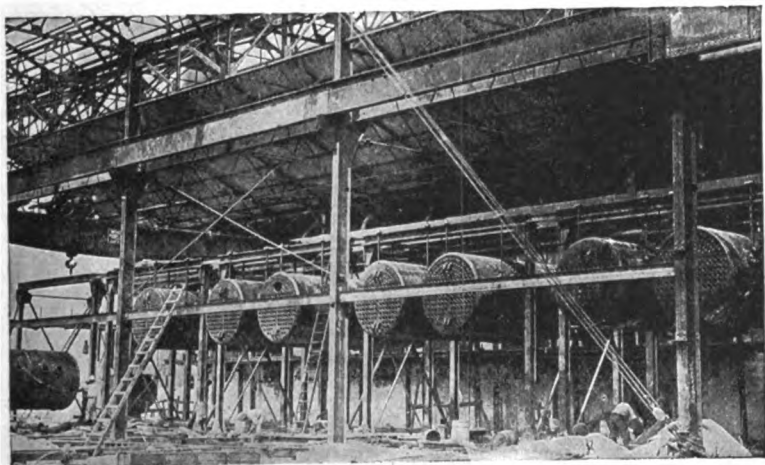
The Engineering Department is always at the service of patrons to give advice and assistance. Correspondence is solicited.



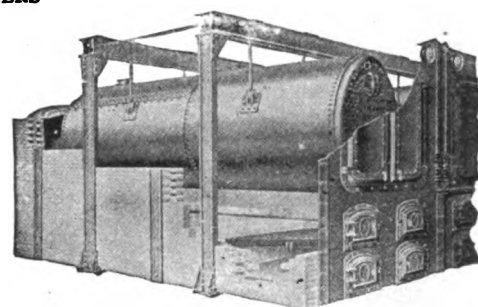
ONE-QUARTER OF LATE INSTALLATION OF SMITH BOILERS, ARRANGED FOR BURNING BAGASSE



TYPICAL INSTALLATION OF SMITH BOILERS



INSTALLATION OF SMITH BOILERS IN CUBA

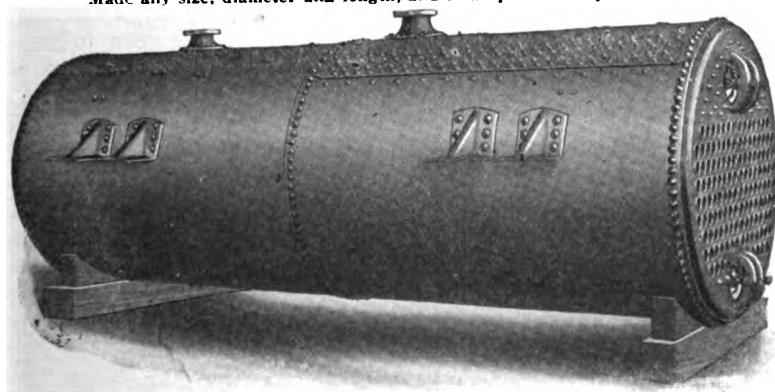


HORIZONTAL BOILER IN SUSPENSION SETTING



VULCANIZER

Made any size, diameter and length, and in all pressures up to 250 lbs.



STANDARD HORIZONTAL TUBULAR BOILER



VERTICAL BOILER, 100 TO 500 H. P.
Up to 200 lbs. working pressure

UNION IRON WORKS

Manufacturers of Steam Boilers and Steel Plate Construction

ERIE, PA.

BRANCH OFFICES AND AGENCIES

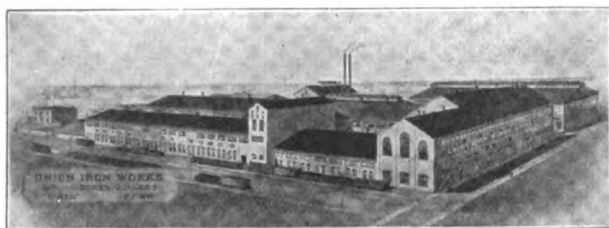
BOSTON, STARKWEATHER & BROADHURST, 53 State Street
 NEW YORK, EDWIN H. LUDEMAN, 165 Broadway
 SYRACUSE, CHAS. F. WAYTE, 918 University Building
 INDIANAPOLIS, DRAVO-DOYLE Co., Merchants Bank Building
 PHILADELPHIA, DRAVO-DOYLE Co., Commercial Trust Building
 ST. LOUIS, LOUIS F. MAHLER, Syndicate Trust Building

SCRANTON, SCRANTON SUPPLY & MACHINERY Co.
 PITTSBURGH, DRAVO-DOYLE Co., Diamond Bank Building
 CLEVELAND, 550 Rockefeller Building
 TOLEDO-DETROIT, W. HAWLEY & Co., 950 Nicholas Building, Toledo, Ohio
 CHICAGO, 330 Old Colony Building
 SAN FRANCISCO, PAUL COOP, Hobart Building

Products.

UNION WATER TUBE BOILERS; UNION HORIZONTAL RETURN TUBULAR BOILERS.

Also, all types of Fire Tube Boilers, Vertical, Internally Fired, Scotch, and Locomotive, as well as Portable Boilers, Stacks, Tanks, Breechings, etc.



PLANT OF THE UNION IRON WORKS

Water Tube Boilers.

Over thirty years' experience in high pressure steam boiler building has produced the Union water tube boiler. There are more distinctive features in its design which make for continued efficiency, high overload capacity, safety, and minimum cost of operation and maintenance than any other water tube boiler. Among these advantages may be mentioned the following:

The patented corrugated flange connection from drums to headers eliminates distortion of tubes and leaky headers. There are no restricted areas, thus free circulation is assured, and internal strains are relieved in the boilers.

The patented purifier in the drums takes out practically all of the impurities in the feed water before it comes in contact with the heating surfaces. Settling chamber is out of range of the fire and path of circulating steam making element. Fitted with separate reinforced blow-off connection.

The horizontal drums provide ample steam and water space and steam liberating surface. Large area of connection from drums to header allows unrestricted circulation. This insures dry steam and large water storage capacity, permitting high overload.

The shape of the handhole permits each steel plate to be withdrawn through the hole it covers. No ground joints are used, and plates are easily kept tight. The yoke is of novel design, readily and quickly removed.

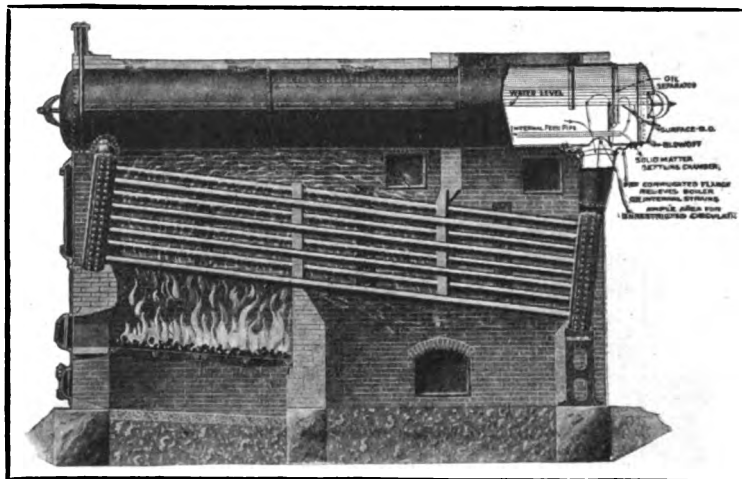
The tube spacing and purifier permit keeping the boiler clean while in operation. These features reduce the labor for cleaning, and the time lost while boiler is out of service. There is both higher operating efficiency and greater overload capacity than in any other boiler on the market.

The headers are made in integral halves in one heat and operation. The water space is of unusual depth and the headers have at no point two thicknesses of plate or rivets in the fire.

We have never had a broken staybolt in the Union water tube boiler. The water contents of these boilers is exceptionally large and practically the same as for return tubular boilers of the same horsepower rating. Regular pitch of staybolts, and additional blow-off at bottom of the headers.

The greater inclination of the tubes promotes more rapid circulation. They are vertically staggered to expose the maximum area to the heat. The horizontal spacing in rows is to permit inspection and proper cleaning of the fire side of the boiler. It also furnishes ample room for the passage of gases. All tubes are straight, of the same length and standard diameter.

The standard vertical baffles permit the installation of any regular superheater, as well as mechanical soot blowers. Horizontal baffles, however, may be fitted, as tube spacing is arranged for them. Products of com-



UNION WATER TUBE BOILER

bustion pass through ample spaces between tubes and baffles, making at least three passes and then are discharged through the uptake areas of large capacity.

The workmanship is guaranteed to be the very best that can be done by a well trained organization, with modern facilities.

All boilers are inspected and put to hydrostatic and steam tests, and passed only when found to be absolutely tight under the highest allowable working pressures, in compliance with boiler laws and insurance company requirements.

Horizontal Return Tubular Boilers.

The Union horizontal return tubular boilers are of standard designs and have the highest reputation for quality of material and workmanship. This line is complete in various types and sizes. A large stock is usually kept on hand for prompt shipment.

HENRY VOGT MACHINE COMPANY

INCORPORATED

Manufacturers of Water Tube and Horizontal Return Tubular Boilers; Oil Refinery Equipment

LOUISVILLE, KY.

NEW YORK, N. Y.

BRANCH OFFICES
CHICAGO, ILL.

TULSA, OKLA.

Products.

WATER TUBE and HORIZONTAL RETURN TUBULAR BOILERS.

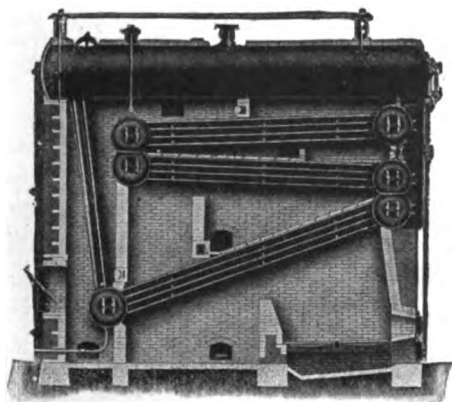
OIL REFINERY EQUIPMENT, including PARAFFIN WAX PRESSES, WAX DISTILLATE CHILLING MACHINES; PRESSURE STILLs; SPECIAL WAX PLANT EQUIPMENT.

Also Filter Presses, Agitators, Condenser Boxes and Welded Vessels; Sectional Steel Boiler Casings, Sectional Shaking and Dumping Grates, and Steel Stacks and Tanks.

For Refrigerating Machinery and Drop Forged Steel Valves and Fittings, see page 543.

Vogt Water Tube Boiler.

The Vogt water tube boiler is constructed in units varying from 250 to 1000 h.p., and complies in every respect with the boiler code of the American Society of Mechanical Engineers.



VOGT WATER TUBE BOILER

Advantages—The success of the Vogt water tube boiler is built on the following service rendering features:

High efficiency, resulting from design of boiler, arrangement of furnace, counter current circulation between water in tubes and flow of the gases.

Extremely large steam storage space for fluctuating load.

Low maintenance cost, due to absence of all curved tubes and numerous handholes, and freedom of boiler for expansion and contraction.

Easy accessibility for cleaning and inspection.

Ability to "pick up" from dead load to peak load in shortest possible time.

Manufactured by the most advanced boiler shop practice from the highest grade material.

Vogt Horizontal Return Tubular Boiler.

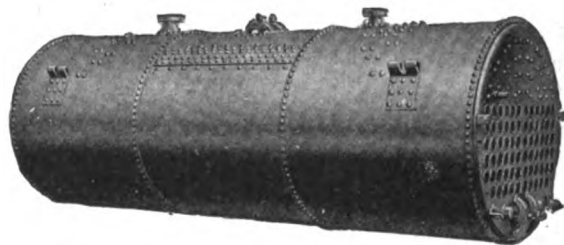
Vogt horizontal return tubular boilers are constructed for 125 and 150 lbs. working pressure, and

Vogt

TRADE-MARK

range in capacity from 45 to 250 h.p. The construction complies with the boiler code of the American Society of Mechanical Engineers.

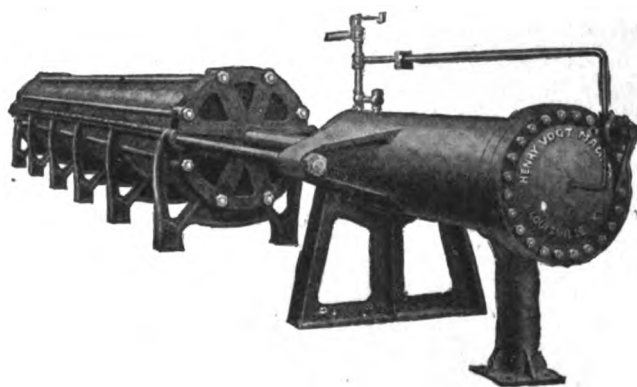
Economy of fuel and high efficiency of the boiler is assured by the large combustion chamber and by ample space between the grates and the bottom of the boiler. Material and workmanship are of the highest quality.



VOGT HORIZONTAL RETURN TUBULAR BOILER

Vogt Oil Refinery Equipment.

Vogt Paraffin Wax Press—Designed for both efficient and economical service in the work of separating the wax from the wax distillate. It is adapted to filter under pressures of 300 to 500 lbs. The plates are made in either the loose ring or the riveted ring type. The press is heavily constructed and the weight evenly distributed. All castings are made of semisteel.



VOGT PARAFFIN WAX PRESS

Vogt Distillate Chilling Machine—The many installations have proved the excellent working features of this machine. It operates with a minimum amount of power. The distillate pipes (inner pipes) are of wrought iron made in one length. All castings are made of semisteel.

Vogt Tube Pressure Still—Comply completely with the specifications for pressure vessels of the American Society of Mechanical Engineers. Special equipment made to order.

THE WALSH & WEIDNER BOILER CO.

CHATTANOOGA, TENN.

Products.

STEEL BOILER CASINGS; HORIZONTAL RETURN TUBULAR BOILERS; HORIZONTAL WATER TUBE BOILERS; SUGAR CRYSTALLIZER; STORAGE TANKS, STRUCTURAL STEEL and all classes of STEEL PLATE CONSTRUCTION.

Also manufacturers of Vertical Water Tube Boilers, Pressure Tanks, Steel Riveted Piping, Acid Tanks, Oil Tanks, and Packing House Tanks.

Facilities.

The plant is located in the heart of the Southern iron and steel territory where material can be purchased to advantage, where the best of skilled mechanics are available and where favorable freight rates prevail.

This company has one of the largest shops in the country for doing all classes of boiler and plate iron work, and is in a position to handle jobs of almost any size.

The shop is well equipped with the most modern machinery, and an efficient corps of engineers capable of designing and preparing plans for all classes of work in this line is employed.

The company is especially well prepared to build special plate ironwork, tanks and structural work required in industrial plants.

A large, experienced erection force is prepared to erect material in any part of the country.

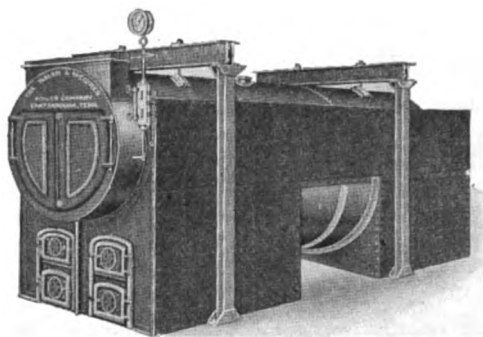
A large stock of materials is always carried on hand, and prices will be quoted for prompt shipment from stock.

Catalogues covering the line will be gladly furnished on application.

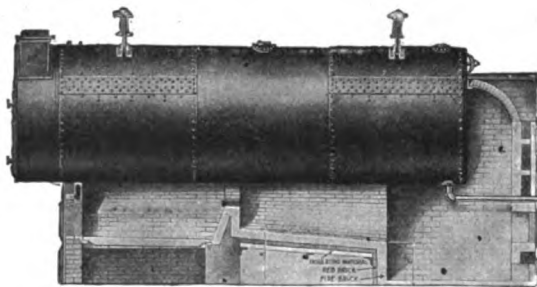
Special Horizontal Return Tubular Boilers with Steel Casing Setting.

This company makes a specialty of high grade horizontal return tubular boilers and usually furnishes the improved drop combustion chamber steel casing setting with them.

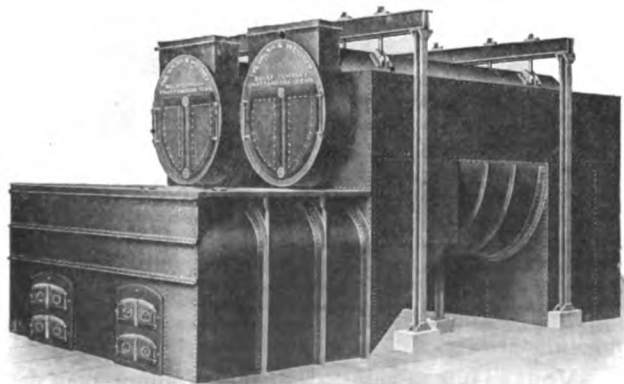
This setting costs about the same as a brick setting and decreases the coal consumption from 10% to 25%. They are built for any number of boilers in a battery and arranged for any special type of furnace.



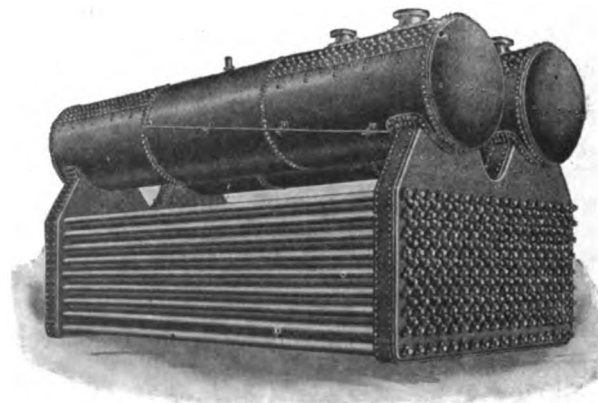
STEEL CASING SETTING



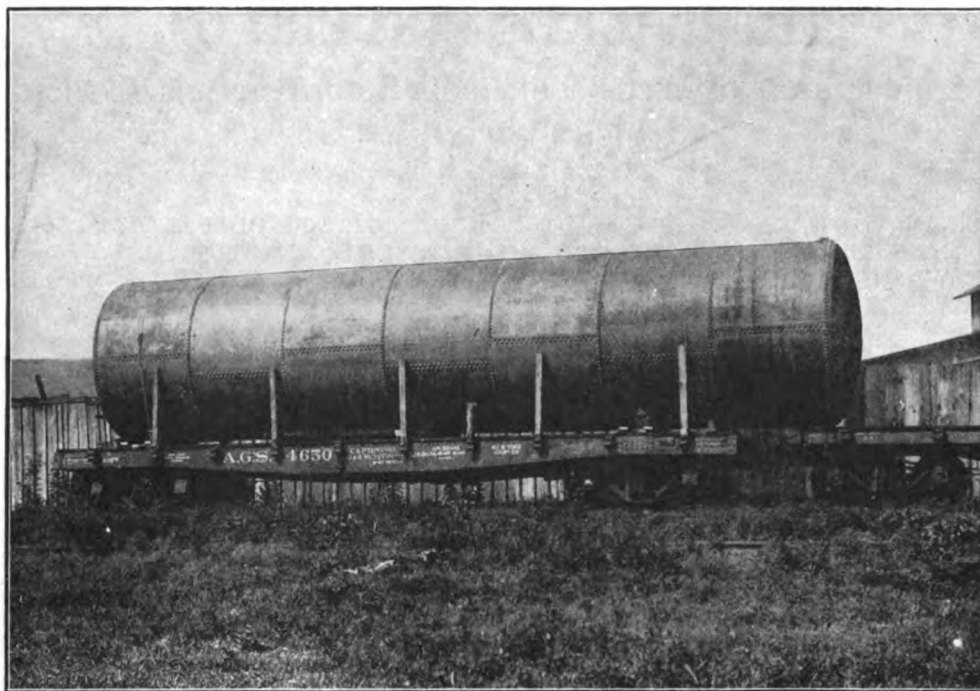
SECTIONAL VIEW STEEL CASING SETTING



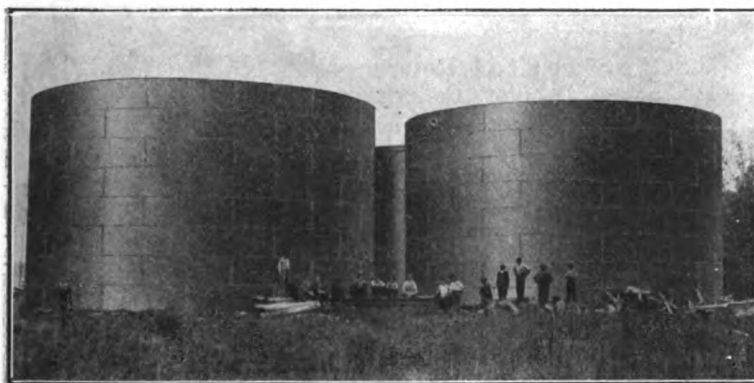
DOUBLE DUTCH OVEN SETTING WITH STEEL CASING
Designed for burning sawdust, bagasse or any other refuse material



HORIZONTAL WATER TUBE BOILER
Built in sizes for all practical pressures.
Furnished with mechanical stokers or stationary grates



ONE OF THE SEVENTEEN 25,000-GALLON BENZOL TANKS BUILT FOR THE T. C. I. & R. R. CO., BIRMINGHAM, ALA.

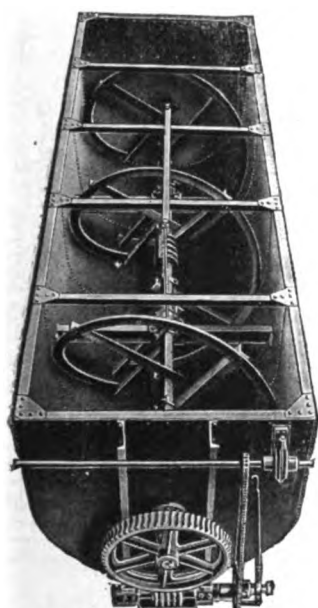


TWO 1,000,000-GALLON TANKS ERECTED FOR THE BARRETT CO., FAIRFIELD, ALA.

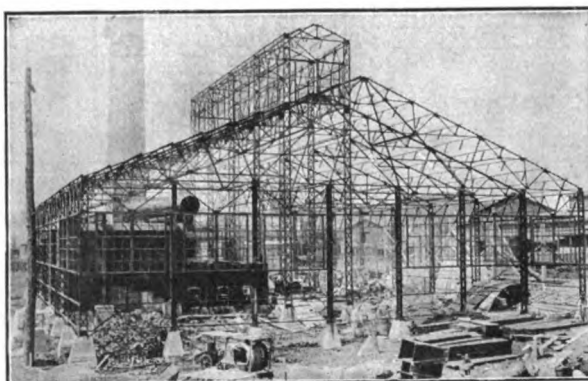
Co-operative Service.

THE WALSH & WEIDNER BOILER CO. is prepared to furnish and erect tanks, plate steel and structural work of any description.

The estimating and engineering departments will gladly furnish prices and designs of whatever is required in this line and give to the inquirer the benefit of long experience.



SUGAR CRYSTALLIZER
Both open and closed types of crystallizers in all sizes are built



STRUCTURAL STEEL BUILDING ERECTED FOR THE MARION EXTRACT CO.



TANKS WITH TOWERS

THE WICKES BOILER CO.

Manufacturers of Water Tube and Return Tubular Boilers

SAG NAW, MICH.

SALES OFFICES

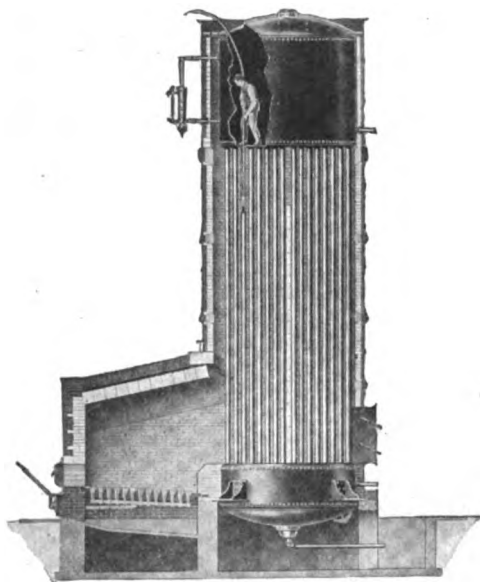
NEW YORK, N. Y., 1716 West Street Building
BOSTON, MASS., 201 Devonshire Street
SEATTLE, WASH., 736 Henry Building

PITTSBURGH, PA., 1218 Empire Building
DETROIT, MICH., 1116 Penobscot Building
CHICAGO, ILL., 76 West Monroe Street

Products.

WICKES VERTICAL WATER TUBE BOILERS.

Also manufacturers of Horizontal Return Tubular Boilers.



WICKES VERTICAL WATER TUBE BOILER
Man stands erect cleaning

Wickes Vertical Water Tube Boilers.

Designed and built in accordance with the A. S. M. E. Code.

Two men can open, wash, close and fill the Wickes in five hours. Turbine in ten hours.

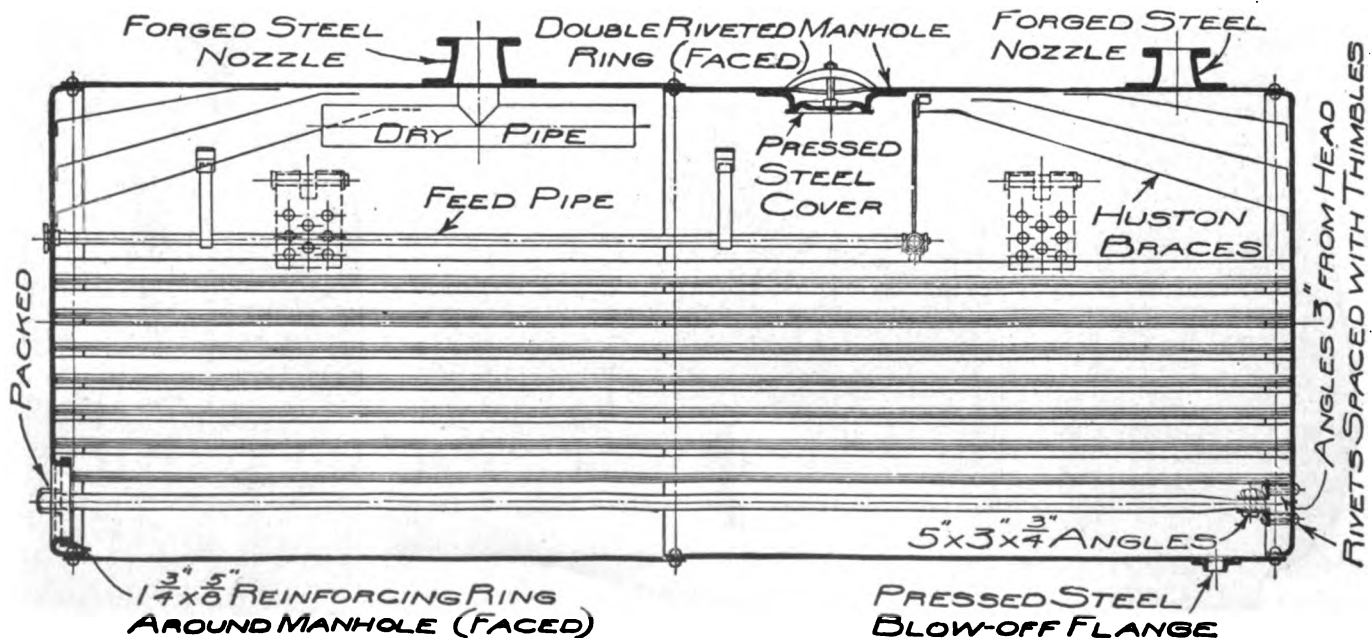
Our technical educational bulletins, pointing out the way to greater economies in boiler room practice, are for the asking. Send for them.

Horizontal Return Tubular Boilers.

Ask for catalogue covering design and workmanship.



STEEL CASED SETTING
Stops air leaks and saves coal



A.S.M.E. CODE RETURN TUBULAR BOILER

M. H. DETRICK COMPANY

Manufacturers of Flat Suspended Fire Tile Arches

155 East Superior Street
CHICAGO, ILL.

DISTRICT SALES OFFICES

NEW YORK, N. Y.
PITTSBURGH, PA.
PHILADELPHIA, PA.
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INDIANAPOLIS, IND.

CLEVELAND, OHIO
CHICAGO, ILL.
BOSTON, MASS.
HAZLETON, PA.

SALT LAKE CITY, UTAH
NEW ORLEANS, LA.
HOUSTON, TEX.
DENVER, COLO.
MONTREAL, QUE.

SEATTLE, WASH.
SAN FRANCISCO, CAL.
ATLANTA, GA.
DETROIT, MICH.
HAVANA, CUBA

Product and Service.

DETRICK FLAT SUSPENDED ARCHES, adaptable to all types of boilers, stokers and furnaces.

The experience gained through the installation of over 4000 of these arches, under various conditions, has enabled the M. H. DETRICK COMPANY to build up an organization consisting of combustion engineers who are specialists in furnace design. Each individual installation is studied thoroughly by the Engineering Department.

For Detrick-Hagan Steam Jet Ash Conveyor, see page 729.

Description.

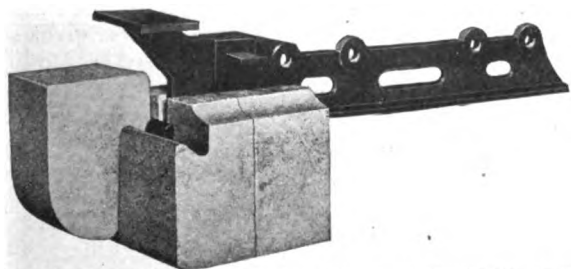
The Detrick flat suspended arch is the only type of flat arch in which the tile are suspended and not rigidly held. Each tile is individually hung from the center, so that each tile becomes a unit in itself and is allowed to expand and contract freely.

There is no thrust on the side walls in a Detrick flat suspended arch. The thrust due to the entire weight of the arch is downward on the cast iron hangers, which in turn are supported by steel beams resting on the side walls.

The Detrick flat arch will not only outlast a sprung arch, but will also insure a maximum efficiency from the boiler, because it is not required to withstand internal stresses due to expansion or contraction and distributes the gases uniformly over the heating surface of the boiler because of the flat surface provided by this construction.

Construction Details.

As the arch must withstand the most severe service at the rear end where the tile is exposed to the flames on two surfaces, special attention has been paid to this feature with the idea of providing: (1) sufficient support for the cantilevered portion of the arch; (2) flexible construction to enable repairs to be made easily and quickly; (3) the apron wall suspended independent of the arch; (4) the end tile of small dimensions.



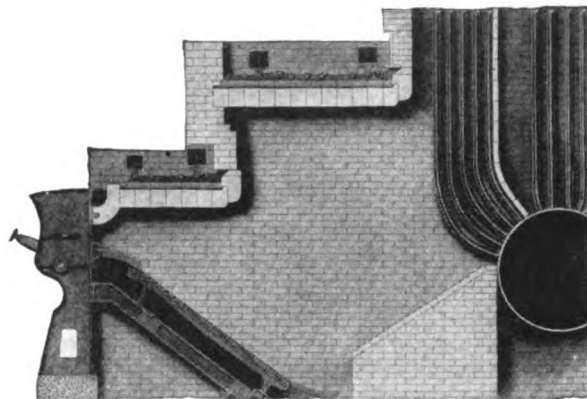
END CONSTRUCTION DETRICK FLAT SUSPENDED ARCH

Note ample fire brick protection from the end of the iron arch bar and removable end casting which is keyed to main arch bar by means of a cast iron wedge

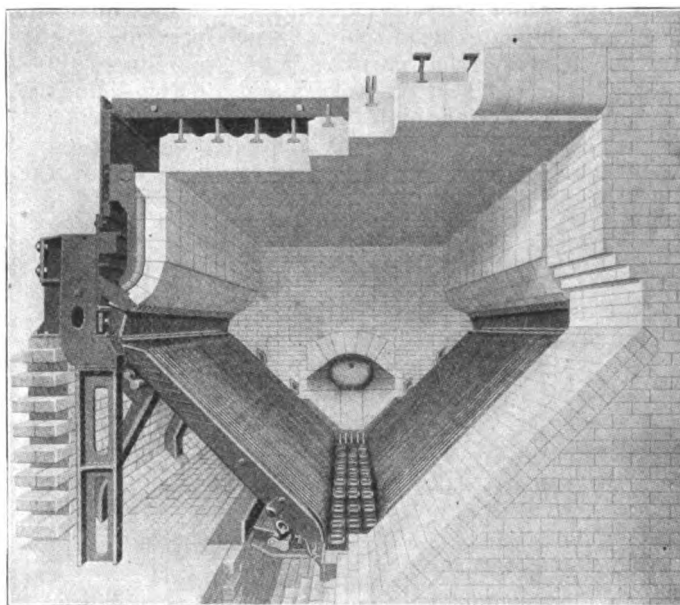
Installation and Repairs.

In the erection of the Detrick flat arch no skilled labor is required. It is only necessary to string the tile on the cast iron beams. In repairing a Detrick flat arch,

it is only necessary to replace the individual tile that is burned, without disturbing the balance of the construction. This work does not require skilled labor.



TYPICAL APPLICATION OF DETRICK FLAT SUSPENDED ARCHES TO FRONT FEED INCLINED STOKER



TYPICAL APPLICATION OF DETRICK FLAT SUSPENDED ARCH TO V-TYPE STOKER

Users.

There are over 1,500,000 boiler horsepower successfully equipped with Detrick flat suspended arches.

A few of the prominent users are:

American Rolling Mill Co., Middleton, Ohio
American Gas & Electric Co., New York, N. Y.
Atlantic Refining Co., Philadelphia, Pa.
Baltimore & Ohio Railroad Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Indianapolis Light & Heat Co., Indianapolis, Ind.
International Harvester Co., Chicago, Ill.
New York & Pennsylvania Co., Lock Haven, Pa.
Sinclair Refining Co., Chicago, Ill.

THE ENGINEER COMPANY

Manufacturers of Automatic Combustion Control and Baffle Walls

17 Battery Place
NEW YORK, N. Y.

BRANCH OFFICES

ATLANTA, GA., Trust Co. of Georgia Building
BOSTON, MASS., 10 High Street
CHICAGO, ILL., 1414 South Michigan Avenue
CLEVELAND, OHIO, 515 National City Building
DETROIT, MICH., 4610 Woodward Avenue
INDIANAPOLIS, IND., 316 Indiana Trust Building
MILWAUKEE, WIS., 614 Security Building

MINNEAPOLIS, MINN., Builders Exchange Building
MONTREAL, QUE., Coristine Building
NEW ORLEANS, LA., 847 Baronne Street
PHILADELPHIA, PA., 1010 Harrison Building
PITTSBURGH, PA., Jenkins Arcade Building
ST. LOUIS, MO., Railway Exchange Building
WILKES-BARRE, PA., 21 Bennett Building

Products.

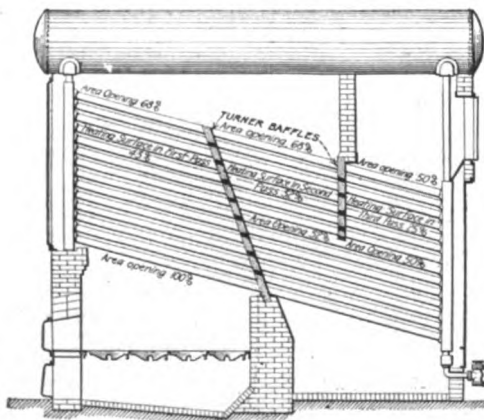
BALANCED DRAFT COMBUSTION REGULATORS and
TURNER BAFFLE WALLS.

Turner Baffle Walls.

Turner Baffle Walls are carefully worked out engineering structures which can easily be built from the inside of the boiler without removal of the sidewalls.

Building the Turner Baffle **Turner Baffle Walls** at any prescribed angle increases radiation surfaces of the tubes, eliminates dead spaces, largely prevents clogging due to flying slag particles, and also reduces the effect of reflected heat on stokers and furnace linings.

Turner Baffles are built tight; they *stay tight* under the most severe firing conditions and they can not loosen, spawl, flake off or crumble. Tubes can be withdrawn, and bent and blistered tubes replaced without injury to the walls.

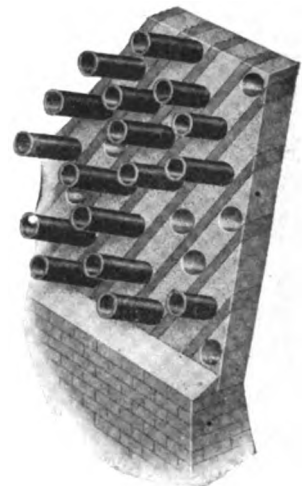


TURNER BAFFLE WALL INSTALLED IN SLOPING POSITION

Construction—The Turner Baffle Wall is built by laying corrugated tile as diagonal shelves on the boiler tubes and filling the pockets thus formed with a plastic, fire resisting cement. The cement hardens in place without application of heat, is non-porous and gastight and for years resists the hottest stoker fires. Whether tile or pocket filling, each wall unit is self-contained. The expansion due to heat is taken up between them and

is not transmitted to the sidewall; nor does the wall buckle.

Retubing—The plastic material fills the space around bent tubes just as readily as around straight tubes. This feature is particularly valuable in rebaffling boilers. The material used shrinks in setting so that a straight tube may be easily pulled out and renewed without injuring the wall. The expansion of the tube when hot closes the small shrinkage space around it so there is no leakage of gas through the wall around the tubes. When replacing a bent or blistered tube, the hole is enlarged to get the tube out and when the straight, new tube has been put in place, the hole in the wall is filled with plastic material by the fireroom force, and the wall is as good as new. This feature is one of the advantages of the Turner Wall.



SECTION OF TURNER
BAFFLE WALL
Showing plastic filling fire brick
tile and bridge wall

Sloping Walls—Combustion engineers have discovered that a baffle wall sloping from the top of a bridge wall to a point on the upper row of tubes, halfway between the curtain wall and the header, gives surprisingly efficient results, as can be surmised by studying the line drawing on this page.

The difficulty of building a sloping baffle wall in a new boiler by ordinary methods, and the practical impossibility of re-tubing the boilers, are both well known.

The Turner Wall can be built equally well sloping forward, vertically, or at right angles to the tubes. Thus most of the baffle troubles which strike at the efficiency of the boiler are corrected.

On new settings the Turner Baffle is bonded into a recess in the sidewall of the furnace; on old work particular care is taken to make a gastight joint with the sidewalls. This prevents leakage around the ends of the walls, a most difficult place to keep tight with ordinary construction.

The Turner Baffle Walls have been approved by steam engineers of highest standing. Walls have stood up against a severe service of four years and are still in good condition.

This Baffle can be used with confidence; it is the best that can be put into a boiler; it will stay tight, and through its unique adaptability to construction at any prescribed angle, will *positively reduce boiler maintenance and fuel consumption*. Send today for our book, "The Development of an Idea."

Balanced Draft.

Each year 750,000 tons of coal are being saved by Balanced Draft.

Balanced Draft is a system of better combustion which controls each boiler individually. It saves fuel and increases boiler output because it insures admission of the correct amount of air and the proper removal of waste gases.

Balanced Draft
TRADE-MARK

Where stokers are used it supplies the correct amount of fuel for the individual combustion requirements of each furnace.

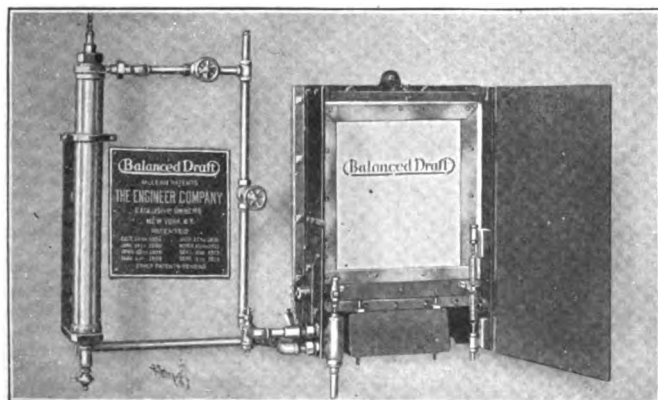
Balanced Draft may be used with any kind of fuel, including coal, coke, breeze, oil and gas. It can be installed as a part of any present plant without disturbing sidewalls or setting. We describe below the apparatus and methods utilized by Balanced Draft to automatically control:

- (1) The supply of air for best combustion.
- (2) The correct flow of the waste gases from the furnace.
- (3) When stokers are used the right amount of fuel for each furnace.

Elements 2 and 3 are controlled by a patented device known as the furnace pressure regulator. This device is unique and of special design.

A cast iron pipe connects the regulator with the furnace, the outer end of the tube terminating in the regulator box and being fitted with a shut-off damper. The regulator contains a swinging blade diaphragm and covers the outer end of the gas pipe, forming a chamber in which the pressure is the same as in the furnace.

The swinging diaphragm is mounted on knife edges, on an axis passing through its center of gravity. The broad blade above the center is balanced by a counterweight below, so that the blade swings easily outward and inward in response to the slightest change in pressure on its broad surfaces, thus operating a pilot valve. This valve is connected by a suitable piping to one or more hydraulic cylinders located on the boiler setting.



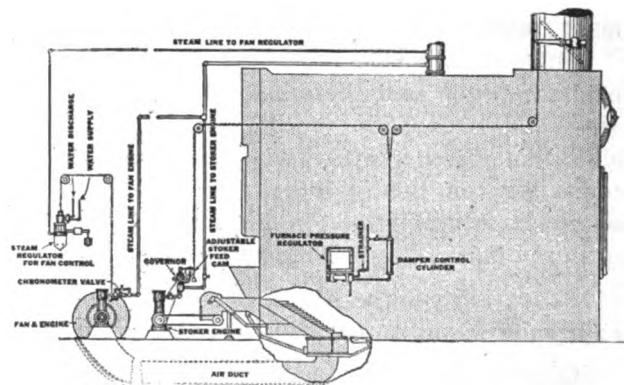
BALANCED DRAFT FURNACE PRESSURE REGULATOR

SWEET'S CATALOGUE

Constant Furnace Suction—The piston of the hydraulic cylinder is connected to the flue damper so that movement of piston in one direction decreases the damper opening and reverse movement increases its size.

When the furnace pressure becomes normal in response to the movement of the damper the swinging diaphragm gradually returns to the vertical.

The compensating feature should be clearly understood. The flue damper does not go from wide open to tight shut and vice versa, but moves only as much as is required to restore the predetermined furnace pressure and is held indefinitely in that position until the furnace conditions require a further change.



BALANCED DRAFT SHOWING STEAM CONTROL OF FAN AND FURNACE PRESSURE CONTROL OF FLUE DAMPER AND STOKER

Fuel Control By Rate of Combustion—With constant suction maintained in the furnace chamber, the damper opening becomes an indicator of the amount of gas passing through the furnace, which in turn is a correct indicator of the rate of fuel consumption, and therefore of the amount of fuel required.

Hence a cylinder similar to that which controls the damper movement also controls the fuel feed, having the same advantage of a wide range of adjustment, rather than merely fast or slow.

Air Feed By Steam Demand—Since the object of air control is to control plant pressure, plant pressure itself is utilized as the source of control. For many years we have used this method, keeping the air feed in step with the steam pressure with no serious variation. To accomplish this it has not been necessary to resort to the "all off" or "all on" idea. Instead of this, a suitable apparatus correctly applied changes the fan speed only to the degree of the changes in plant header pressure.

Thus every element of combustion is kept in step. Under these conditions the percentage of CO_2 is increased, the stack temperatures are lowered, the efficiency of the heating surface is greater, and the capacity of the stack is increased.

Further Information.

We will gladly send full information regarding the savings secured in plants where Balanced Draft is in use. "Modern Practice in Combustion Control" is the title of a book which explains in detail the apparatus and operation of Balanced Draft. Let us help secure a like savings in your plant. Send for it today.

LIPTAK FIRE BRICK ARCH CO.

Builders Exchange Building
MINNEAPOLIS, MINN.

Products.

LIPTAK DOUBLE SUSPENSION ARCH.
LIPTAK FURNACE WALL SUPPORT.

Liptak Double Suspension Arch.

The Liptak double suspension arch meets the demand for better arch performance by lengthening the life of the arch with its consequent lower upkeep, eliminating the interruption of forced shutdowns, and economizing on fuel by developing additional horsepower. Its simplicity of construction makes it easy to install and repair.

Adaptability—The Liptak double suspension arch is adaptable to any furnace where arches are used.

Construction—The Liptak double suspension arch is built of the best materials available, and consists of an iron support, main arch and reserve arch.

As can be seen in the illustration, this gives a construction having two confined dead air spaces which prevent heat waste, improve ignition conditions and lessen fuel consumption.

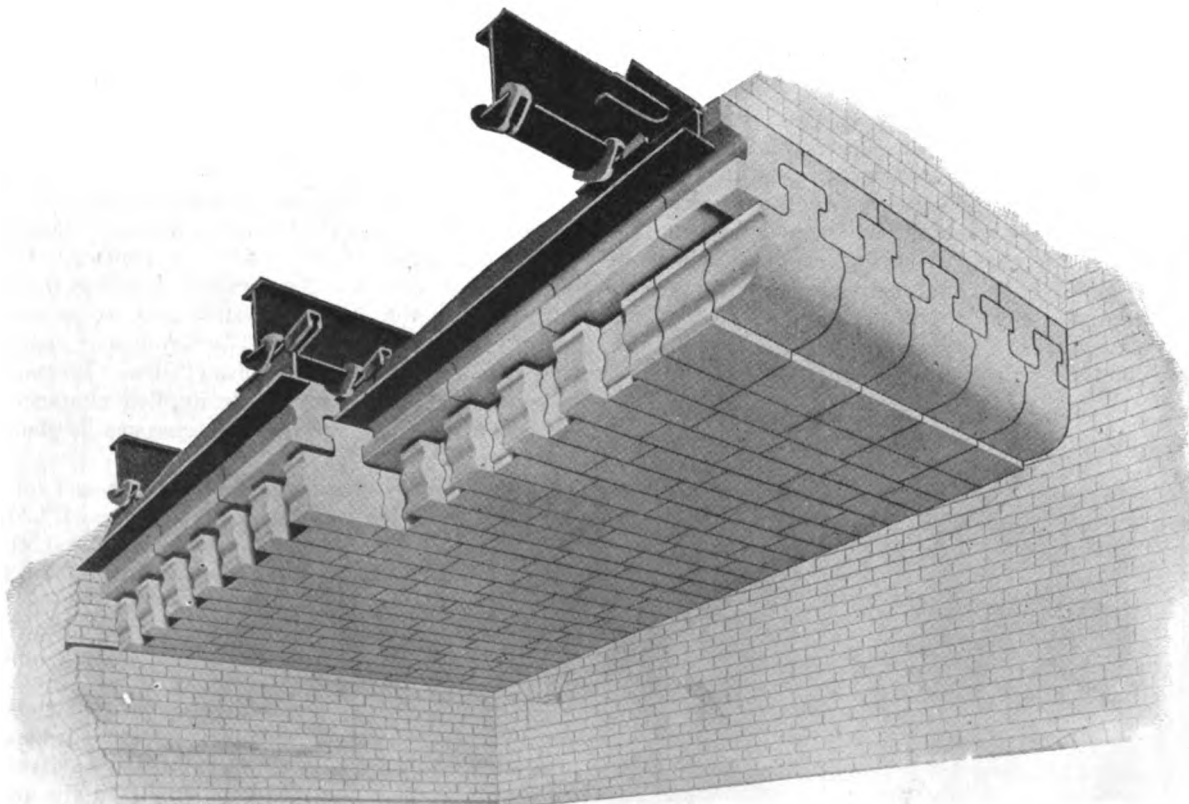
IRON WORK—Consists of steel I-beams and cast iron brackets, hangers, extension tips, and curtain wall plates, so manufactured that to assemble the iron work of the arch no tools are necessary.

The iron work is so adjustable that the slope of the arch can be changed 30° either way from level with no change whatever in the iron work.

The I-beams which support the cast iron hangers by the use of cast iron brackets are in turn supported by the side walls.

ARCH BLOCKS—The upper arch blocks are placed over and are supported by the flange of the cast iron hanger. These blocks are buttered at the ends and grouted with fire clay between the sides of the blocks and the channel of the hanger.

The lower arch blocks are supported by the dovetail in the groove formed by the upper block construction. These blocks are so manufactured that by reversing every other block, a staggered joint is formed on the face of the arch. The blocks are placed in position with no fire clay between them, which eliminates the side thrust on walls—produced by sprung arches:



LIPTAK DOUBLE SUSPENSION ARCH CONSTRUCTION

Showing the two dead air spaces between arches and iron support. Also showing the staggered joint and waved line construction

Liptak Furnace Wall Support.

Liptak furnace wall support is designed particularly for furnace walls where repairs are frequent and maintenance costs high. It can be applied to furnace walls of any thickness that are perpendicular and have straight line sides.

Construction—The Liptak furnace wall support is constructed of simple, durable parts, every one accessible and readily renewable.

The Liptak furnace wall support consists of the cast iron header box, which is fastened with bolts to the buck stays commonly used or specially provided for in boiler or furnace wall construction, and the special shaped refractory blocks which set into it. The illustration clearly shows the part that these elements play in securely tying the inner wall to the outer, so that the two can not separate.

Advantages—The Liptak furnace wall support facilitates repairs and reduces maintenance cost on furnace walls. As the inner wall of Liptak side wall construction is tied to the outer brickwork by iron ties

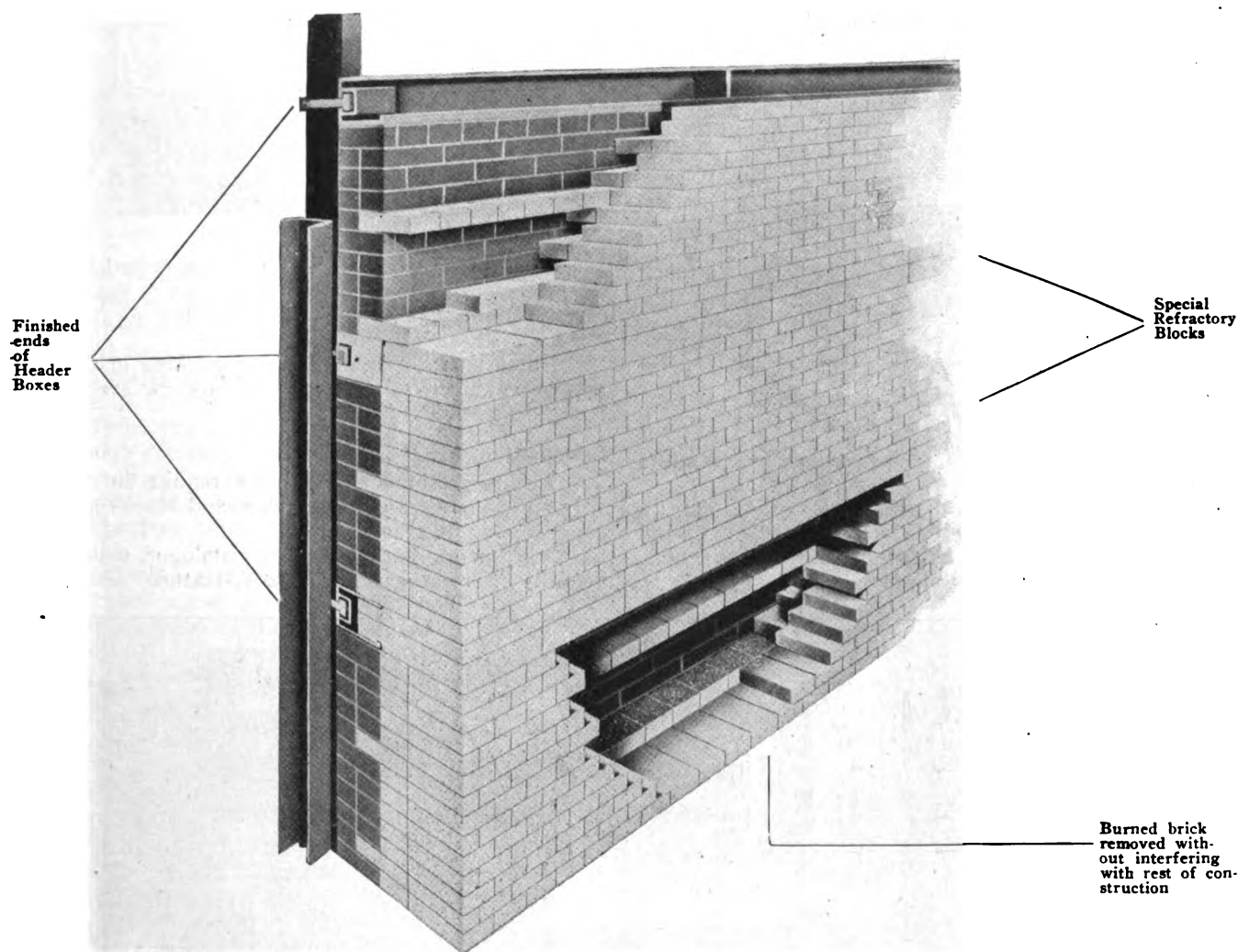
and the specially designed refractory blocks, at regular intervals, the usual warping or sagging is totally eliminated. This also makes it possible to repair burned out portions without disturbing in any way the remaining construction. Should any part of the blocks burn away, new blocks are easily inserted, the iron work remaining unaffected and permanent.

Sizes—The Liptak furnace wall support can be furnished in any length of even feet. It can be made to fit any arrangement of buck stays in use or contemplated.

Service and Installation.

Each installation or requirement in arch or side wall construction is treated with the utmost thought and care by skilled engineers.

The LIPTAK FIRE BRICK COMPANY has capable representatives in most of the principal cities who will be glad to call and explain the Liptak products more in detail, or any additional information will be gladly furnished, on request, from this office.



LIPTAK FURNACE WALL SUPPORT INSTALLED IN FURNACE WALL

McLEOD & HENRY CO.

Manufacturers of Forms for Boiler Settings

TROY, N. Y.

BRANCH OFFICES

NEW YORK, N. Y., 1400 Broadway

DETROIT, MICH., 300 Moffatt Building

BOSTON, MASS., 533 Little Building

Products.

"STEEL MIXTURE" FORMS for Boiler Settings, as follows: Boiler Door Arches, Firebox Blocks, Combustion Chamber Arches.

Also manufacturers of Blow-off Pipe Protectors, Dutch Oven Arches, Fire Brick, Fire Clay.

"Steel Mixture" Forms.

Forms are made of a material which has been named "Steel Mixture." It is a hard and refractory substance especially produced for boiler setting use, and is noted for its ability to give long service under boiler furnace conditions.

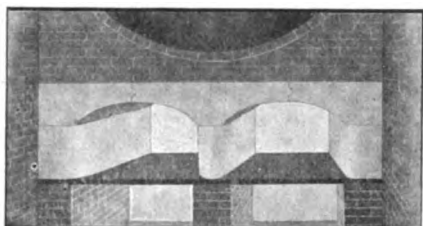
"Steel Mixture" is installed in thousands of power plants, where it is used regularly in preference to other forms of construction.

On receipt of order a special point is made of furnishing just what is wanted.

Special shapes made to order.

Boiler Door Arches.

The boiler door arches are of standard form and made in suitable sizes, so that practically any size or shape can be supplied. The arches flare up and to the sides so as not to obstruct the spreading of the fuel. Not being bonded to the brickwork above, any disturb-



"STEEL MIXTURE" BOILER DOOR ARCH

ance of the latter due to expansion does not tend to destroy them.

They are easy to install, as they are composed of a very few simple parts, which come all ready to put together. These parts have tongue and groove joints, which hold them rigidly in place.

Tongued and Grooved Firebox Blocks.

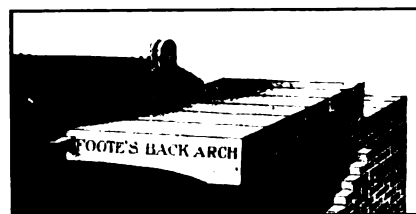
These blocks are made in three thicknesses: 6, 8 and 9 in.; and in two heights: 12 and 18 in. All sizes come in three lengths: 12, 18 and 24 in.

Their use greatly reduces the number of joints in the furnace wall, which thus exposes a smoother and more durable surface to the action of the fire. Clinkers do not adhere to them as easily as to small brickwork.

They can be laid up, according to individual ideas, for lining the firebox or building bridge walls. For the latter, they will be bullnosed or beveled in any specified way.

Back Combustion Chamber Arch.

Foot's combustion chamber arch fits any horizontal boiler. It is carried by the walls of the setting and is not affected by the expansion of the boiler. The clevis arm bar, which can be supported from above, is



FOOTE'S BACK ARCH

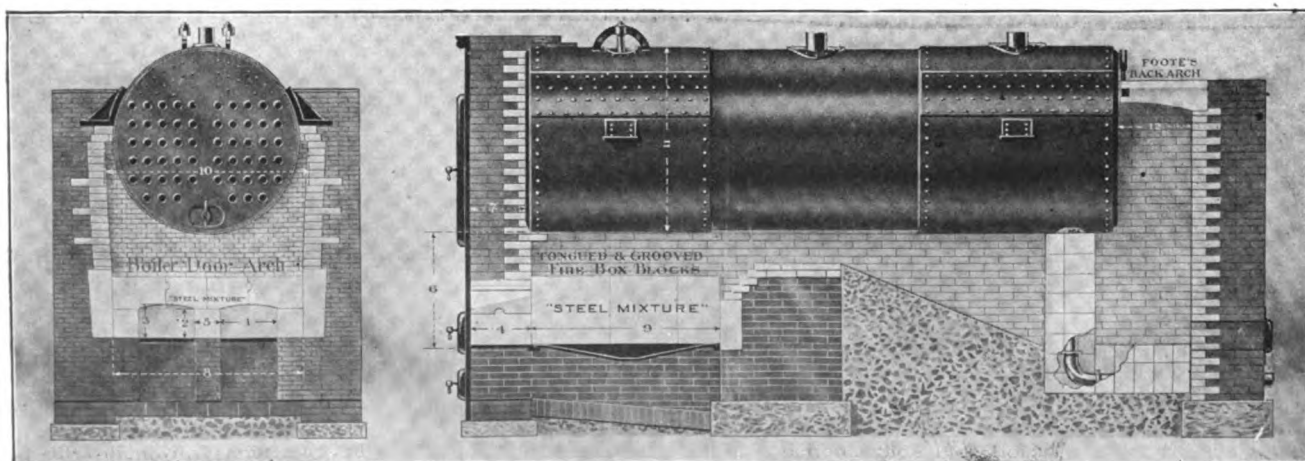
furnished in most cases. The bar is protected by being set in a groove of the material as shown in the illustration. The pieces are shiplapped together so as to produce a gastight joint.

There is ample headroom for working in the combustion chamber, so that once in place the arch should last indefinitely.

Information.

The measurements which we require in order to furnish estimates on these arches and blocks are indicated in the illustration below.

Ask for our Furnace Lining Catalogue, which gives detailed information about "Steel Mixture" settings.



Elevation with Front Removed

Sectional Side Elevation

DIMENSION CUT OF "STEEL MIXTURE" FORMS FOR BOILER SETTINGS

BERNITZ FURNACE APPLIANCE CO.

Clinker-Proof Furnace Walls

15 State Street
BOSTON, MASS.

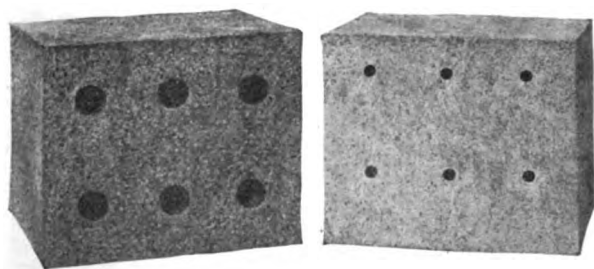
Products.

BERNITZ CO. CLINKER-PROOF BLOCKS, BRICKS, and SPECIAL TILES.

Bernitz Method of Furnace Wall Construction.

The Bernitz Method, which is very easily installed in old boiler settings as well as new, should be used wherever the conditions in a furnace are such as to cause deterioration to the linings, through too high temperature, or by the formation of slag and clinkers on the walls.

In installations where formerly linings lasted only from thirty to sixty days, linings protected by this method have been in service over two years and are still good.



BERNITZ CO. CLINKER-PROOF BLOCKS

The air supply through linings is controlled by small openings in the rear face of blocks where the openings are protected from the extreme heat of the furnace

Advantages in Using the Bernitz Method.

(1) The eliminating of hard clinkers on the linings greatly increases the life of the furnace walls, as no hammering with heavy sledges and bars is necessary in order to remove the clinkers. This results in saving the settings from becoming shattered, loose, and broken up.

(2) Improves combustion in a higher percentage of CO_2 , and eliminates smoke by completely and efficiently burning the fuel where previously great side wall clinkers obstructed the free flow of air from grates.

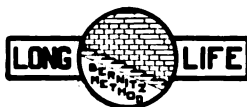
(3) Allows boiler furnaces to be operated continuously at the highest temperatures known in modern power house operation, without danger from overheating the furnace linings in contact with the fuel bed.

(4) Increases the capacity of the grate to burn fuel, through added clean and active grate surface.

(5) Longer period of active operation of boiler—as the boiler can be used at full capacity during such time as it otherwise would be required to burn down, clean and rebuild the fire, and the frequent laying up of boiler through repairs to linings is eliminated.

(6) No blockade of the entering coal by large overhanging sidewall clinkers, consequently no stoker wrecks from this account.

(7) No shutdowns on account of linings crumbling into the furnace when clinkers are removed.



(8) More efficient operators—by saving much valuable labor in shortening the time spent on cleaning the walls, an opportunity is given to attend to the various operating duties with better efficiency.

(9) *Saves fuel* by eliminating the costly process of burning down the fire before cleaning, and of building up after cleaning.

By shortening the time spent on cleaning walls, and of dumping fires which reduces to a minimum the influx of cold air through open fire doors.

By enabling the operator to burn the coke off the clinkers before dumping.

By having more complete combustion from the coal along the side walls through cleaner grates.

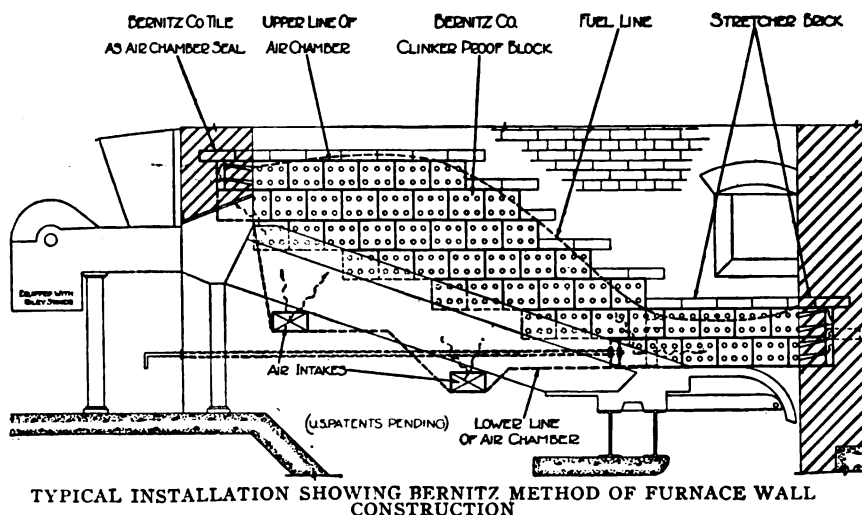
By reducing hard manual labor, thereby enabling the engineer to obtain and keep better trained assistants in boiler room, resulting in a saving of coal through more efficient operation of the furnaces.

(10) The Bernitz Method assures low maintenance of settings.

Users.

Below is a partial list of users of the Bernitz Method:

Arlington Mills, Lawrence, Mass.
Edison Electric Illuminating Co., Boston, Mass.
General Electric Co., Pittsfield, Mass.
Massachusetts Institute of Technology, Cambridge, Mass.
United Electric Light Co., Springfield, Mass.
United Illuminating Co., New Haven, Conn.
Hartford Electric Light Co., Hartford, Conn.
Great Northern Paper Co., Millinocket, Me.
Brown & Sharpe Co., Providence, R. I.
Queens Borough Gas & Electric Co., Far Rockaway, N. Y.
Public Service Electric Co., Newark, N. J.
Youngstown Sheet & Tube Co., Struthers, Ohio
Republic Iron & Steel Co., Youngstown, Ohio
Cheswick Power Co., Springdale, Pa.
Du Pont Engineering Co., Nashville, Tenn.
Monongahela Valley Traction Co., West Virginia
Potomac Electric Power Co., Washington, D. C.



TYPICAL INSTALLATION SHOWING BERNITZ METHOD OF FURNACE WALL CONSTRUCTION

Bernitz Service.

The BERNITZ FURNACE APPLIANCE CO. will be glad to assist in solving furnace problems, furnishing designs of furnace wall construction and supervising construction. Full information will be sent on application.

BETSON PLASTIC FIRE BRICK CO., INC.

P. O. Box 386-13
ROME, N. Y.

Products.

BETSON'S PLASTIC FIRE BRICK and
BETSON'S HI-HEAT CEMENT.

Uses of Plastic Fire Brick.

Betson's Plastic Fire Brick is the pioneer and ideal one-piece furnace lining. It is used in place of bricks, moulded blocks or special tiles in any make and style of boiler, old or new, for lining the furnace, making the front arch and wall, side walls, bridge wall, combustion chamber, back arch and baffles.

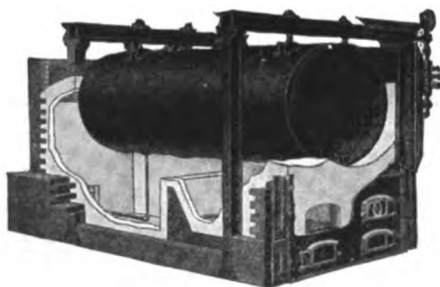
Betson's Plastic Fire Brick is made of the highest grade refractories, properly proportioned to take up the strains of expansion and contraction, due to varying temperatures. It is shipped in 500-lb. barrels, in a moist condition, ready for use.

Furnace Linings — Permanent, gastight furnace linings for water tube boilers and return tubular boilers are easily made right in place, by any one. No special moulds, forms or tools required.

Betson's Plastic Fire Brick is first placed in chunks or balls. Next it is pounded in with a mallet. Then it is smoothed off with a trowel—and the job is done. The result is a one-piece furnace lining that has no joints, is air- and gastight and lasts for years.



APPLYING BETSON'S PLASTIC FIRE BRICK FURNACE LINING
Made in one piece and of any desired thickness. Job can be done by any one in old or new boilers



BETSON'S PLASTIC FIRE BRICK AS USED FOR LINING FURNACE OF RETURN TUBULAR BOILER

Side Walls—Betson's Plastic Fire Brick makes the most serviceable side walls in any boiler furnace. With ordinary fire brick or blocks, the extreme furnace temperatures make the mortar crumble, the joints loosen, and then the bricks finally fall out. With Betson's Plastic Fire Brick the construction is in one piece, without joints, so there is nothing to give way.

Front Walls—Door openings, bridge walls, and other boiler furnace parts can be easily and quickly

There is Only One
Plastic Fire Brick



TRADE-MARK

formed. These are made in one solid block, from the dead plate to a perfect fit around the boiler shell on fire tube boilers or up to the tube header on water tube boilers, and bonded in as a solid monolithic part of the side walls. Compared with ordinary construction the number of repairs or renewals can be reduced at least three to one.

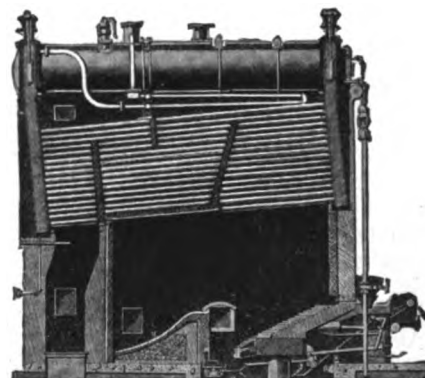
Gastight Boiler Baffles.

Gastight baffles, of the right shape and slope are essential to the efficient operation of water tube boilers. Baffles made of special blocks or tiles are difficult to slope and shape, and because of the joints, they can not be made gastight.

Baffles made of Betson's Plastic Fire Brick (patented) are formed in one piece, without joints. Special tools are not required and the tubes do not have to be pried apart. The baffles can be made horizontal, vertical, or inclined to give the desired tapering gas passages so necessary for uniform velocity and high boiler efficiency.



HOW A BETSON VERTICAL BAF-
FLE IS FORMED



GASTIGHT BAFFLES OF BETSON PLASTIC FIRE BRICK
Easily formed to give the tapering gas passages necessary in modern high power boilers

Betson's Hi-Heat Cement.

For laying up fire brick and tile in settings, furnaces and retorts, Betson's No. 3 Hi-Heat Cement will give the best service. Fire Brick usually begins to soften at 3000°, but Hi-Heat Cement withstands temperatures of 3100° and over. It will therefore maintain a perfect bond as long as the brick or tile lasts. The material is shipped in 400-lb. barrels and is ready for use by the addition of water.



Catalogues.

Specialized booklets dealing with the applications of Betson's Plastic Fire Brick, Boiler Baffles and Hi-Heat Cement are available. These practical and instructive catalogues are gladly sent on request.

CELITE PRODUCTS COMPANY

Producers of Insulating Material and Cements

11 Broadway
NEW YORK, N. Y.

BRANCH OFFICES

PHILADELPHIA, Liberty Building
PITTSBURGH, Oliver Building
LOS ANGELES, Van Nuys Building

CHICAGO, Monadnock Building
CLEVELAND, Guardian Building
SAN FRANCISCO, Monadnock Building

DETROIT, Book Building
ST. LOUIS, Railway Exchange Building

Products.

SIL-O-CEL INSULATING BRICK, BLOCKS, POWDER and CEMENTS for Insulating Regular and Irregular Surfaces of Heated Equipment, also for Cold Storage Insulation and for Sound Deadening and Fireproofing in Building construction.

CELITE HIGH TEMPERATURE CEMENTS for Laying, Facing and Patching Fire Brick Settings.

CELCOTE for Preventing Infiltration of Air in Brick Settings in Heated Equipment, also as a Waterproofing Coat for Sil-O-Cel Insulation.

FILTER-CEL, an Inert Mineral Powder, used in conjunction with filtering equipment presses to improve the clarity of filtered liquids.

Sil-O-Cel Blocks, Powder and Cements.

These products are produced from Celite, known commercially for its exceptional insulating qualities due to its siliceous composition, cellular structure, and extremely light weight.

The brick are furnished in standard fire brick shapes and sizes; the blocks in sizes 6 by 18 in. and 6 by 36 in., in thicknesses of 1, 1½, 2 and 3 in. The brick are always recommended as an insulating backing to fire brick linings, and also on steel surfaces where a high temperature insulation is required.

The blocks are recommended for the same purpose and particularly in high temperature oven equipment where a larger unit than the brick is desired.

The powdered Sil-O-Cel proves an excellent form of insulation where it is impracticable to use either the brick or block form, in such as hollow wall spaces, or between the fire brick and shell of incased equipment.

Sil-O-Cel insulating cements are applied in three coats: the first a sticking coat, the second or 85% Sil-O-Cel coat and the third, a hard finish coat.

The first coat provides a surface to which the second, or insulating coat will adhere. The third coat is trowelled smoothly over the first and second coats to give a hard, durable and even finish. This form provides an excellent means of insulating cylindrical and uneven surfaces.



TRADE-MARK



BOILER BREECHING INSULATED WITH SIL-O-CEL INSULATING CEMENTS



LAYING SIL-O-CEL INSULATING BRICK IN STERLING BOILER

Celite High Temperature Cements.

These cements are made in several grades for different temperature ranges. They are mixtures of ceramic materials scientifically compounded for laying, facing and patching fire brick constructions.

Celcote.

Celcote is an elastic and bitumastic compound for preventing infiltration of air through brick construction, also for waterproofing Sil-O-Cel insulation exposed to the weather or subject to dampness. It is applied in one or two coats, each ⅛ in. in thickness.

Uses of Celite Products.

The following is a list of equipment in which Celite products can be used to advantage:

Annealing furnaces	High temperature flues
Annealing pits	Hot blast mains
Bakers ovens	Hot blast stoves
Boiler settings	Hot metal cars
Bustle pipes	Japanning ovens
Coke ovens	Kilns
Core ovens	Malleable furnaces
Dryers	Marine boilers
Dust catchers	Metal mixers
Electric furnaces	Oil stills
Enameling ovens	Pipe covering, etc.
Furnace doors	Regenerators
Gas generators	Soaking pits
Gas producers	Tanks and vats
Heat treating furnaces	Waste heat boilers

Filter-Cel.

Filter-Cel is a very light weight, highly porous, siliceous powder, especially prepared for facilitating filtration processes. It is used to advantage in the filtration of all kinds of liquids in conjunction with all types of filters. Filter-Cel is inert and insoluble, and has no other action than the removal of suspended matter. Filter-Cel has proved eminently satisfactory in the filtration of the following liquids:

Adhesives	Linseed oil
Alcoholic extracts	Liquid soap
Antitoxins and serums	Lubricating oil and used automobile oils
Castor oil	Maltose
Cereal beverages	Metallurgical solutions
Cider	Milk sugar
Cocoonut oil	Molasses
C. P. chemicals	Peanut oil
Corn oil	Pharmaceuticals
Cottonseed oil	Shellac
Dyestuffs	Soap lye
Fish oil	Sorghum syrups
Flavoring extracts	Stearic acid
Fruit juices	Tannic acid
Glucose	Varnish and lacquer
Glycerine	Vinegar
Grapefruit juices	Wine
Lemon juice	

Engineering Service.

The services of our technical staff are at the disposal of any one desiring help or information on heat insulation or filtration problems. It will incur no obligation on your part and it will be a pleasure for us to assist. Address nearest office.

JOINTLESS FIRE BRICK CO.

TELEPHONE:
LINCOLN 9184

1130-1150 Clay Street
CHICAGO, ILL.

PLIBRICO IS WAREHOUSED IN ALL PRINCIPAL CITIES FOR PROMPT DELIVERY

Products.

Manufacturers of PLIBRICO JOINTLESS FIRE BRICK, a Plastic Refractory for all kinds of boiler settings, furnace linings, and baffles. Better than fire brick, and used wherever fire brick can be used. JOINTLESS FIRE BRICK CO. also manufacture a HIGH TEMPERATURE BOND for laying up ordinary fire brick, that will last as long as the brick.

Uses of Plibrico Jointless Fire Brick.

Plibrico forms a jointless one-piece lining in the front door arches, entire fronts, side walls, arches, bridge walls, baffles, etc. It can be used in any boiler, furnace or oven, and can be used wherever fire brick is employed.

Plibrico is used in all kinds of industrial plants, public and private institutions. It can not be excelled for patching broken and burned out linings.

Description.

Plibrico jointless fire brick is an unbaked high grade fire brick. It is plastic and is shaped and pounded into place like moulded clay. The furnace lining is thus made first, and is afterward baked out and vitrified. The result is a *one-piece jointless furnace lining*, better than any fire brick, guaranteed to stand 3100° Fahr., that will not leak air or gas, and will not crack or spall.

Plibrico should not be applied as a plaster over ordinary fire brick. It should never be used less than 4½ in. thick.

Fuel Economy and Efficiency.

Plibrico constitutes one of the largest factors in fuel economy and efficiency that can be installed in any power plant. The saving of fuel is not the only consideration but also the satisfaction and efficient results to be had from good equipment.

A jointless fire brick lining is a sure and determinable saving of one of the largest preventable losses of economy in a boiler plant.



SHOWING HOW EASILY PLIBRICO CAN BE PUT IN

Method of Application.

Instead of first baking fire brick and laying up



TRADE-MARK

with fire clay joints, apply putty form Plibrico (fire brick material), shape it not less than 4½ in. thick, and then bake into a one-piece monolithic, vitrified, finished furnace lining without joints, making the fire brick setting airtight and gas tight.

Advantages of Plibrico.

- (1) It is jointless.
- (2) It is plastic.
- (3) It is airtight and gastight.
- (4) It will stand 3100° Fahr.
- (5) It will save fuel.
- (6) It can be installed by inexperienced labor.
- (7) It will outlast fire brick.
- (8) It can be used in any boiler, furnace or oven.
- (9) It can be used wherever fire brick is used.
- (10) It can not be equalled for patching.



PLIBRICO CAN BE MOULDED TO FIT ANY PLACE IN FURNACE OR SETTING

How Supplied.

Plibrico comes in steel containers of about 650 lbs. in a stiff, moist, plastic consistency, ready for use. It weighs 130 lbs. to the cubic foot. The amount required is easily estimated by measuring the length, thickness and height of the particular arch or wall to be installed or replaced, thus arriving at the contents (expressed in cubic feet). Then multiply the number of cubic feet by 130 which will give the number of pounds required. High Temperature Bond comes in 100-lb. bags and 500-lb. steel drums.



PLIBRICO CONTAINER
Of distinctive appearance as shown

Co-operative Service.

Estimate on requirements furnished on receipt of blue prints.

Book of instructions on setting all types of boiler furnaces sent on request. Gives full directions on how to build and maintain tight furnace linings.

THE S. OBERMAYER CO.

Manufacturers of Furnace Cement

2835 Smallman Street
PITTSBURGH, PA.

BRANCH OFFICES

DENVER, COLO., 211 Tramway Building
MILWAUKEE, WIS., Loan & Trust Building

DETROIT, MICH., 570 Penobscot Building
ST. LOUIS, MO., 1313-15 North Broadway

FACTORIES: PITTSBURGH, CHICAGO, CINCINNATI, RILLTON, PA.

WAREHOUSES: ST. LOUIS, PITTSBURGH, DENVER, LOS ANGELES; NEWARK, Blanchard and Ferry Streets

Product.

"HOTT-PATCH" FURNACE CEMENT.



SEALS

Description.

"Hott-Patch" furnace cement is a high temperature resisting, plastic patented compound containing chemicals which serve to render it permanently adhesive at high operating temperatures. It is the product of many experiments, and one that has been tried and proved in some of the largest plants in the United States.

The binder used in "Hott-Patch" furnace cement is sulphite pitch instead of sodium silicate used by most manufacturers of high temperature cements.

Upon drying or baking, this cement becomes as hard as a rock—at the same time adhering firmly to the brick, and forming a solid, high refractory wall. The expansion coefficient of the completed joints, has been designed to coincide closely with that of the brick, assuring equal expansion and contraction throughout the structure, and therefore firm and continuous adhesion between the brick and the bonding material.

Uses.

"Hott-Patch" furnace cement is adapted to replacement of boiler settings and furnace linings and for lining foundry ladles, cupola and electric furnace spouts.

Owing to its composition, it is of particular value in laying up soaking pits or for any purpose where there is a possibility of oxides of any kind adhering to walls, as scale will not stick.

It is equally as well adapted for use in high temperature oil burners and pulverized coal-fired plants, as it will withstand temperatures up to 3000° Fahr. without

cracking, warping, peeling, blistering or opening at the joints.

Advantages.

"Hott-Patch" furnace cement is possessed of many advantages over all other high temperature cements, which have won for it instant favor with engineers wherever it has been used.

It possesses nearer the same chemical composition of fire brick than any other cement on the market.

No unequal expansion, contraction; no disintegration or loosening bricks, as is the case where fire clay is used as a bonding material.

Saves expense of replacement of boiler settings and furnace linings.

"Hott-Patch" furnace cement fluxes under heat and forms a practically airtight bond that abolishes all clinker and prevents cold air infiltration through the furnace walls. This means 100% effective grate surface and increases the ultimate capacity of the boilers.

No need of moistening the fire brick before the use of "Hott-Patch" furnace cement.

Clinkers will not stick to side-walls or bridge-walls.

Directions for Use.

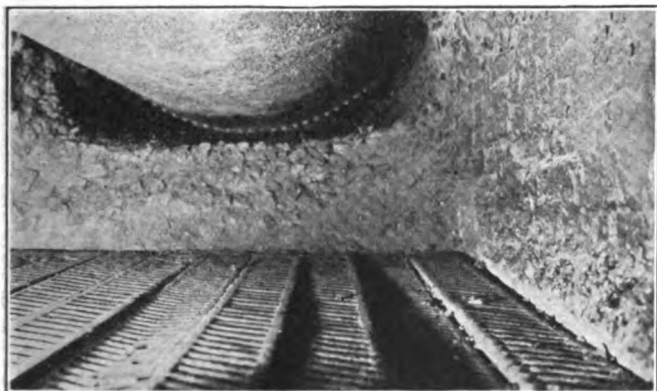
"Hott-Patch" is a dry cement, becoming plastic when mixed with water and on becoming air-dried, the simple addition of water causes it to regain its plastic properties.

Quantity Required.

"Hott-Patch" furnace cement has a covering capacity of about 350 lbs. per thousand 9-in. brick. It is put up in barrels weighing approximately 500 lbs.

Terms.

Sold on approval, freight prepaid on first lot, east of Mississippi River and as far south as Atlanta, Ga.



REPAIRED WITH "HOTT-PATCH" FURNACE CEMENT



STEEL LADLE DAUBED AND LINED WITH "HOTT-PATCH" CEMENT

QUIGLEY FURNACE SPECIALTIES COMPANY, INC.

GENERAL OFFICES

CABLE ADDRESS:
"QUIGLECO"26 Cortlandt Street
NEW YORK, N. Y.CODE USED:
Western Union, 5 Letter

FACTORIES: JAMAICA, N. Y., FREDERICKSBURG, VA.

SALES OFFICES

BALTIMORE BUFFALO DENVER PHILADELPHIA PITTSBURGH PROVIDENCE
Representatives in 35 cities in the United States and Canada

Products and Services.

HYTEMPITE, a Refractory Cement for bonding silica and fire clay brick, and for kindred uses.

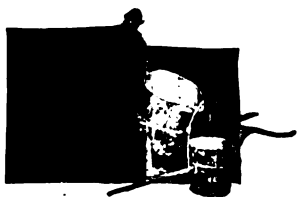
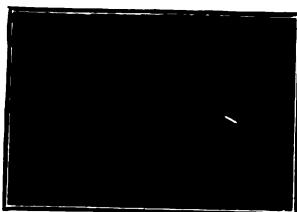
INSULBRIX, a specially prepared Cellular Insulating Refractory Brick which keeps heat in or out.

POWDERED COAL EQUIPMENT: Quigley System for preparing, distributing and burning powdered coal and other fuels.

Also **Carbosand**, a highly Refractory Granular Material for making rammed-in linings, special tile, patches, and repairs in furnace structures.

Hytempite.

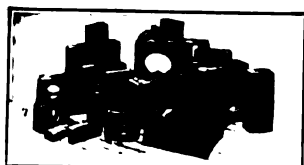
A high temperature furnace cement which forms a lasting union between materials to be joined. It sets at normal temperatures and retains its strength up to temperatures at which the best quality of brick loses its strength and becomes soft.

HYTEMPITE FOR CUPOLAS
AND LADLESHYTEMPITE FOR BOILER
SETTINGS

Hytempite, when used in place of fire clay for laying up brickwork, greatly adds to the life of the structure.

It is successfully used for furnace and boiler settings and repairs; for setting tile, retorts, oil stills; lining metal melting furnaces, pit furnaces, open flame melting furnaces, foundry cupolas and ladles, and as a core wash.

Tests have proven that Hytempite used as a binder, when air set, forms a joint as strong as the refractory material united, and that the strength is not impaired but increased by the action of heat. This property makes a wall or structure impossible to obtain with fire clay, or

MIXING REFRACTORY MA-
TERIALS WITH HYTEM-
PITE FOR RAMMED-IN
LININGSHYTEMPITE FOR SPECIAL
SHAPES AND TILEHYTEMPITE FOR PIT FUR-
NACES

other materials which depend on heat to effect a bond or vitrification.

Hytempite withstands the cutting action of flames and is especially recommended for oil furnaces where the gases are usually of high velocity.

Hytempite can be used as a coating or wash, or to smoothen and harden the surface of a furnace lining to protect it from abrasion, etc.

Hytempite can be used wherever fire brick or tile is used.

HYTEMPITE FOR LAYING
UP LININGS OF LARGE
LADLESHYTEMPITE FOR COATING
CORES

Insulbrix.

A specially prepared cellular insulating refractory brick for furnaces or other structures. These brick are made in standard fire brick size and special shapes. Their weight is about one-half that of ordinary fire brick. They have low thermal conductivity—1 in. of Insulbrix being equal to six to ten times the same thickness of fire, or red brick, depending upon conditions such as furnace temperature, conductivity of other brick, etc. They have high heat resisting quality, their

fusing point being over 2900° Fahr. without showing shrinkage at 1800° Fahr. They have a crushing strength of 425 lbs. to the sq. in. They are used as an insulating course in boiler settings, furnaces, kilns, ovens, or other structures where the conservation of heat in the heating chamber is an important item.



INSULBRIX

Quigley Powdered Coal System.

For preparing, transporting and burning powdered coal. Pulverized coal is transported in bulk through small diameter standard wrought pipe to bins at furnaces.

Entire equipment is dusttight from coal siding to furnaces.

With this improved method of burning powdered coal, the fuel is automatically weighed as sent to the furnace bins. By turning a hand or chain wheel, absolute control of fuel fed to the burners is obtained.

Send for bulletins describing complete system, with illustrations of plants now in successful operation.

WALSH FIRE CLAY PRODUCTS COMPANY

Manufacturers of Fire Brick and Refractory Material

4070 North Main Street
ST. LOUIS, MO.

BRANCH OFFICES

CHICAGO, ILL., 7 W. Madison Street

NEW YORK, N. Y., 220 Fifth Avenue

Products.

The WALSH BRAND of STANDARD FIRE BRICK and SPECIAL SHAPES used in Linings for Blast Furnaces, Stoves, Cupolas, Brass Furnaces, and for the construction of all kinds of Iron and Steel Furnaces, Malleable Iron Air Furnaces, Heating Furnaces, Copper Smelting and Copper Refining Furnaces, also in the construction of Smelting Furnaces, tin, zinc, lead, silver, and gold, Linings of Cement Rotaries, Boiler Furnaces and special material for the modern powerhouse and high powered stokers, including all special work for drawing.

Also Standard Brick, Glass Tank Flux and Refractory Blocks and Specials used in the construction of Glass Furnaces, Lehrs, Annealing Ovens, etc.

Service.

The Walsh brands of fire brick have been on the market many years, an old tried out line of furnace material. The output is large, therefore, this company is in shape to take care of large orders quickly and always glad to receive small favors. The greater part of this business is repeat orders, showing the popularity of these brands of fire brick. They are manufactured for quality and are considered among the best produced.

In the early part of 1919 this company brought into operation its third fire brick plant, it being one of the largest and most modern in the country. Every consideration was given to latest devices and machinery for the work intended, and it has, after a year's service, met all demands.

The engineering department of this company is composed of men competent in their line and will be found an aid whenever needed in problems of construction, furnishing plans and specifications when necessary.

This organization, in all departments, is composed of experts, qualified with years of experience in the manufacture, sales, and use of fire brick.

Much progress has been made in the glass product line, the material being of the highest quality and is received with much favor by glass manufacturers.

Clays.

This company produces all its own clays and selects the various kinds and grades for the work intended.

Walsh XX Brand.

A brand of brick in the standard 9 in. and 9 in. series, also in special shapes.

It is of an open, porous structure, manufactured from selected Missouri flint clays, made to resist high heats and sudden changes in temperature.

It is a brick of quality and very popular where much is expected and where furnace temperatures are high.

Walsh Brand.

A brand of brick, made in the standard 9 in. and 9 in. series, also special shapes.

It is made in two kinds. First, a tough, dense material, of selected high grade clay, made to resist high heats and abrasion. Second, brick made semiopen, of the same clays as above, to resist high heats and quick changes.

Both of these brick have many uses, the dense brick is popular where there are fluxes such as in lead, tin and other smelting operations.

Full information concerning these splendid brick gladly furnished on request.

Information.

This company solicits inquiries. Information will be cheerfully given concerning the various kinds of material required in furnace construction.

Shipping Facilities.

Being conveniently located on the various railroads, with direct connections, prompt shipments may be expected.

Export Trade.

The large stocks carried at the various plants enable this company to make prompt shipments. The export trade is increasing very fast, indicating that the high quality of these brands of fire brick are being appreciated and repeat orders are the result.

THE GENERAL SPECIALTY COMPANY

Boiler Tube Cleaners and Soot Blowers

71 Carroll Street
BUFFALO, N. Y.

Products.

"DEMON" BOILER TUBE CLEANER for water tube boilers, straight or curved tube types; "TORPEDO" BOILER TUBE CLEANER for fire tube boilers.

Also Air Driven Cleaners for water tube boilers, Turbine Tube Cleaners and Soot Blowers for fire tube boilers.

"Demon" Boiler Tube Cleaner.

The "Demon" is a cleaner for water tube boilers and operated by water pressure of 100 to 150 lbs.



FIG. 1. "DEMON" STRAIGHT TUBE CLEANER

For tubes $3\frac{1}{2}$ and 4 in. in diameter



FIG. 2. "DEMON" CURVED TUBE CLEANER

For tubes 3, $3\frac{1}{4}$ and 4 in. in diameter. 3-in. size may be used in straight tubes also

It has a rotary piston type of motor. The pressure of the water acts directly on three rotary pistons of wide area extending lengthwise of the cleaner. The large piston areas, coupled with the full direct pressure of the water on them, result in a tremendous torque or twisting power.

In actual tests it has been found that the "Demon" possesses ten to thirty times the power it is possible to obtain with a turbine type of motor.

In the $3\frac{1}{2}$ - and 4-in. sizes the "Demon" is furnished with a fixed, non-yielding cutter head set to the full inside diameter of a clean tube. When desired, the cutters can be easily adjusted to take up wear or to meet any slight variation in the tubes.

In the 3-, $3\frac{1}{4}$ -, and 4-in. sizes for curved tube boilers, the "Demon" is furnished with a flexible type of cutter head which is connected to the motor by means of a universal joint. A drill head in addition to a cutter head is also furnished with these curved tube cleaners.

The 3-in. "Demon" for straight tubes is the same as the 3-in. curved tube cleaner except that it has a longer body or motor.

When it comes to removing scale the "Demon" is a stubborn machine. The cutters grip the scale and stubbornly work their way forward crushing the scale and washing it out of the tube. The tremendous power

back of the cutters insure success in cleaning the hardest and most tenacious scale.

"Torpedo" Boiler Tube Cleaner.

Cleans the tubes of a return tubular, marine or locomotive boiler in from 2 to 4 hours, vibrating the scale off without injuring the tubes.

Operated by air or steam pressure at from 60 to 90 lbs.

Connect it with the steam or air line, stick it into a tube, turn on the power and away goes the vibrator tapping the tube wall lightly at the rate of 11,000 taps per minute.

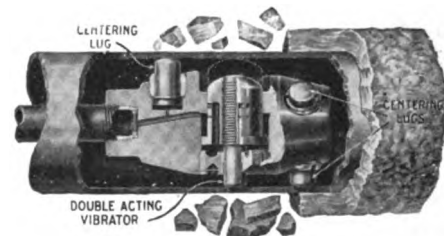


FIG. 3. TORPEDO REMOVING SCALE FROM TUBE OF RETURN TUBULAR BOILER

As the cleaner hums merrily through the tube the scale falls in showers to the bottom of the boiler.

In this manner each tube is taken in turn until the entire boiler is cleaned.

The vibrator has a travel of only $\frac{1}{8}$ in. and its stroke is cushioned. By reason of the fact that the stroke is reversed before the air or steam is entirely exhausted from the cylinder, there is always a "cushion"—imprisoned air or steam—in the cylinder which moderates the force of the blow.

The cleaner is held in the center of the tube by means of six centering lugs, thus insuring even tapping on all sides of the tube.

The centering of the "Torpedo" in the tube, the short and "cushioned" stroke of the vibrator and the high speed of its operation all make the "Torpedo" a safe as well as efficient tube cleaner.

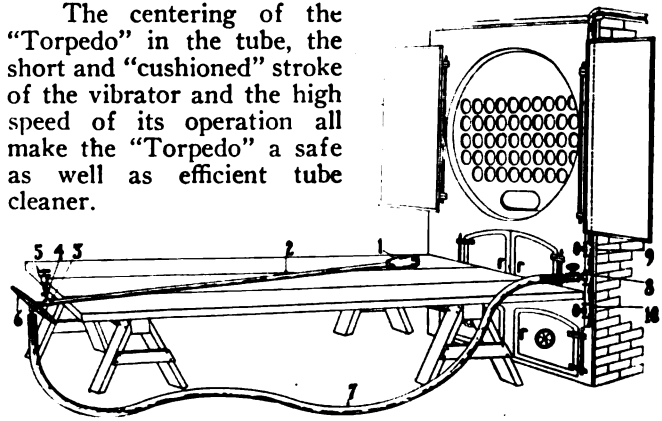


FIG. 4. IDEAL WAY OF USING "TORPEDO"

Where headroom in front of boiler is not sufficient to use this plan the gas pipe (2) may be dispensed with and hose used altogether. Nos. 3, 4, 5, and 6 furnished with "Torpedo"

MAGNESIA ASSOCIATION OF AMERICA

EXECUTIVE COMMITTEE

WILLIAM A. MACAN, CHAIRMAN

GEORGE D. CRABBS, The Philip Carey Co., Cincinnati, Ohio
ALVIN M. EHRET, Ehret Magnesia Mfg. Co., Valley Forge, Pa.

J. R. SWIFT, The Franklin Mfg. Co., Franklin, Pa.
R. V. MATTISON, JR., Keasbey & Mattison Co., Ambler, Pa.

Manufacturers of "85% Magnesia" Insulation for Power and Heating Systems

Products.

85% CARBONATE of MAGNESIA NON-HEAT-CONDUCTING COVERINGS for power, heating and ventilating systems, including 85% MAGNESIA SECTIONAL PIPE COVERING, MAGNESIA BLOCKS and MAGNESIA PLASTIC.

85% Magnesia for Pipe and Boiler Covering.

85% Magnesia is an inorganic, inert mineral composition, composed of 85% of commercially pure carbonate of magnesia, with which is incorporated sufficient mineral fiber to act as a binder, thus giving the necessary structural strength.

In substance, 85% Magnesia consists of myriads of microscopic crystalline cells, each one holding enmeshed an infinitesimal particle of *dead air*—the only accepted scientific principle of perfect heat insulation.

Application.

85% Magnesia is manufactured in the form of half sections, for pipes up to 10 in. in diameter; *segments* for larger sized pipes and curved surfaces; *blocks* for boilers and flat surfaces; and *plastic* (or fibrous powder) for irregular surfaces, filling of joints, etc.

Efficiency.

The efficiency of 85% Magnesia is equal to a saving of from 75% to 97% of the total heat wasted by bare pipes, the percentage varying somewhat with the temperature and thickness. (For the correct thickness for maximum saving at all pressures and temperatures, see Table No. 2.)

Durability.

Many cases are on record where 85% Magnesia coverings have been in continual use for upwards of a quarter century, without any loss of efficiency. In many instances they have outlasted the metal pipes and boilers they protected, and have been removed in perfect condition and applied on the new work installed to replace the old.

General Service Experience.

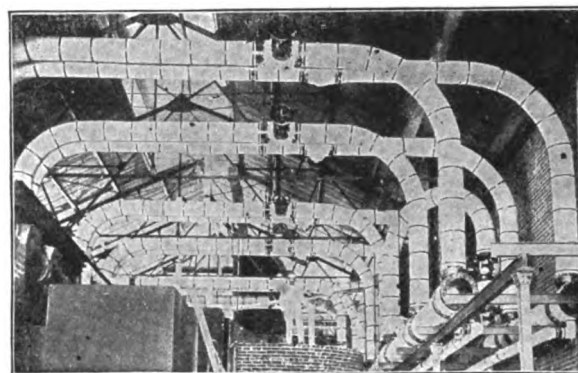
The insulation value of 85% Magnesia coverings is attested by the records of over 30 years' experience in the U. S. Navy, the leading steamship lines, railroads, locomotive builders, power and heating plants and the largest hotels, public buildings, skyscrapers and other large structures in America and elsewhere.

Magnesia Association Specifications.

For 85% Magnesia non-heat-conducting coverings for power and heating systems.

I. Non-heat-conducting Material—Non-heat-conducting covering material for all heated surfaces shall be 85% Magnesia covering, consisting of hydrated carbonate of magnesia, manufactured according to the standard formula ($4 \text{ MgCO}_3 \cdot \text{MgO} \cdot \text{H}_2\text{O}$), and asbestos fiber. The mixture shall contain in combination not less than 95% of said magnesia and fiber, of which at least 85% of the whole shall be said magnesia.

II. Form of Coverings—Non-heat-conducting covering materials shall be furnished in the forms and dimensions



85% MAGNESIA COVERED STEAM PIPES, CINCINNATI & COLUMBUS TRACTION CO., COLUMBUS, OHIO

specified in Table No. 1 of this specification. Pipe shall be covered with molded sections or segments. Boilers, heaters, and similar surfaces shall be covered with blocks and "85% Magnesia" Plastic Cement. Flanges, fittings, and similar surfaces shall be covered with blocks and "85% Magnesia" Plastic Cement, or "85% Magnesia" Plastic Cement only.

III. Thickness of Covering—The thicknesses of non-heat-conducting coverings shall be in accordance with the following table, except as otherwise specified in sections V to XI. Pipes—superheated steam

Sizes up to 4 in.	**double standard
Sizes 4 in. and larger	3 in. (double layer) and ½ in. "85% Magnesia" plastic cement

Pipes—high pressure saturated steam

Sizes up to 4 in.	2 in.
Sizes 4 in. and larger	**double standard

Pipes—low pressure steam—exhaust..... *standard

Pipes—heating system..... *standard

Pipes—feed water..... *standard

Drips—high pressure..... **double standard

Drips—low pressure..... *standard

Flanges—superheated steam..... 2 in.

Flanges—high pressure saturated steam.... 2 in.

Flanges—low pressure steam—exhaust.... 1 in.

Flanges—heating system..... 1 in.

Boilers, high pressure—tops..... 3 in. total

Boilers, high pressure—ends..... 3 in. total

Boilers, low pressure and heating..... 2 in. total

Heaters, receivers, separators, tanks, etc.

High pressure steam..... 3 in. total

Low pressure steam..... 2 in. total

Hot water..... 1½ in. total

Traps—high pressure..... 1½ in. total

Traps—low pressure..... 1 in. total

*See table No. 2

**See table No. 2

Note to Specification Writer—The thicknesses specified above represent good practice for average conditions: i. e., coal \$4 per ton, 150 lbs. high pressure steam, 150° Fahr. superheat. For scientifically correct thicknesses to meet any special condition see table No. 2 and curves.

IV. Workmanship—Workmen employed in the application of coverings shall be skilled pipe coverers.

V. Steam and Hot Water Piping—(a) PIPING (SINGLE THICKNESS COVERINGS)—All single thickness pipe coverings shall be carefully applied so that seams and butt joints are tight. Coverings shall be finished with canvas jacket pasted on, and black japanned bands on 18-in. centers.

(b) SPECIAL FINISH FOR SINGLE THICKNESS COVERINGS—

Note—To be used where the pipe is so located that the covering may be damaged, or where a specially neat appearance is desired, as in finished rooms, etc.:

The pipe coverings on pipes specified below shall have applied over the standard canvas jacket, heavy sheathing paper, followed by an extra 8-oz. canvas jacket well sewed on, approximately three stitches to the inch.

..... pipe, located.....
..... pipe, located.....

(c) **PIPING (DOUBLE THICKNESS COVERINGS)**—All double thickness covering shall be applied by the broken joint method. The first layer of sectional or segmental covering shall be securely wired in place with No. 18 annealed-iron wire; the second layer shall be applied so as to break both butt and lateral joints, and be secured in place by No. 18 annealed-iron wire, not less than three separate loops to the section. Any cracks on the surface between the sections or segments shall be carefully filled with "85% Magnesia" Plastic Cement.

All double thickness covering shall be furnished with an 8-oz. canvas jacket, neatly applied over heavy sheathing paper and well sewed on, approximately three stitches to the inch.

(d) **FITTINGS**—Pipe fittings, including flanged fittings, shall be covered with "85% Magnesia" Blocks and "85% Magnesia" Plastic Cement, or all "85% Magnesia" Plastic Cement, to a thickness not less than the covering on the pipes. The finishing coat shall be smoothly troweled and finished with a canvas jacket to match the sectional covering.

(e) **FLANGES**—All high pressure steam flanges, except flanges on fittings, shall be covered with "85% Magnesia" Blocks and "85% Magnesia" Plastic Cement or all "85% Magnesia" Plastic Cement, made up on framework of ½-in. mesh iron wire netting in two sections so as to be easily removable and replaceable. Low pressure steam and hot water flange covers shall be built up solid.

Flange covers shall be finished with a canvas jacket to match the sectional covering.

The covering on pipes at flange bolts shall be cut back and neatly beveled to allow sufficient space for the removal of the bolts without injury to the covering.

VI. Exhaust-Piping—(a) **PIPING**—All exhaust piping, fittings and flanges shall be covered as specified in Sections III and V, except as modified by VI-b.

All other irregular surfaces in the exhaust system shall be covered as specified in section X.

(b) **FLANGES WITHOUT COVERING**—May be used for piping conveying steam, the heat of which will not be further utilized, such as exhaust to a condenser or the atmosphere, and where the heat from the uncovered parts will not be objectionable.

On lines specified below all flanges, whether on pipes or fittings, shall be left uncovered, and the covering on the pipes shall be cut back and neatly beveled to allow sufficient space for the removal of the bolts, without injury to the covering.

..... pipe, located.....
..... pipe, located.....

VII. Boilers—(a) **BOILER TOPS**—All exposed boiler tops, or tops of drums, shall be covered with "85% Magnesia" Blocks, finished with ½ in. of "85% Magnesia" Plastic Cement and a coat of hard finished cement.

The covering shall be extended over the top surface of the brick setting on either side of, and in between, the boiler tops and drums, and over top of combustion chamber.

(b) **ENDS OF DRUMS**—The ends of boiler drums, both heads and rings, shall be covered with "85% Magnesia" Blocks and "85% Magnesia" Plastic Cement, or all "85% Magnesia" Plastic Cement, of thickness required, securely wired in place, followed with a smooth finishing coat and covered with a canvas jacket to match the sectional covering or with hard finish cement. The covering of drum ends shall be beveled around manholes.

(c) **BOILER WALLS**—The side brick walls of boiler settings shall be thoroughly sealed against air infiltration by means of 2 coats of heavy paint made up of tar and asbestos; over this shall be applied 1¼-in. thickness of "85% Magnesia" Plastic Cement followed by a final ¼-in. thick coat of hard finish cement.

The "85% Magnesia" Plastic Cement shall be reinforced by means of 2-in. hexagonal wire mesh placed at a distance of from 1 to 1½ in. from the brick wall and fastened thereto by means of No. 16 gauge iron tie wires which shall be either embedded in the brickwork or fastened to expansion bolts embedded in the brickwork on 18-in. centers.

The covering shall be neatly beveled about all openings, and for a distance of 4 ft. from the boiler room floor it shall be protected by some form of sheet metal casing, which shall be provided by the sheet iron contractor.

VIII. Smoke Breeching—On connections from boiler to main smokestack, including portions running to economizer, there shall be applied first, ½-in. mesh black iron wire cloth with ¾-in. V-iron attached, to form air space and fastened directly to the iron.

Block and plastic material shall follow, as specified for boiler tops.

IX. Ducts and Stacks—All hot and temperate air and cold air ducts and flues, and all exposed surfaces of fan casings, tempering coils, etc., shall be covered with "85% Magnesia" Blocks, 1 in. in thickness, firmly secured with No. 18 galvanized iron wire, with all block joints pointed up with "85% Magnesia" Plastic Cement and the edges of all exposed ducts protected with a light metal formed to an "L."

All said insulation (except that concealed in walls, ceilings, etc.) shall be finished with sheathing paper and an 8-oz. canvas jacket, well stretched, and neatly sewed, not less than three stitches to the inch.

X. Heaters, Receivers, Return Tanks, Traps, etc.—All heaters, receivers, return tanks, traps, etc., shall be covered with "85% Magnesia" Blocks and "85% Magnesia" Plastic Cement, and finished with hard finish cement troweled smooth, or with canvas jacket pasted on, the canvas to be the same weight as used on the adjacent pipe covering.

XI. Exposed Coverings—All pipes running outdoors or exposed to extremely low temperatures, whether steam or heating mains shall be covered with 1-in. greater thickness than previously specified, and applied as provided under specification for steam piping, but finished with 3-ply waterproof roofing (in place of canvas), applied with lapped joints and secured with No. 16 copper wire, spaced not over 8 in. on centers.

XII. Painting—Such painting as is required by the engineer or architect is to be included in the general painting contract.

On interior insulation, the canvas jacket shall be thoroughly sized and painted 2 coats of standard lead and oil paint, of such colors as may be selected by the supervising engineer.

TABLE NO. 1—PRICE LISTS

Adopted August 1, 1907

85% CARBONATE OF MAGNESIA PIPE COVERINGS FOR WROUGHT IRON PIPES

Inside diameter of pipe, in.	Thickness of standard covering, in.	Price per lin. ft. canvas jacketed	Thickness of covering, in.	Price per lin. ft. canvas jacketed	Thickness of covering, in.	Price per lin. ft. canvas jacketed	Double layer double standard thickness, in.	Price per lin. ft. canvas jacketed	Double layer double standard thickness, in.	Price per lin. ft. canvas jacketed
1/2	1/4	\$0.22	1 1/2	\$0.46	2	\$0.75	1 1/2	\$0.65	3	\$1.20
3/4	1/4	.24	1 1/2	.49	2	.80	1 1/2	.70	3	1.35
1	1/4	.27	1 1/2	.52	2	.85	1 1/2	.75	3	1.40
1 1/4	1/4	.30	1 1/2	.56	2	.90	1 1/2	.80	3	1.45
1 1/2	1/4	.33	1 1/2	.60	2	.95	1 1/2	.85	3	1.55
2	1/4	.36	1 1/2	.64	2	1.00	2 1/4	.90	3	1.65
2 1/2	1/4	.40	1 1/2	.70	2	1.05	2 1/4	1.00	3	1.75
3	1/4	.45	1 1/2	.76	2	1.15	2 1/4	1.10	3	1.90
3 1/2	1 1/4	.50	1 1/2	.82	2	1.25	2 1/4	1.20	3	2.05
4	1 1/4	.60	1 1/2	.88	2	1.35	2 1/4	1.40	3	2.20
4 1/2	1 1/4	.65	1 1/2	.94	2	1.45	2 1/4	1.50	3	2.35
5	1 1/4	.70	1 1/2	1.00	2	1.55	2 1/4	1.60	3	2.50
6	1 1/4	.80	1 1/2	1.10	2	1.70	2 1/4	1.80	3	2.70
7	1 1/4	1.00	1 1/2	1.20	2	1.85	2 1/4	2.25	3	2.90
8	1 1/4	1.10	1 1/2	1.35	2	2.00	2 1/4	2.50	3	3.15
9	1 1/4	1.20	1 1/2	1.50	2	2.20	2 1/4	2.70	3	3.40
10	1 1/4	1.30	1 1/2	1.65	2	2.40	2 1/4	2.90	3	3.65
12	1 1/2	1.85	1 1/2	1.85	2	2.70	3	4.10	3	4.10
14	1 1/2	2.10	1 1/2	2.10	2	3.00	3	4.60	3	4.60
16	1 1/2	2.35	1 1/2	2.35	2	3.30	3	5.10	3	5.10
18	1 1/2	2.60	1 1/2	2.60	2	3.60	3	5.60	3	5.60
20	1 1/2	2.85	1 1/2	2.85	2	4.00	3	6.00	3	6.00
24	1 1/2	3.30	1 1/2	3.30	2	4.50	3	7.00	3	7.00
30	1 1/2	4.00	1 1/2	4.00	2	5.50	3	8.40	3	8.40

*All coverings larger than 10 in. furnished in segment form; jackets and bands not included.

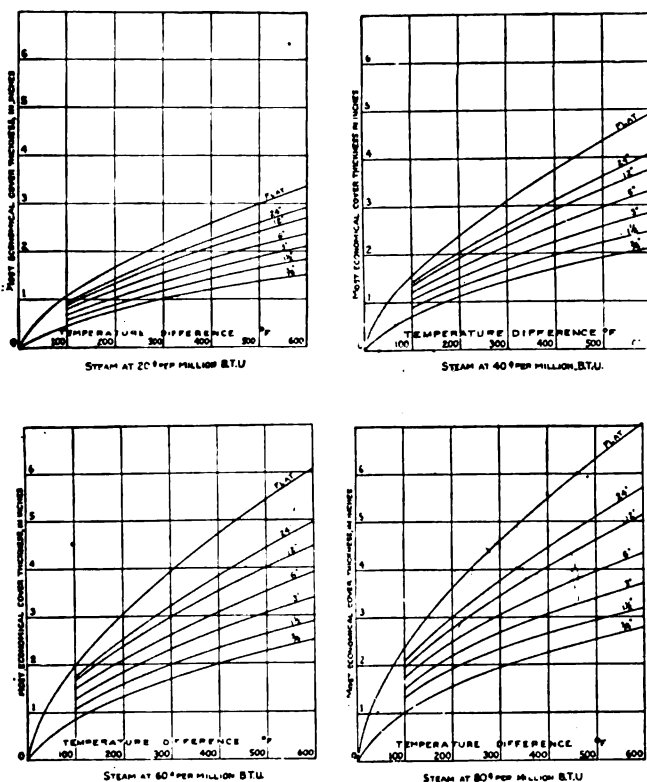
Double standard thickness—the inner layer is furnished in sections for pipe sizes up to and including 10 in. and in curved blocks for larger sizes. The outer layer is furnished in sections for pipe sizes up to and including 8 in. and in curved blocks for larger sizes.

Double 1¼-in. thickness—the inner layer is furnished in sections for pipe sizes up to and including 10 in. and in curved blocks for larger sizes. The outer layer is furnished in sections for pipe sizes up to and including 7 in. and in curved blocks for larger sizes.

85% CARBONATE OF MAGNESIA BLOCKS FOR BOILER COVERING AND SIMILAR SURFACES

Thick-ness, in.	Price per sq. ft.	Thick-ness, in.	Price per sq. ft.	Thick-ness, in.	Price per sq. ft.	Thick-ness, in.	Price per sq. ft.
1 1/4	\$0.30	1 1/2	\$0.45	2 1/4	\$0.64	2 3/4	\$0.83
1 1/2	.34	1 3/4	.49	2 1/2	.68	2 7/8	.87
1 3/4	.38	2	.53	2 3/4	.72	3	.90
1 3/8	.42	2 1/8	.57	2 7/8	.75	3 1/4	.98
		2 1/4	.60	2 3/4	.79	3 1/2	1.05
						4	1.20

Standard Block sizes are 6 by 36 in. and 3 by 18 in.



CURVES SHOWING THICKNESS OF "85% MAGNESIA" FOR MAXIMUM NET SAVING

For use in plants where heat costs, steam temperatures, etc., are accurately known.

These curves are based on the latest determinations of fact, arrived at by the Mellon Institute of Industrial Research

TABLE NO. 2—THICKNESS OF "85% MAGNESIA" FOR MAXIMUM NET SAVING

S=Standard Thickness; DS=Double Standard Thickness (See Table No. 1)

COAL AT \$2.00 PER TON						COAL AT \$4.00 PER TON					
Size pipe, in.	Hot water 175° F.	Steam 5 lbs.	Steam 100-200 lbs.	200 lbs. 150° F. super-heat	200 lbs. 300° F. super-heat	Size pipe, in.	Hot water 175° F.	Steam 5 lbs.	Steam 100-200 lbs.	200 lbs. 150° F. super-heat	200 lbs. 300° F. super-heat
3/4	S	S	S	1 1/2"	DS	3/4	S	S	1 1/2"	DS	2"
1 1/2	S	S	S	1 1/2"	DS	1 1/2	S	S	1 1/2"	DS	2"
3	S	S	S	1 1/2"	DS	3	S	S	1 1/2"	DS	2"
6	S	S	1 1/2"	2"	DS	6	S	1 1/2"	DS	3"	3"
12	S	S	2"	2"	DS	12	S	1 1/2"	DS	3 1/2"	4"
24	S	S	3"	3"	DS	24	S	1 1/2"	DS	3 1/2"	4"
Flat	1"	1 1/2"	2"	3"	3 1/2"	Flat	1 1/2"	2"	3"	4"	5"

COAL AT \$6.00 PER TON						COAL AT \$8.00 PER TON					
Size pipe, in.	Hot water 175° F.	Steam 5 lbs.	Steam 100-200 lbs.	200 lbs. 150° F. super-heat	200 lbs. 300° F. super-heat	Size pipe, in.	Hot water 175° F.	Steam 5 lbs.	Steam 100-200 lbs.	200 lbs. 150° F. super-heat	200 lbs. 300° F. super-heat
3/4	S	S	DS	2"	2"	3/4	S	1 1/2"	1 1/2"	2"	3"
1 1/2	S	1 1/2"	DS	2"	3"	1 1/2	S	1 1/2"	2"	3"	3"
3	S	1 1/2"	DS	2"	3"	3	S	1 1/2"	2"	3"	3"
6	1 1/2"	2"	DS	3"	4"	6	1 1/2"	2"	3"	4"	5"
12	1 1/2"	2"	DS	4"	4"	12	2"	3"	3"	4"	5"
24	1 1/2"	2"	DS	4"	5"	24	2"	3"	4"	5"	5 1/2"
Flat	2"	3"	4"	5"	6"	Flat	2 1/2"	3 1/2"	4 1/2"	6"	7"

N.B.—These tables, with the curves accompanying, are based on the latest determination of fact, arrived at by the Mellon Institute of Industrial Research, Pittsburgh, Pa.

How to Use Table No. 2.

Determine the following factors in connection with the heated surfaces to be covered: cost of coal, steam pressure and size of pipes. Select the table most nearly corresponding to the cost of coal, and the column in table nearest to the condition of steam pressure or temperature. The thicknesses in this column are the proper thicknesses for pipe sizes given at the left.

Example—Cost of coal \$3.75, steam pressure 150 lbs., size of pipe 12 in. Select the \$4.00 per ton table, and the column headed, "Steam 100-200 lbs." Run down this column to the 12-in. line and find that Double Standard (D.S.) is the proper thickness for maximum net saving.

Explanation of Tables and Curves.

The thicknesses given in these tables and curves are the proper thicknesses for the maximum net saving for each condition. They are based on a period of service of 8,760 hours per year.

Where pipes are cold part of the year, multiply the cost of coal by the number of hours per year the pipes are hot and divide by 8,760; use the value obtained instead of the actual coal cost. 20% of the cost has been allowed as the cost of application, and 13% of the total cost for the annual fixed charges (6% interest, 5% depreciation, 2% miscellaneous). The value of the heat losses used in calculating the net savings are based on a series of experiments, covering a period of three years, made for the MAGNESIA ASSOCIATION OF AMERICA by the Mellon Institute of Industrial Research of the University of Pittsburgh.

The tables are for use in plants where costs are not accurately known. They are based on average conditions. In transforming the steam cost to coal cost, it has been assumed that 75% of the cost of steam is coal cost, that 1 lb. of coal will evaporate 7 lbs. of water, and that each pound of steam contains 1,000 B.t.u. above the feed water temperature.

The curves are for use in plants where heat costs, steam temperatures, etc., are accurately known. They are applicable to all heated surfaces, since they are based on the temperature of the surface and the value of the heat in dollars per million B.t.u.

Special Note to Engineers and Architects.

Occasionally when an architect or engineer is writing his specifications, he finds that brevity is so necessary that he can not enter fullest details. When such is the case on the subject of non-conducting pipe coverings, the use of the following abbreviated Magnesia Association Specification will amply insure application of correct insulation:

Non-conducting Covering—All exposed boiler surfaces, all pipes, fittings, or appurtenances carrying steam, hot water or hot gases, where radiation would cause condensation or drop in temperature, or result in loss of B.t.u. which could be utilized, shall be thoroughly insulated as specified in Magnesia Association Specification for 85% Carbonate of Magnesia Non-conducting Coverings.

Copies of Specification.

Copies of the Magnesia Association Specification, herein referred to, will be mailed to engineers and architects on request addressed to any of the members of the MAGNESIA ASSOCIATION OF AMERICA.

Should any insulating condition arise in practise not fully covered in this Specification, please send details of problem to one of the members of the MAGNESIA ASSOCIATION OF AMERICA, and it will have expert consideration and prompt reply.

Handbook.

A practical handbook, "Defend your Steam," dealing fully with the manufacture, uses and application of 85% Magnesia coverings and with the theory and practise of heat insulation, will be sent free on request.

ARMSTRONG CORK & INSULATION COMPANY

Heat Insulating Materials for High Temperature Equipment

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NONPAREIL INSULATING BRICK for furnaces, ovens, kilns, boiler settings, etc.

NONPAREIL HIGH PRESSURE COVERING for high pressure and superheated steam lines.

NONPAREIL HIGH PRESSURE BLOCKS and CEMENT for ovens, steam drums, breechings, heaters and other high temperature surfaces.

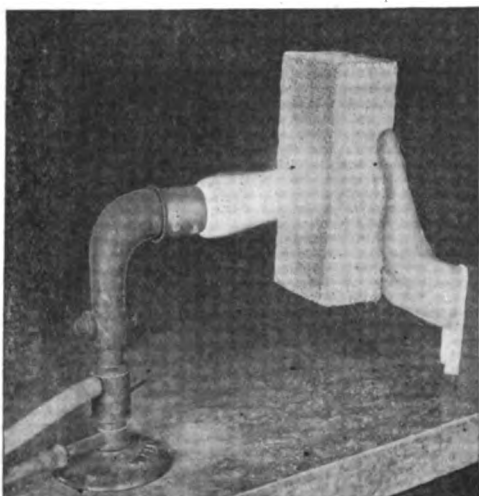
CONTRACTORS for heat and cold insulation.

For Cold Storage Insulation, see page 545.

Nonpareil Insulating Brick.

Nonpareil Insulating Brick combine high insulating efficiency with structural strength and heat resistance in a form readily adaptable to the insulation of furnaces, ovens, kilns, boiler settings and drums, lehrs, benches, stills, retorts and similar apparatus.

Nonpareil Brick are composed principally of diatomaceous earth, a cellular material of practically pure silica which, because of its large "dead" air content, is

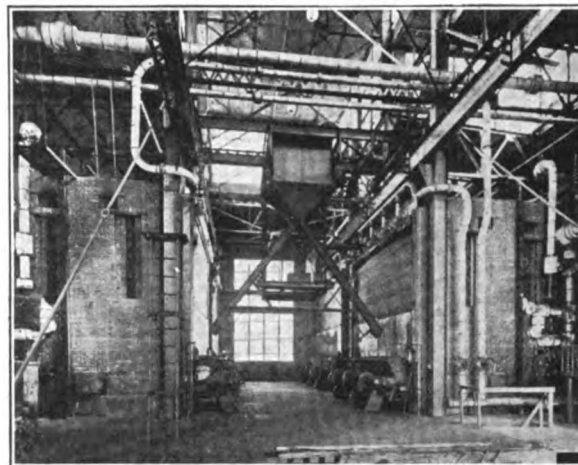


BLOWPIPE TEST ON NONPAREIL INSULATING BRICK

peculiarly effective in retarding the transmission of heat. Granulated cork is mixed with the raw earth, afterward being burned out, and the spaces thus left further enhance the insulating value of the finished product.

Insulating Value—Nonpareil Brick have fully 10 times the heat retarding capacity of common or fire brick; in other words, a 4½-in. course is equal in insulating efficiency to 45 in. of ordinary brick. Their use results in a saving of from 60% to 75% of the heat lost by conduction and radiation from uninsulated construction. As radiation loss frequently amounts to as much as 25% of the total heat, the resultant fuel economy is extremely important. Carefully checked operating records have shown fuel savings of 15% or more where Nonpareil Brick have been used in the construction.

Other Advantages—Though fuel economy alone is more than sufficient to justify their use, other results are of equal importance. More constant furnace temperatures assure greater uniformity of product and

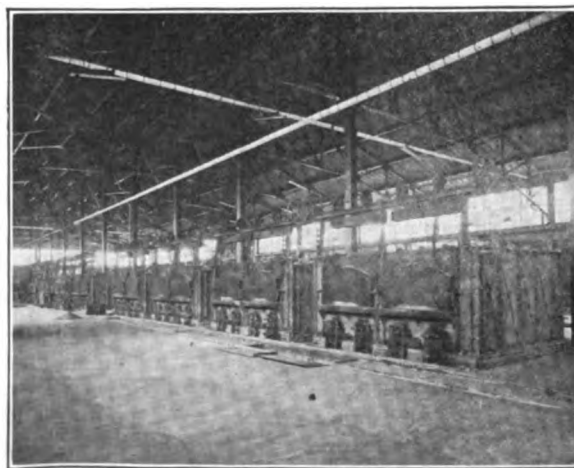


FOUR 1050-H.P. BOILERS OF THE DOMINION POWER & TRANSMISSION CO., HAMILTON, ONT.

Insulated in the walls and over the drums with Nonpareil Insulating Brick

increased capacity. Less time is required to reach working heat. Lower temperatures are maintained in the workrooms with consequent improvement in morale and efficiency.

Structural Features—Being supplied in standard shapes and sizes, Nonpareil Brick are easily built in with fire brick or common brick. Their use involves no additional construction as they take the place of at least an equal number of other brick, the saving in the cost of which largely offsets the cost of insulation. Though averaging in weight only about 1.6 lbs. each, Nonpareil Brick have a crushing strength of 10 tons per sq. ft., and are therefore capable of carrying the weight and withstanding the strains encountered in high temperature equipment. Nonpareil Brick are not a refractory. They will, however, endure a direct heat of 1650° Fahr. without change of form or quality, which, when properly installed, is ample for practically all conditions.



HEAT TREATING FURNACES OF THE GENERAL MOTORS CO., DETROIT, MICH.

Insulated all around with a 4½-in. course of Nonpareil Insulating Brick

The advantages of solid insulation construction over former methods of insulating with loose materials, packed in, or plastic cements, applied externally, are obvious. Nonpareil Brick can not settle or pack or flake off. They are built into rigid, permanent construction, an integral part of the equipment itself.

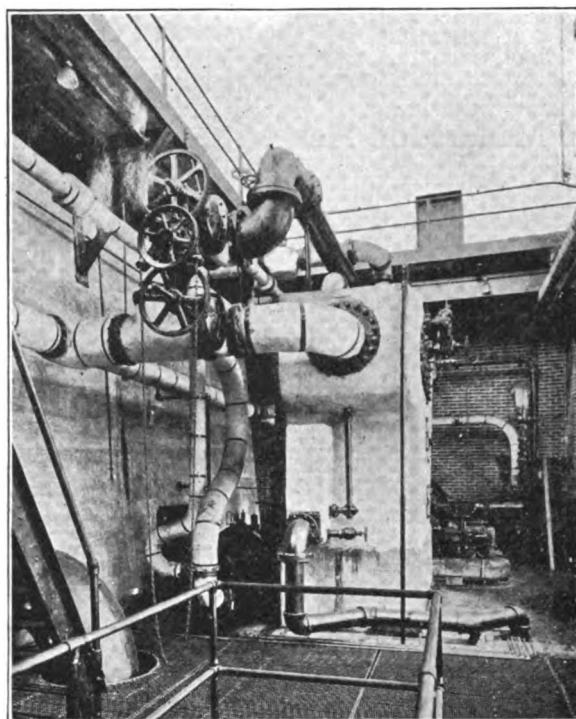
Further Information—The unusual merits of Nonpareil Insulating Brick and their many industrial applications are fully described in a new illustrated publication of 72 pages, "Nonpareil Insulating Brick," which will be sent free on request. Many classes of equipment are treated separately and specifically, with operation records, detailed reports of tests and full specifications. The information given in this book is of exceptional value to designers and operators of industrial plants using high temperature equipment.

Nonpareil High Pressure Blocks.

The insulating efficiency and structural features that characterize Nonpareil Blocks have demonstrated a decided superiority over other materials for the insulation of such apparatus as feed water heaters, evaporators, tanks, enamelling, japanning, core baking and mold drying ovens, economizers, breechings, steam and still drums, etc. As in Nonpareil Insulating Brick, the chief ingredient of Nonpareil High Pressure Blocks is diatomaceous earth, mixed with asbestos fiber to serve as a binder. Here, again, the exceptional insulating property of the raw material accounts for the fact that carefully conducted tests against similar materials prove Nonpareil Blocks to possess approximately 12% greater heat retarding value.

Other Advantages—Insulation of this type, however, demands other qualities of equal or greater importance than low heat conductivity. For instance, the temperatures encountered are high, up to 1000° Fahr. or more. Hence, the insulation must be capable of withstanding this heat for long periods without change in structure or deterioration in quality. The ability of Nonpareil Blocks to meet this condition successfully has been repeatedly proved by service records in many industries. In an enamelling oven in Detroit, Nonpareil Blocks were subjected to a continuous temperature of about 1000° Fahr. for a year, at the end of which time no change in any respect could be discerned.

Again, industrial conditions are frequently such that the insulation is exposed to moisture or even continued soaking. All ingredients of Nonpareil Blocks are insoluble in water, and contain no chemicals to set



PLANT OF THE DOMINION POWER & TRANSMISSION CO.,
HAMILTON, ONT.

Steam lines and feed water heater insulated with Nonpareil High Pressure Covering, Blocks and Cement

up deteriorative action, whether wet or dry. After repeated wettings or complete submersion, Nonpareil Blocks, when dried out, will be found to have lost nothing in insulating efficiency or structural strength.

Nonpareil High Pressure Blocks are supplied in standard sizes, 3, 6 and 12 in. wide, 18 and 36 in. long, and in eight thicknesses between 1 in. and 4 in., inclusive. Special sizes can also be furnished. The structural strength of the blocks is sufficient to withstand shipment and handling with a minimum of breakage. Application is easy and inexpensive.

Nonpareil High Pressure Cement.

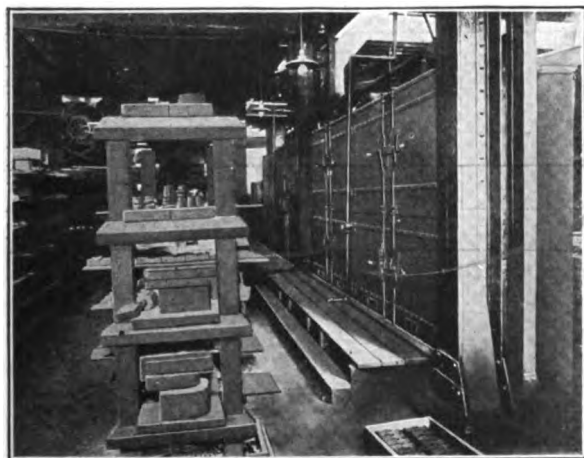
Nonpareil High Pressure Cement is composed of the same materials as the blocks, in loose form. It has the same insulating efficiency, possesses large covering capacity, works easily and takes a hard, smooth finish.

A detailed description of the characteristics, applications and results of using these materials is contained in a 20-page book, "Nonpareil High Pressure Blocks and Cement," which, together with samples, will be sent free on request.

Nonpareil High Pressure Covering.

Nonpareil High Pressure Covering for steam lines is the same in composition as Nonpareil Blocks. It is supplied in 36-in. canvas covered sections and in five standard thicknesses. Not only is Nonpareil High Pressure Covering a better non-conductor of heat than other coverings on the market, but because of its ability to withstand high temperatures, it is particularly well suited for the insulation of superheated steam lines. Moreover, since it will bear repeated wetting and drying without injury, it is an ideal form of covering for underground steam lines.

A 72-page book, "Nonpareil High Pressure Covering for Heated Surfaces," gives detailed information which will prove of interest. Samples and literature will be furnished on request.



TWO 4-COMPARTMENT SHELF-TYPE CORE OVENS OF THE
STROHM CASTINGS CO., DETROIT, MICH.

2-in. Nonpareil High Pressure Blocks used for insulation

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ASBESTOS ROOFINGS: BUILT-UP, READY-TO-LAY and CORRUGATED FORMS; ASBESTOS SHINGLES.

MASTIC FLOORING.

ASBESTOS WOOD.

Service.

Johns-Manville power plant, roofing and building materials are backed by the responsibility of JOHNS-MANVILLE, INC. which assures the engineer better service, better value and greater satisfaction, because of the long, economical service these materials afford. Full details, specifications and drawings will be gladly furnished by the engineering service department of the nearest branch office.

Johns-Manville engineers will be glad to confer on any problems of insulation of boilers, hot and cold pipe systems (inside, outside or underground); packing of rods and pistons; waterproofing, or the use of radiator or steam traps.

Johns-Manville Underground System of Pipe Insulation.

The underground method of distribution of steam and hot water is the most desirable, convenient and economical, provided the system installed meets three important qualifications:

(1) Its efficiency must be equal to, or greater than, that attained with properly insulated pipes running indoors. (2) Its insulating value must not depreciate more rapidly than the pipe itself. (3) Its cost per year, based on its saving of heat and its great durability, must be less than the cost of others.

The Johns-Manville underground system of pipe insulation provides a permanent, efficient and economical means of placing underground, and insulating, pipes conveying steam or hot water.

The efficiency of the Johns-Manville system is at least 90% when installed according to the Johns-Manville specifications, and by them or under their supervision. This efficiency is maintained for a long

period of time on account of the character of the materials used in the construction of this system.

Johns-Manville Pipe and Boiler Insulation.

One of the most important results of the development of asbestos by Johns-Manville has been the saving of heat through insulation. Johns-Manville have developed materials, built on asbestos as a base, that retard the escape of heat from boilers, furnaces, pipes and flues. Twenty-six years' specialization, directed by the highest engineering talent, has enabled Johns-Manville to develop and produce insulations of exceptional efficiency and durability under every service condition.

Asbesto-Sponge, for example—a remarkable felt which combines the insulating value of sponge with the heat resistance and endurance of asbestos—ranks first in efficiency among commercial steam pipe insulations; or 85% Magnesia or Asbestocel, Zero, Anti-Sweat or Brine and Ammonia Insulations. Whatever the needs, they can be met efficiently with one of the Johns-Manville insulations tabulated below:

Service	Type of Insulation	Insulation Recommended
Steam pipes, all pressures	Sectional	Asbesto-Sponge Felted; 85% Magnesia
Medium and low pressure steam pipes	Sectional	Asbestocel
Low pressure steam and hot water pipes	Sectional	Asbestocel
Antifreezing	Built-up and sectional	Built-up Hair Felt; Zero
Brine and ammonia pipes	Built-up and sectional	Brine and Ammonia; Anti-Sweat
Cold water pipes	Built-up and sectional	Anti-Sweat or Built-up
Boiler insulation	Sheet and block, and cement	Asbesto-Sponge; Asbestocel; 85% Magnesia; Cements, Nos. 302, 400, 85% Magnesia
Stack lining	Sheets	Vitrobestos

Johns-Manville Packings.

Johns-Manville packing design provides for economy by reducing friction and preventing leakage losses. By designing for service, JOHNS-MANVILLE, INC. have reduced friction and wear of rods and packings at no sacrifice of tightness.

Engineers have found that instead of having to repack several times a season, a set of Johns-Manville sea rings often lasts several seasons, because the heavy wear on packings, wear of the rod, and loss of power

through friction, so common with other forms of packings, have been reduced to a minimum. Economical service is afforded by Universal piston packing, Service sheet, Kearsarge gaskets, Vulcabeston pump valves and by all the Johns-Manville line.

Johns-Manville Refractory Cements.

Johns-Manville high temperature cements are composed of highly refractory minerals, which, when thoroughly mixed with water to the consistency of mortar or grout, are especially adapted for use as a bond between, or coating of, fire brick for withstanding the action of flame and severe temperatures.

The three cements used for general plant conditions are Nos. 31, 26 and 32. Cements No. 31 and No. 26 are used for bonding, while No. 32 is used as a coating to protect the exposed face of the brick.

These cements are designed to resist high temperatures without fusing or melting, and to provide for continual expansion and contraction of fire settings without disintegrating. Their use in place of fire clay and other mixtures with lower fusing points will greatly increase the life of boiler and other fire brick settings.

Johns-Manville Electrical Materials.

The "Noark" line of electrical protective devices is complete. It comprises: cartridge enclosed fuses, renewable and non-renewable, cutout bases, main line and branch fuse and switch boxes, primary distribution fuse boxes, underground junction and distribution boxes, service meter protective devices, exteriorly operated switch boxes, allsafe switches, and a complete line of accessories.

This entire line is the result of many years conscientious effort to produce the best and most dependable electrical protective devices. The satisfactory service they render wherever used is positive evidence that this effort has been successful, and furnishes obvious proof of Johns-Manville responsibility.

Johns-Manville Steam Traps.

This trap is adapted to power plant requirements and is generally used in sizes with connections from $\frac{3}{4}$ to 2 in. inclusive. It permits the free discharge of water without loss of steam. The action is direct—that is, operation depends upon the movement of the water flowing into it, rather than the temperature or the pressure of the steam.

There is just one moving part—a ball, which is held against the discharge bushing by unbalanced pressure and rises when water flows into the chamber. Whenever the water level rises to a certain point above the discharge orifice, the buoyant force of the water rolls the ball up and exposes part of the discharge orifice, allowing free escape of water and air. As the water level lowers, the ball settles back and closes the discharge orifice, and the water seal which is maintained prevents steam leakage; operation is continuous, for it discharges as the water is received.

Johns-Manville Radiator Traps.

This device permits the free discharge of water and air from the radiator without loss of steam, whether the system operates by gravity or vacuum, and is similar to the Johns-Manville steam trap in construction and principle.

Johns-Manville Asbestos Roofings.

Asbestos rock fiber, a fireproof, timeproof and weatherproof mineral is the base of all Johns-Manville

asbestos roofings which are made in a variety of forms for every roofing need.

Johns-Manville Standard and "Colorblende" asbestos shingles. Made of asbestos fiber and Portland cement united under hydraulic pressure. Furnished in various sizes and shapes, in four colors and two thicknesses, $\frac{1}{4}$ in. and $\frac{1}{8}$ in.

Johns-Manville asbestos ready-to-lay roofings for sloping roofs. Made of asphalt impregnated sheets of asbestos felt cemented together with natural base asphalts. Furnished in three or four plies, in sheets or rolls, ready-to-lay.

Johns-Manville asbestos built-up roofing for flat surfaces. Sheets of asphalt impregnated asbestos felts built up on the roof deck with hot asphalt, in the required thickness, by Johns-Manville workmen.

Johns-Manville corrugated asbestos roofing for skeleton frame buildings. Made of asphalt impregnated sheets of asbestos felt with a reinforcing center sheet of metal.

These roofings are approved by the Underwriters' Laboratories, Inc., take base rates of insurance and are backed by Johns-Manville service and responsibility. This company's engineering service department will be glad to confer and submit detailed specifications and estimates.

Johns-Manville Asphalt Mastic Flooring.

This flooring is in the nature of an asphaltic concrete and consists of a binder, or cement, made up of a combination of natural asphalts and a well graded mineral aggregate of torpedo gravel, crushed stone and sand, with particles ranging in size from those passing a $\frac{3}{4}$ -in. mesh screen down to those which pass a 200-mesh screen.

Johns-Manville Mastic can be laid in any consistency between extreme hardness and softness and, while always dense, possesses a certain amount of resiliency. Does not cause foot soreness and fatigue like concrete and other non-yielding floor surfaces: and where employees of machineshops, factories, and other industries are compelled to stand while at work, it adds greatly to their comfort and efficiency. Furthermore being damp-proof, it is a protection against ailments common to dampness.

This is essentially a floor that is "made to fit"; therefore, each installation should be treated as an individual problem and a specification written to meet the exact requirements. A brief description of conditions sent to any of our Branch Engineering Departments will bring immediate response.

Johns-Manville Asbestos Wood.

A fireproof building material made of asbestos fiber and Portland cement. Recommended for use as a fire barrier in factories, foundries, warehouses, machineshops and wherever a fireproof building material is required, in any of the following forms:

Smoke breechings, roofing, sheathing, window casings, moldings, cabinets, tank linings, ceilings, floorings, battens, boxes and receptacles, fire doors and partitions. It is also impervious to the action of most commercial chemicals.

It has a gray surface which requires no painting, but it can be painted, varnished or grained in imitation of slate, marble or any hardwood.

Can be fastened with nails or screws and does not distort, chip or weaken in service. Comparatively light in weight and has a modulus of rupture of 3500 lbs. per sq. in. under transverse loads.

Approved by the Underwriters' Laboratories, Inc.

MIKESELL BROTHERS COMPANY

Manufacturers of Asbestos and Rubber Products, Converters of Jute and Cotton Fabrics

TELEPHONE:
FRANKLIN 2542

EXECUTIVE OFFICES
156 North LaSalle Street
CHICAGO, ILL.

Products.

ASBESTOS FIBERS; INSULATING MATERIAL, PIPE and BOILER COVERING: "Mibroco" Air Cell Covering, "Mibroco" Asbestos Felt Covering and "Mibroco" Frostproof Covering; "SATINET" ASBESTOS CEMENT; ASBESTOS MILLBOARD and PAPER: "Mibroco" Asbestos Sheet Millboard; "Mibroco" Asbestos Paper or Felt; ROOFING MATERIAL: "Mikesell" Roofing, "Miami" Roofing and "Dearborn" Individual Shingles.

Also manufacturers of Asbestos and Rubber Packings.

Asbestos Fibers.

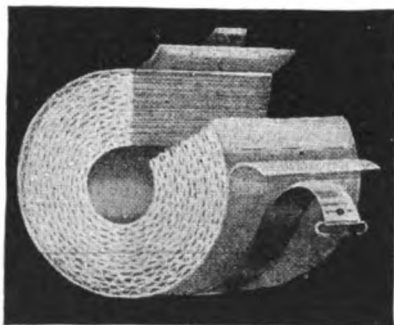
We are prepared to furnish either direct from the mines, or from warehouse stocks at Chicago and at our plant, any grades of fiber desired, such as our M 1 long fiber, M 2 long and short fiber, M 3 short fiber, M M Floats finely ground fiber, and MKS sand. This material is extensively used as a filler in the composition of floors, and stucco work.

"Mibroco" Air Cell Covering.

Asbestos air cell coverings are composed of pure asbestos felt of the best quality and strength, made in the most perfect way. This material is a recognized non-conductor, thoroughly fireproof and almost indestructible. It is adapted for medium and low pressure steam and hot water pipes. No covering on the market can be applied to pipe as quickly or as cheaply as air cell covering. It is a full $\frac{1}{4}$ -in. to the ply and has small corrugations, leaving small spaces for the confining of air.

"Mibroco" Asbestos Felt Covering.

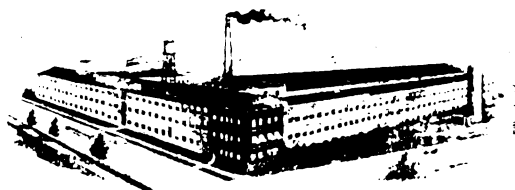
This material is manufactured of successive laminations of expanded asbestos felt in such manner that the process fills the covering with dead air spaces, thus forming a very effective insulation for either high or low pressure. It is not affected by extreme vibrations and is highly recommended for use on pipes of railway cars, factories, power plants, etc.



"MIBROCO" ASBESTOS FELT COVERING

"Mibroco" Frostproof Covering.

This material is composed chiefly of hair felt and wood felt. The efficiency of this covering is due to the hair felt inside, which thoroughly protects the pipes from freezing even in zero weather.



PLANT AND WORKS OF MIKESELL BROTHERS COMPANY, WABASH, IND.

"Satinet" Asbestos Cement.

This cement is 95% pure asbestos. Contains no clay or other impurities. Its adhesive qualities are 100%. It will not crack. It can be used any number of times without deterioration. It will not "set up" in the box while being applied. This material works beautifully under the trowel, making a velvety finish. "Satinet" has a larger covering capacity, fully one-third more, than heavy cements. It is a positive non-conductor of heat. It becomes hard under excessive heat.

"Mibroco" Asbestos Sheet Millboard.

This material is composed of long, fibrous asbestos and is used as a fireproof and acidproof lining for floors, partitions, fire screens, and walls exposed to heating apparatus. Is furnished in hard, medium and soft quality. In sheets either 40 by 40 in. or 42 by 48 in.

"Mibroco" Asbestos Paper or Felt.

This paper is an all fireproof quality and a most efficient insulator against heat, cold and sound. It is flexible, verminproof, and of perfect insulating quality. It is very popular as a fire stop in floors, walls and ceilings, for wrapping heater pipes, lining elevator shafts, for sheathing purposes and building construction.

"Mikesell" Roofing.

A high grade roofing with smooth surface, without corrugations or roll marks, with fine talc dusting finish, including sherardized large-headed nails, in each roll. In rolls of 108 sq. ft. each, 36 in. wide.

"Miami" Roofing.

Slate surface roofing in red or green color, weighing 80 to 85 lbs. to a 108-sq. ft. roll, 36 in. wide.

"Dearborn" Individual Shingles.

Slate surface, each shingle 8 by $12\frac{3}{4}$ in., weighing 220 to 230 lbs. per square. Same composition as "Miami" slate surface roofing.

Catalogue and Samples.

Catalogue "B" will be mailed to interested parties on request. Samples of any of our products for test gladly furnished free of charge.

NORRISTOWN MAGNESIA & ASBESTOS CO.

NORRISTOWN, PA.

BRANCH OFFICE: 23 Lewis Wharf, BOSTON, MASS.

FACTORIES: NORRISTOWN, PA., DOYLESTOWN, PA., and PLEASANT MILLS, N. J.

Products.

ASBESTOS MAGNESIA PIPE and BOILER COVERINGS and CEMENT; ASBESTOS BLOCK, BOARD and PAPER.

Also manufacturers of Cloth and Wick Packing; Asbestos Sheet Packing and Gaskets.

Pipe Coverings.

Pipe coverings are furnished for a wide range of applications to steam and water pipes.

Asbestos Magnesia—A sectional covering for high and low pressure steam work; of solid construction, light in weight, particularly strong and easily handled with small breakage. Uninjured by being water soaked, if allowed to dry without being disturbed.

"Ideal"—For high pressure work, also for pipe lines exposed to weather when water-proofed. Made up of our standard magnesia asbestos with a $\frac{1}{2}$ -in. jacket of wool felt added. This jacket of wool felt, being applied by the broken joint method over the inner core of asbestos magnesia, gives a much higher efficiency and also serves as an excellent protection to the inner core against breakage and hard usage.

Air Cell—For medium and low pressure work. This covering is made up of our special corrugated asbestos paper. It is a non-conductor, thoroughly fire-proof and almost indestructible. Full quarter inch to the ply with small corrugations. Made in 3- and 4-ply, making $\frac{3}{4}$ -in. and 1-in. thicknesses, respectively. Thicker if desired.

"Conomie"—This covering differs from Air Cell by being reinforced by a backing of $\frac{1}{4}$ -in. specially prepared solid asbestos. This backing makes it more efficient and durable than Air Cell. We recommend using 2-ply for exposed riser work and 4-ply for high pressure lines.

Indent—Adapted for use wherever excessive vibration is to be provided for. Made up from our asbestos paper, which has been indented previous to rolling. This is one of the most substantial coverings that we have produced, its particular qualities being efficiency and durability.

Asbestos Felted—Made up similar to Indent, except that the asbestos paper is rolled flat. This is an

exceedingly hard, heavy, durable covering, the walls being practically pure solid asbestos fiber.

Felt—For hot water work. Made any thickness, of a body of superior wool felt. Lined inside with asbestos paper. Has proved an exceptional non-conductor for all low temperature heating work. We recommend $\frac{3}{4}$ -in. thickness for hot water work.

Sweatproof—Particularly adapted for cold water lines through warm or damp rooms to prevent sweating and dripping. Made by our special process, from a special quality of wool felt and lined with tarred paper.

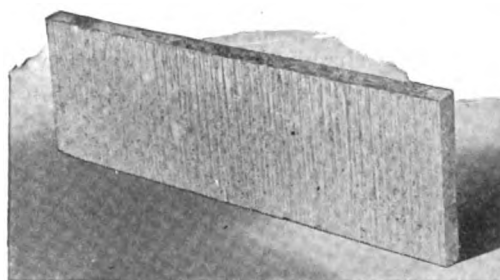
Cold Water Pipe—For exposed pipe lines. Made from the highest quality of wool felt, and lined with the thickest, heaviest grade of tarred paper.

Frostproof

—For outdoor pipe lines exposed to the severest weather. Composed chiefly of hair felt and wool felt. Fittings should be lapped securely with hair felt and canvas. This covering gives exceptional protection to outdoor water lines, protecting them from frost.

Block, Board and Paper.

Asbestos Magnesia Block—For covering large pipes, heaters, stacks, boilers, and flat surfaces. These blocks contain virtually the same materials as our high pressure coverings, except that asbestos fiber of extra length is used to give all possible strength. Made 6 by 18 by 1, $1\frac{1}{2}$, or 2 in., and 3 by 18 by 1, $1\frac{1}{2}$, or 2 in.



ASBESTOS MAGNESIA BLOCK

Asbestos Air Cell Block, Indented Board, "Conomie" Board, Mill Board—Acidproof and fire-proof. For lining walls and ceilings and covering hot surfaces.

Asbestos Paper—Plain and corrugated. Made of pure asbestos. For covering hot air pipes and flues, and for use where a thin pliable covering is required. A good rust preventive.

Cement.

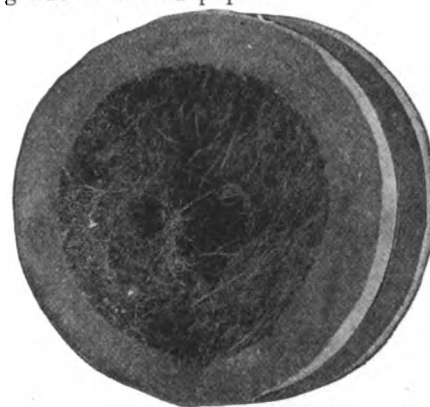
This cement is made of asbestos fiber, magnesia, infusorial earth, and other selected ingredients to insure strength and non-conduction of heat.



ASBESTOS MAGNESIA COVERING



"IDEAL" COVERING



FROSTPROOF COVERING

MANISTEE IRON WORKS COMPANY

Manufacturers of Rotary Jet Condensers and Air Pumps

MANISTEE, MICH.

OFFICES IN ALL LARGE CITIES

Products.

ROTURBO ROTARY JET CONDENSERS and AIR PUMPS.
For Roturbo Centrifugal Pumps, see page 902.

Roturbo Rotary Jet Condensers and Air Pumps.



ROTURBO IMPELLER
The only moving part

Although slightly different in minor detail and size, both the Roturbo rotary jet condensers and air pumps embody the patent pressure chamber impeller used in the Roturbo centrifugal pumps.

Only One Moving Part
—This, combined with ingenious design, results in a mechanism which is distinctive on account of its simplicity, having only one moving part. It is noted for its efficiency in maintaining high and variable vacuums.

Principle of Operation—The single rotating portion of the apparatus performs three functions:

(1) The impeller lifts the circulating water through any height up to 25 or 26 ft. and imparts to it a hydraulic head, thus performing the function of the circulating pump.

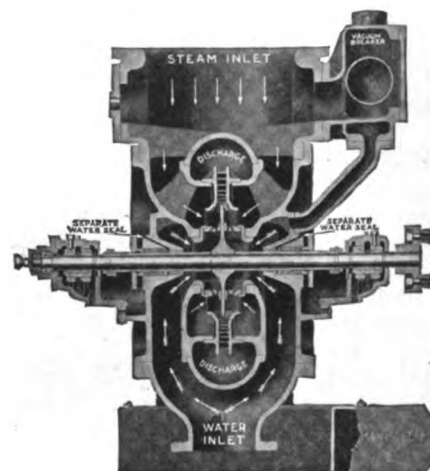
(2) The space between the periphery of the impeller and the inner circumference of the fan wheel forms the mixing chamber and vacuum space in which the vapor is brought in contact with the radial jets of water.

(3) The fan wheel itself acts as ejector and extracts the mixture of circulating water, condensate and non-condensable vapors against the external atmospheric pressure, thus performing functions of air pump.

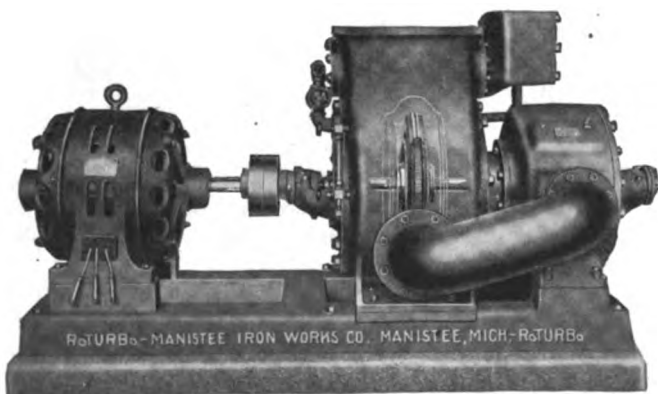
Adaptability.

The condenser and air pump are built for all capacities of steam or air and are especially adapted for high vacuums.

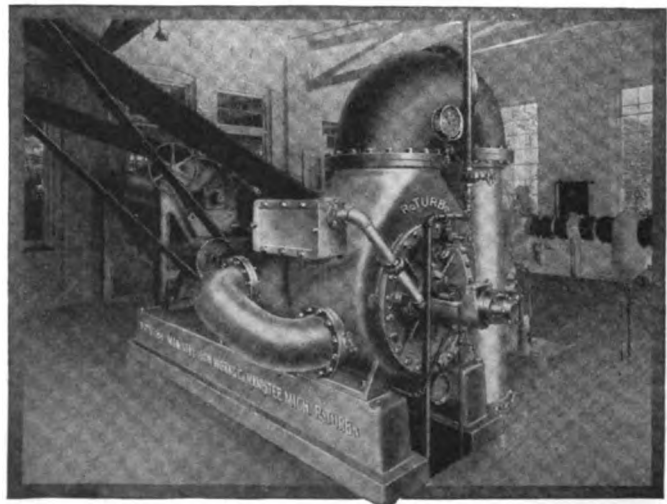
They may be arranged for direct connection, or through gears, or belt and pulley to any type of driver. Send for catalogues.



SECTIONAL DRAWING OF CONDENSER OR AIR PUMP



CONDENSER WITH BOOSTER PUMP



TYPICAL CONDENSER INSTALLATION

WHEELER CONDENSER AND ENGINEERING CO.

CARTERET, N. J.

BRANCHES

NEW YORK
ATLANTA

TUCSON
BOSTON
NEW ORLEANS

DENVER
SEATTLE
PITTSBURGH

SAN FRANCISCO
CINCINNATI
LOS ANGELES

CLEVELAND
PHILADELPHIA
CHICAGO

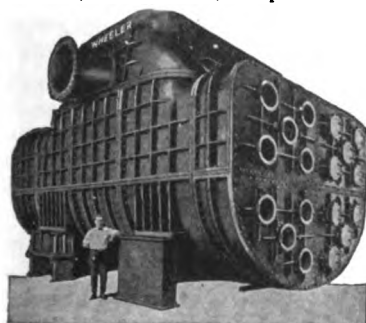
CHARLOTTE
BIRMINGHAM
LONDON

Products.

Manufacturers of complete CONDENSING, PUMPING, and EVAPORATING EQUIPMENT:

High Vacuum Surface and Jet Condensers; Wheeler Steam Jet Air Pumps; Wheeler Rotative Dry Vacuum Pumps; Centrifugal Pumps; Wheeler-Edwards Air Pumps; Wheeler Turbo-air Pumps; Lillie Vapor-reversing Evaporators; Cooling Towers of wood and steel; Crescent Brand Seamless Drawn Copper and Brass Tubes and Pipe.

Also manufacturers of Barometric Condensers; Atmospheric Relief Valves; Feed Water Heaters; Receivers; Reheaters; Expansion Joints.

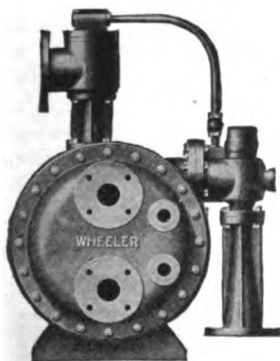


50,000 SQ. FT. SURFACE CONDENSER

Surface Condensers.

For turbines of any capacity. The compartment type can be cleaned while in service without shutting down the turbine. The auxiliary tube plate type eliminates trouble from leakage of circulating water into the condensing chamber.

The condenser illustrated showed on test 300,000 lbs. of steam condensed per hr.; vacuum, 29.53 in. corrected to 30-in. barometer. Equipped with Wheeler turbo-air pump.



WHEELER STEAM JET AIR PUMP

Steam Jet Air Pumps (Patented).

Made in two or more stages with a condenser between each stage.

Rotative Dry Vacuum Pumps.

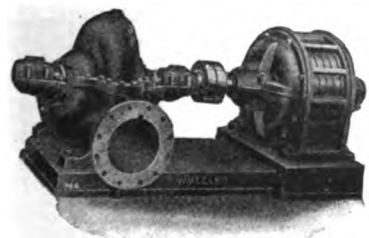
For high vacuum condenser work. Will maintain a vacuum within 0.5 in. of barometer.



ROTATIVE DRY VACUUM PUMP

Centrifugal Pumps.

High efficiency single stage pumps for every purpose; circulating, hot well, and tail pumps for condensers, and for all general pumping requirements. Built in horizontal and vertical shaft, and multi-rotor types; for any drive.



MOTOR DRIVEN WHEELER CENTRIFUGAL PUMP FOR GENERAL SERVICE

Wheeler-Edwards Air Pumps for Air and Condensate.

Eliminate expense of independent air and hot well pumps. No suction or bucket valves. Single, twin, or triplex types, any drive.

Wheeler Jet Condensers.

For steam turbines. Of spray-distribution type. Vacuums 28 to 29 in.



WHEELER JET CONDENSER

Turbo-air Pumps.

High speed rotary type for jet or surface condensers; directly connected to turbine or motor. Highly efficient and reliable.



TURBO-AIR PUMP

Evaporators.

We are exclusive manufacturers of Lillie Vapor-reversing evaporators in single and multiple effects. Lillie evaporators have special features of mechanical circulation, film evaporation, and vapor-reversibility.

Cooling Towers.

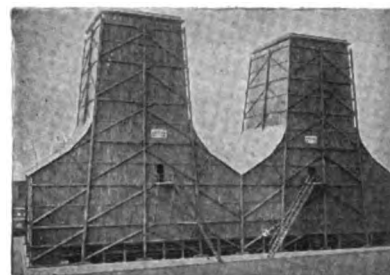
All sizes and capacities for cooling water efficiently in power and industrial plants. Pumping costs are low; in fan types the only other maintenance cost consists of a small amount of power for operating fans during summer months or while carrying heavy loads. Standardized unit construction permits additions to meet increased needs. Built of wood or steel in every draft combination.



LILLIE VAPOR-REVERSING EVAPORATOR
Quadruple effect

Crescent Brand Seamless Drawn Tubes and Pipe.

Made to specifications, of copper, brass, Muntz metal, Admiralty mixture, and other non-ferrous alloys; tinned inside or outside or both; all standard sizes and gauges; cut to required lengths; pipe sizes are threaded when so ordered.



WHEELER WOODEN NATURAL DRAFT COOLING TOWER
Capacity, 500,000 gals. per hr.



CRESCENT BRAND CONDENSER TUBING

THE GREEN FUEL ECONOMIZER CO.

BEACON, N. Y.

BRANCH OFFICES

NEW YORK, N. Y.
PITTSBURGH, PA.
SALT LAKE CITY, UTAH

CHICAGO, ILL.
CLEVELAND, OHIO
TUCSON, ARIZ.
SEATTLE, WASH.

BOSTON, MASS.
ATLANTA, GA.
HONOLULU, HAWAII
LOS ANGELES, CAL.

PHILADELPHIA, PA.
ST. LOUIS, MO.
SAN FRANCISCO, CAL.

ASSOCIATED WITH

GREEN'S ECONOMISER, LIMITED, TORONTO, MONTREAL, WINNIPEG and VANCOUVER, CANADA
E. GREEN & SON, LTD., WAKEFIELD, ENGLAND

Products.

GREEN'S FUEL ECONOMIZERS.

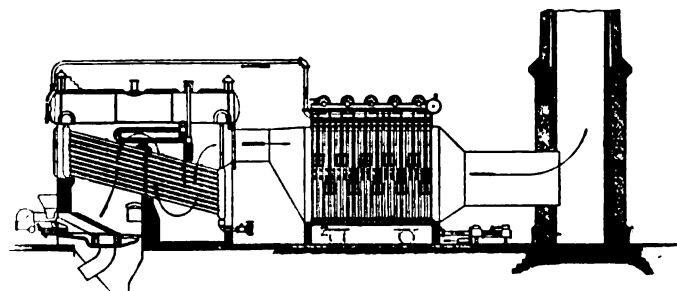
Also manufacturers of Green's Hi-efficiency Hi-speed Radial Flow Fans, Steel Plate Fans, Mechanical Draft Apparatus, Blowers, etc.

Fuel Economizers.

The Economizer consists of a number of cast iron tubes and headers through which the feed water passes on its way to the boiler and around which the waste gases of combustion pass on their way to the stack.

The average saving or increased capacity obtained by installing an Economizer varies from 10% to 15%, depending upon plant conditions, although in many cases greater savings have been made.

Economizers show an unusually high return on the investment due to the large saving in proportion to the small cost of installation, and they should be used in almost every boiler plant, especially as the conservation of fuel is a matter of national importance.



TYPICAL INSTALLATION OF GREEN'S FUEL ECONOMIZER

Economizer Practice.

The standard boiler rating is 10 sq. ft. of heating surface per horsepower and is based on the evaporation of 34.5 lbs. of water per hour from and at 212° Fahr. by the heat transmitted through that amount of heating surface or the transmission of 33,480 B. t. u. per hour. Actual operating conditions, however, vary greatly, as the boiler may be operated at some point below this rating or perhaps at 400% of rating.

A percentage of the heat of the fuel always leaves the boiler in the flue gases as it is impractical and uneconomical to make the boiler surface large enough to transmit all of the heat generated in the furnace. This percentage of the heat of combustion present in the flue gases varies from 12% to 30% under average conditions.

Without an Economizer this heat would all be wasted, but by applying the "countercurrent" prin-

ciple and using the heat in the flue gases after they leave the boiler to heat the feed water before it enters the boiler, a large part of this heat may be saved.

By using an Economizer the temperature of the feed water may be raised from the water supply, hot well or exhaust steam feed water heater temperature to a temperature approaching that of the water in the boiler. The higher feed water temperature thus obtained results in a proportional saving in fuel, as the transmission of less heat by the boiler surface combined with that recovered by the Economizer will produce the same amount of steam as would be produced if the Economizer were not used.

The average saving is 12.5%, and results under varying conditions of feed water temperature and boiler pressure may be approximated by estimating 1% saving of fuel for each 10° to 11° Fahr. added to the temperature of the feed water.

While this information will enable engineers to approximate the results that may be obtained with an Economizer, it is advisable to have this company's engineers calculate each case, taking into account all factors covering the individual installation before making any final plans or specifications for boilers or feed water heating equipment.

GENERAL DIMENSIONS OF GREEN'S ECONOMIZERS

Number of tubes wide	Length of tubes	Width inside chamber walls			Free area through Economizer			Weight of section full of water, lbs.	External heating surface per section	Number of sections	Length over Economizer
		Without side dampers	With 1 side damper	With 2 side dampers	Without side dampers	With 1 side damper	With 2 side dampers				
4	9'	3'-4"	4'-1"	4'-10"	16.60	23.85	31.10	1636	51.0	4	2'-5"
4	10'	"	"	"	18.44	26.50	34.55	1756	55.8	8	4'-10"
4	11'	"	"	"	20.28	29.15	38.00	1877	60.7	12	7'-3"
4	12'	"	"	"	22.13	31.80	41.46	2005	65.4	16	9'-8"
6	9'	4'-8"	5'-5"	6'-2"	21.85	29.10	36.35	2388	76.5	20	12'-1"
6	10'	"	"	"	24.27	32.32	40.38	2570	83.8	24	14'-6"
6	11'	"	"	"	26.70	35.55	44.40	2751	91.0	28	16'-11"
6	12'	"	"	"	29.13	38.78	48.46	2942	98.3	32	19'-4"
8	9'	6'-0"	6'-9"	7'-6"	27.00	34.25	41.50	3096	102.0	36	22'-11 1/4"
8	10'	"	"	"	30.00	38.05	46.11	3337	111.7	40	25'-4 1/4"
8	11'	"	"	"	33.00	41.86	50.72	3578	121.4	44	27'-9 1/4"
8	12'	"	"	"	36.00	45.66	55.33	3835	131.0	48	31'-5"
10	9'	7'-4"	8'-1"	8'-10"	32.25	39.50	46.75	3760	127.5	52	33'-10"
10	10'	"	"	"	35.83	43.88	51.94	4061	139.6	56	36'-3"
10	11'	"	"	"	39.41	48.27	57.14	4363	151.7	60	38'-8"
10	12'	"	"	"	43.00	52.66	62.33	4684	163.8	64	42'-3 1/4"
12	9'	8'-8"	9'-6"	10'-3"	39.25	44.75	51.50	4380	153.0	68	44'-8 1/4"
12	10'	"	"	"	43.61	49.72	57.22	4742	167.5	72	47'-1 1/4"
12	11'	"	"	"	47.87	54.99	62.94	5104	182.0	76	49'-6 1/4"
12	12'	"	"	"	52.33	59.67	68.67	5485	196.6	80	53'-2"

Height over sections, 10'-2 1/4" for 9-ft. tubes.

Height over gearing, 13'-5 1/4" for 9-ft. tubes.

Increase height 1 ft. for each 1-ft. increase in tube length above 9 ft.

DRAVO COMPANY

Manufacturers of Superheaters

1290-1296 30th Street
MILWAUKEE, WIS.

Products.

SUPERHEATERS.

Also manufacturers of Power Plant Equipment.

Dravo Superheaters.

On account of the saving in fuel and the increased efficiency of boilers, the superheating of steam is becoming so general a practice that engineers and power plant owners are more and more interested in procuring high grade apparatus for the purpose.

Dravo superheaters are designed for efficiency, ruggedness, simplicity, and accessibility.

In operation for over six years, and with thousands of boiler horsepower now equipped, they have proved fully the excellence of their design.

Construction.

Dravo superheaters are built in sections and are tested hydrostatically before leaving the shop. They are ready for erection on arrival at their destination.

All parts are of cast or wrought steel, and the apparatus is strictly in accordance with the code of the American Society of Mechanical Engineers applying to superheaters.

Points of Advantage.

The headers are always on the outside of the boiler or separate setting, thereby making it easy to get at the interior of the tubes for inspection.

The tubes can be thoroughly cleaned, which is desirable in many locations.

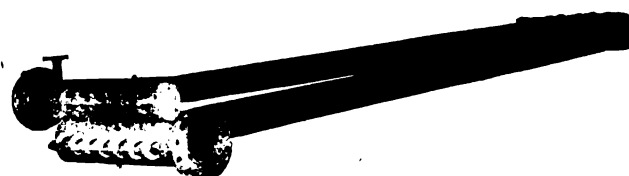
The apparatus does not greatly affect the draft, since the open nesting of the tubes offers but little resistance to the passage of the gases. With boilers being operated at high capacities, this is a valuable feature.

The open arrangement of the tubes permits of their being kept clean on the outside.

Scope.

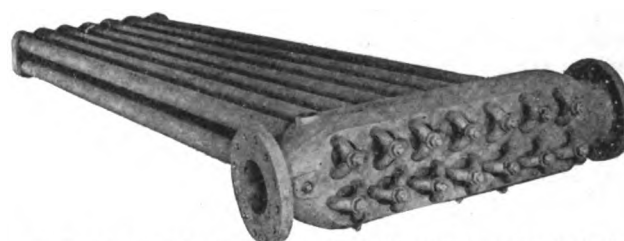
Dravo superheaters have been adapted to nearly every type of boiler.

They are also built for separate firing, with settings and furnaces of their own.



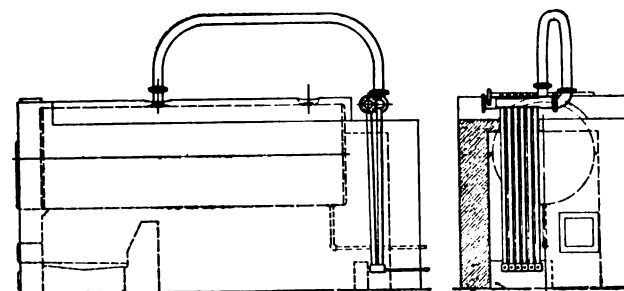
SECTION OF DRAVO SUPERHEATER WITH WROUGHT STEEL HEADER

This type is used largely with H.R.T. boilers

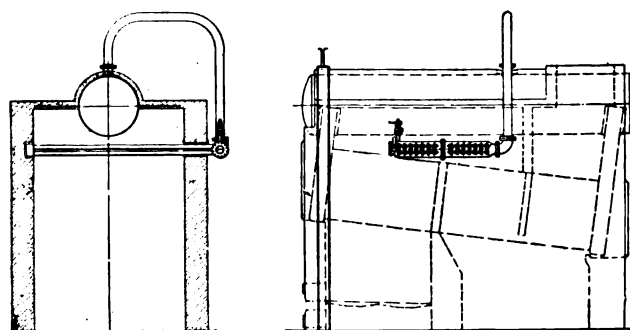


SECTION OF DRAVO SUPERHEATER WITH CAST STEEL HEADER

Used with water tube boilers and separately fired units



DRAVO SUPERHEATER AS INSTALLED IN HORIZONTAL RETURN TUBULAR BOILER



DRAVO SUPERHEATER AS INSTALLED IN A TYPICAL HORIZONTAL WATER TUBE BOILER

POWER SPECIALTY COMPANY

Manufacturers of Superheaters

TELEPHONE:
RECTOR 111

111 Broadway
NEW YORK, N. Y.

BRANCH OFFICES

BOSTON, MASS., 50 Congress Street
PHILADELPHIA, PA., Land Title Building
CHICAGO, ILL., Harris Trust Building
SAN FRANCISCO, CAL., Balboa Building
PITTSBURGH, PA., Park Building
LONDON, ENG., 3150 Oxford Street, W1

AGENCIES

SEATTLE, WASH., J. D. HULL

OTTAWA, CAN., GENERAL SUPPLY CO. OF CANADA, LTD.

Products.

FOSTER SUPERHEATERS: Stationary, Portable, Locomotive and Marine.

FOSTER ECONOMIZERS.

Superheated Steam.

Steam as generated in a boiler has a fixed temperature, which is determined by the pressure. When steam from a boiler is subjected to further heating, its temperature and volume increase, and it becomes what is known as superheated steam.

The process of superheating consists of passing the saturated steam through tubes exposed to the hot gases of the furnace. In this way the temperature of the steam is raised without changing its pressure, and the heat energy in each pound is increased.

Elimination of condensation losses in cylinders and pipe lines; increase in efficiency of steam turbines by at least 10% due to absence of water, which causes friction and wear; reduction of lubrication required in cylinders, since there is no water present to wash oil from the walls; smaller steam lines required, due to reduced friction; same power can be obtained from old boilers when pressure has to be reduced; high temperature at low pressure for special manufacturing requirements.

Steam Saving.

For various kinds of engines, it may be stated, generally, that the steam saving effected by superheating 100° Fahr., as compared with saturated steam, would be for turbines 10%, triple expansion engines 12%, compound engines 14%, and simple engines 18% and over.

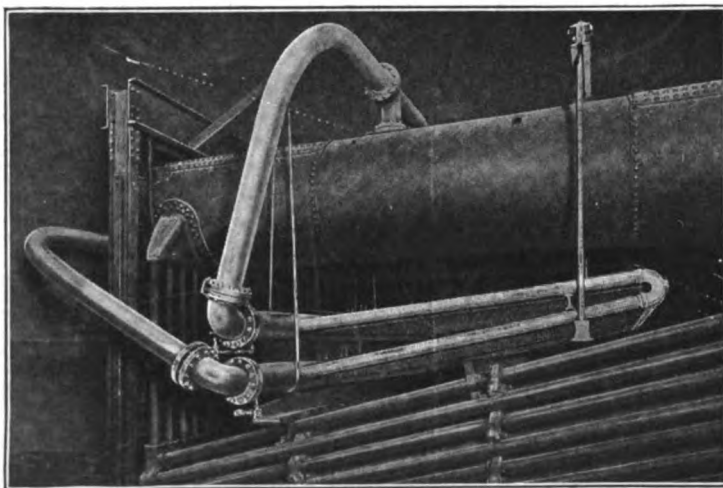


FIG. 1. TYPICAL INSTALLATION OF FOSTER SUPERHEATER IN BABCOCK & WILCOX WATER TUBE BOILER

Foster Superheaters.

Scope—The Foster superheater is built in four general types, as follows:

Attached type for adding up to 200° or 250° Fahr. superheat; separately fired type, for any variety of fuel and any range of superheat up to final temperature of 1200°; waste heat type for steel mills and smelter plants, or marine practice; portable type, for heating steam, oil or air, with oil, coal or gas fuel.

The Foster superheater, for attachment within the boiler setting, is designed for installation in all types and makes of vertical and horizontal water tube boilers, return tubular boilers (Fig. 2), Scotch marine and other fire tube boilers. A total of many million horsepower is in successful operation.

Fuel Saving.

Fuel saving is, of course, the principal reason for installing superheaters, and this saving ranges from 6% to 25%, depending upon the type of power plant; the less economical the plant, the greater the saving with superheat.

Advantages of Superheated Steam.

Superheated steam possesses the following advantages over saturated steam, which effect fuel saving and augment the efficiency of a plant:

Typical Construction—Fig. 1 illustrates a water tube boiler equipped with Foster superheater. As may be seen, the superheater is located above the water tubes and underneath the drums, where it is exposed to the hot gases passing through the boiler. The superheater consists of a series of U-bend tubes or sections set parallel to each other, expanded into two steel manifolds running the full width of the boiler, the saturated steam being led to one of these and thence through the U-bend tubes to the other, and through the outlet piping to the steam main.

An inspection of Fig. 3 shows the construction of the heating elements of the Foster superheater. These

elements are U-shaped steel tubes covered with cast iron rings and split cast iron sleeve over the U-bend. The ends are expanded into inlet and outlet manifolds having reamed holes.

Where U-bend construction can not be used, or where straight elements are required, steel return headers with expanded joints and handhole plugs replace the U-bends.

Material—All parts exposed to steam pressure are of steel, thus giving maximum strength. All parts exposed to gases of combustion are of cast iron, thus insuring long life.

Handholes—Opposite the end of each element a handhole is fitted with a steel plug and metallic gasket, in order to give free access to every part of the interior for inspection and cleaning. The holes, into which the

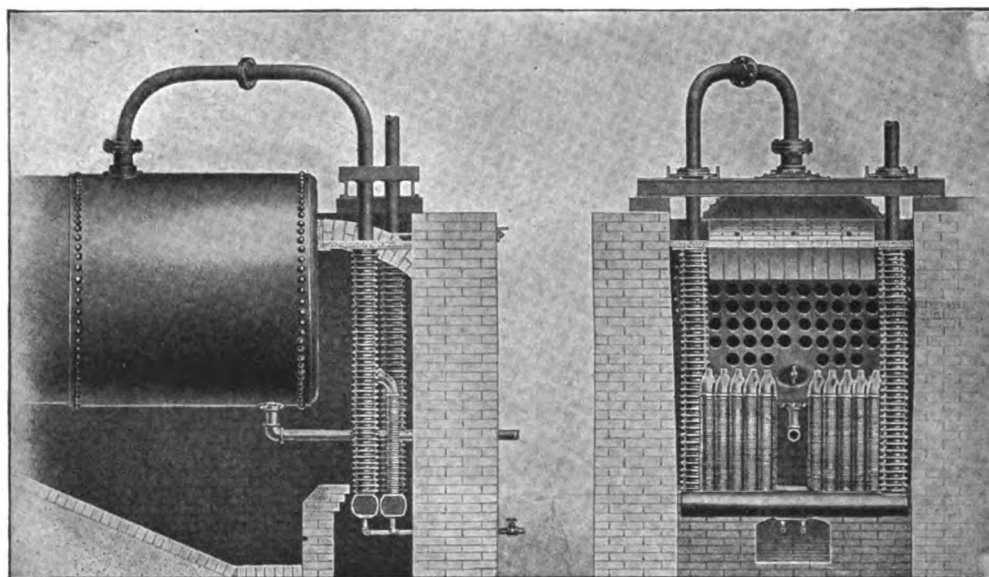


FIG. 2. FOSTER SUPERHEATER IN HORIZONTAL RETURN TUBULAR BOILER

This construction provides a section of great ultimate strength with absolute freedom from internal strains, and forms a large reservoir for the storage of heat which is given up to the steam as required by the variations in gas temperature. This keeps the temperature of the steam constant.

Central inner cores provide annular spaces through which all steam must pass close to the heating surface. Fig. 3 shows the construction including headers and handhole plugs.

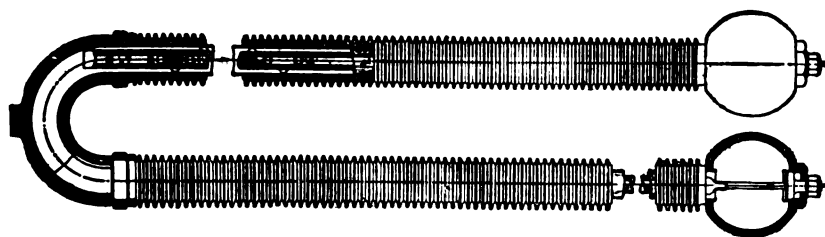


FIG. 3. CROSS SECTION OF RETURN BEND ELEMENT AND CONNECTING HEADERS USED IN CONSTRUCTION OF FOSTER SUPERHEATERS

tubes are expanded and the handhole plates fitted, are reamed to gage.

Advantage of Extended Surface—The extended surface formed by the cast iron annular rings or gills on the outside of the steel tubes greatly increases the absorption of heat from the hot gases, thus making the heat transfer to the steam flowing through the tubes much more effective than that of a base construction. The cast iron outer surface also protects the steel tubes from the erosive and corrosive action of the furnace gases.

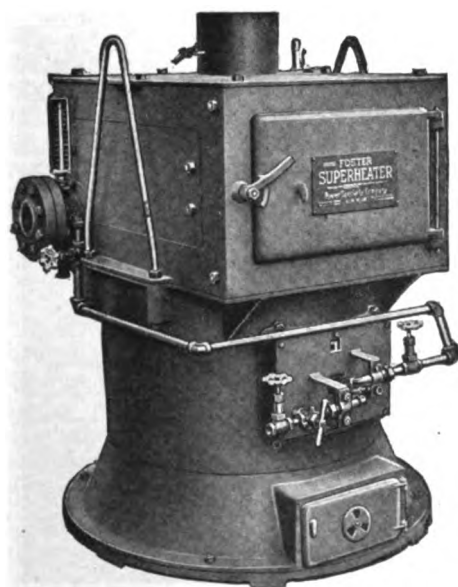


FIG. 4. SMALL PORTABLE FOSTER SUPER-HEATER

For special purposes or field work, such as heating air for drilling, hoisting or general contractor's work

Advantages Obtained by Reheating Air.

The efficiency of compressed air is greatly increased by reheating.

The volume increases directly in proportion to the absolute temperature, and owing to the low specific heat of air the volume of 1 lb. of air may be greatly increased by the expenditure of a very small additional amount of heat.

Foster Economizer.

The use of fuel economizers to raise the temperature of the feed water by means of the heat in the waste gases from boilers is particularly desirable in these days of high fuel costs.

The well-known principles of Foster superheater construction are utilized in the Foster economizer. All pressure parts are of steel. The tubes are completely protected by an external covering of accurately fitted cast iron gilled rings. In the composite elements so formed are combined the advantages of all-steel construction to hold pressure and cast iron to prevent deterioration of steel pressure parts due to direct contact with furnace gases. In addition the gilled ring construction greatly increases the amount of heating surface per lineal foot of element, and permits greatest possible economy of space and simplicity of design.

The Foster economizer is usually offered as a part of each boiler unit, thus reducing to a minimum air infiltration between boiler and economizer, and draft losses through economizer.

Full information regarding the application of Foster economizers to any type of boiler will be forwarded on request.

LOCOMOTIVE SUPERHEATER CO.

Steam Superheaters and Pipe Coils for All Purposes

30 Church Street
NEW YORK, N. Y.

CHICAGO, ILL., Peoples' Gas Building

Products.

SUPERHEATERS: Elesco Superheaters for all types and sizes of Stationary Boilers; Separately Fired Superheaters for all purposes; Superheaters for Locomotives and Steam Shovels and for Marine Service.

PIPE COILS and ELESKO SUPERCOILS for all purposes.

Engineering Service.

The engineering department of this company is at the service of those interested in the advantages or application of superheated steam.

Elesco Superheaters.

Elesco superheaters are suitable for all types of boilers without changes to the boiler setting. They reduce fuel consumption, increase boiler efficiency, reduce condensation in steam lines, reduce steam consumption in engines and turbines, and increase the capacity of the plant.

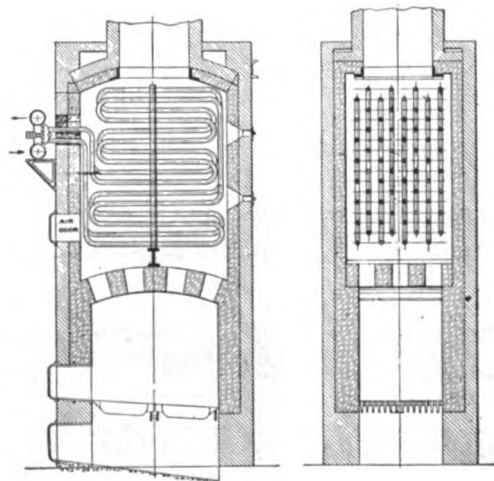
Their design and construction provide freedom from leaks, ease of application, accessibility for inspection and repairs, and maximum length of service without renewal.

The Elesco superheater consists in general of two headers, one acting as the distributor for the saturated steam coming from the boiler and the other as a superheated header for collecting the steam after it has been superheated, and the necessary connecting units in which the actual superheating takes place. The headers are made of steel and located out of the path of the hot gases, and in most cases, outside of the boiler setting proper, affording easy access for inspection and cleaning.

Units are of heavy cold drawn seamless steel tubing located in the advantageous gas temperatures, giving a large ratio of superheating surface, an even distribution to the flow of the gases and a proper distribution to the steam through the superheater. The units present a smooth surface to the gases, tending to prevent an

accumulation of soot and ashes and are thus easily cleaned. Because of their small diameter and proper distribution, they offer a minimum obstruction to the gases.

A metal-to-metal ball joint forms the connection between the units and the headers, giving a positive tight joint and avoids the use of handholes and gaskets.



SEPARATELY FIRED ELESKO SUPERHEATER

Separately Fired Superheaters.

This company designs and manufactures separately fired superheaters for all purposes and for process work, for pressures from atmospheric up to 1000 lbs. per sq. in. and for temperatures up to 1000° Fahr.

The special features of accessibility, regulation, long life and high efficiency are incorporated in these designs.

Superheaters for Steam Shovels.

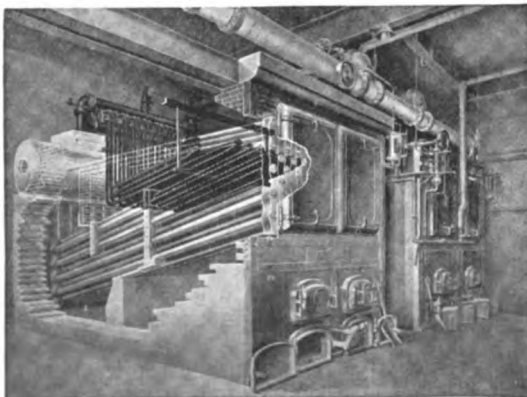
Elesco superheaters, easily installed in steam shovels, reduce fuel consumption at least 25%. At least as high a saving in water is also possible.

Elesco Pipe Coils.

Designed and manufactured to practically any specifications for any purpose. The feature of these coils involving a return bend is the patented forged return bend, which results in a coil of practically a continuous pipe, without threaded or acetylene-welded joints; greatest surface within a given space possible; absolutely leakproof.



SECTIONAL VIEW OF ELESKO PATENTED RETURN BEND



TYPICAL INSTALLATION OF ELESKO SUPERHEATER

JAMES BEGGS & CO.

Manufacturers of Shaking and Dumping Grate Bars

OFFICE AND SALESROOM

42 Warren Street
NEW YORK, N. Y.

Products.

BEGGS SHAKING and CUT-OFF GRATE; BEGGS DUMPING GRATE.

Also, Steam Blowers.

For Boilers, see page 754.

Beggs Shaking and Cut-off Grate.

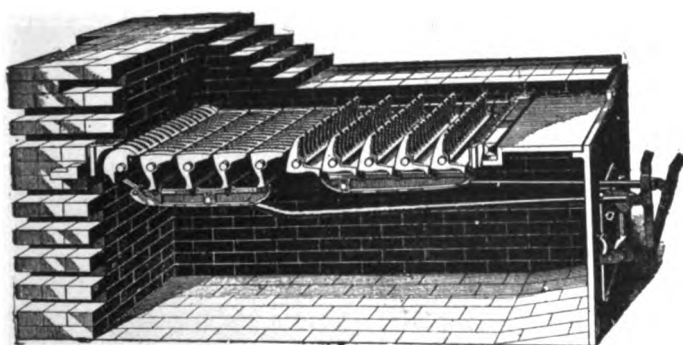
This grate is designed for burning all kinds of coal from bituminous run-of-mine to the smallest size of anthracite.

The grate has three distinct motions; first, the cut-off, where a slice of ash is removed from the bottom of the fuel bed; second, the dumping, where the entire contents of one or more sections is dumped in the ash pit; third, the shaking, where the fuel bed is agitated, permitting the fine ash only to fall into the ash pit.

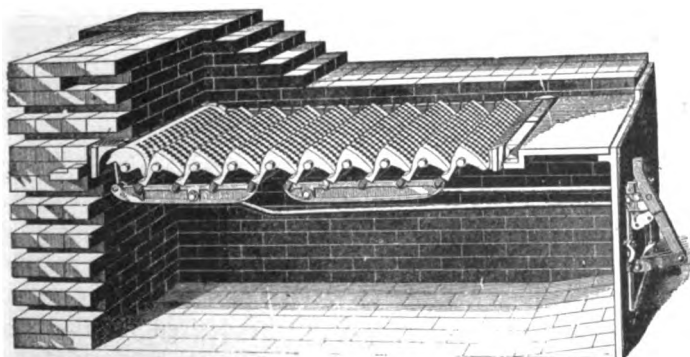
The grate surface is divided into sections, and any one of these motions may be imparted to any section without disturbing the other sections.

Anthracite Fuel—Anthracite coals require that the fuel bed shall be disturbed as little as possible.

With the Beggs improved grate, the combustion is maintained with the minimum of agitation.



Showing Front Section Dumping, Rear Section Firing Position



Showing Shaking Position
BEGGS IMPROVED GRATE

As the layer of ash under the hot coal accumulates, a slice approximately 3 in. thick is removed by means of the cut-off motion of the grate.

Bituminous Fuel—Bituminous coal tends to slag and cake, thereby cutting off the draft through the fuel bed. Continuous agitation is required to keep the fire broken up.

The Beggs improved grate is admirably adapted for this shaking motion.

Beggs Dumping Grate.

Some think that all dumping grates are good; therefore they purchase the lowest priced dumping bar. Others realize that all dumping bars are not of equal value and therefore make a discrimination according to the merits of the bars; viz., design, construction, strength, weight, etc.

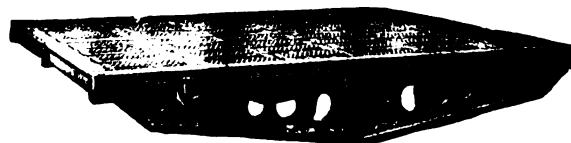
The Beggs dumping bar is what is known as a cradle construction. The cradle holds the bars, which are in contact with the fire. These bars are short, so that expansion may be taken care of without obstructing the operation of the grate.

The Beggs dumping grate dumps forward, that is, the ashes are dumped toward the front of the boiler instead of toward the rear.

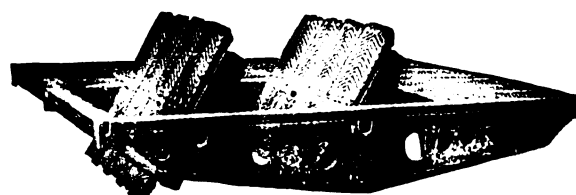
The Beggs dumping bar is very heavy in construction. The extra weight of metal is put where it does the most good; in the operating bars, cradle, journal bars, working bars, etc.

The Beggs dumping bar can be made for any size of furnace having square corners. It can be made to dump in any number of sections which may be practicable.

Catalogue sent on request.



Firing Position



Two Sections Dumping, Others in Firing Position
BEGGS DUMPING GRATE

THE AUTOMATIC FURNACE CO.

DAYTON, OHIO

Products.

MODEL AUTOMATIC SMOKELESS FURNACE; MODEL CHICAGO CHAIN GRATE; DAYTON COAL FEEDER; CULVER SHAKING and DUMPING GRATE; MODEL ACME STEAM ENGINE.

Co-operative Service.

This company will gladly co-operate with consulting engineers, architects, owners, managers, operatives, and all who have to do with steam power, heat or light plants and will gladly furnish such detailed information as may be desired to determine the practicability of any proposed installation.

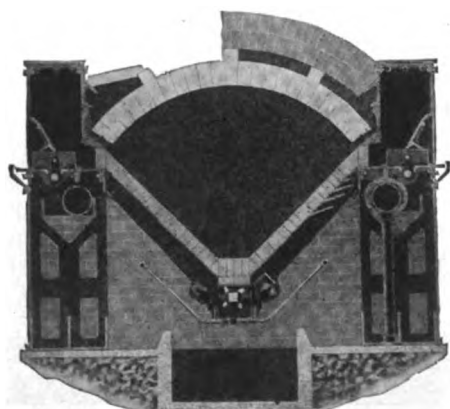
Model Automatic Smokeless Furnace.

The Model Automatic smokeless furnace is so designated because it is an improved form of the side-feed type and embodies greater utility than any other make or type.

The devices for getting rid of the ash have been so designed and perfected that the furnace keeps the fire clean all the time.

The principal parts of the furnace are not exposed to damage and will last a lifetime. The grates are in pairs, one piece of each being stationary and the other movable.

Illustrations show the narrow surface of each grate that is exposed to the heat and the broad surface on which the air acts and cools as it is drawn into the fire bed.



CROSS SECTION THROUGH MODEL AUTOMATIC SMOKELESS FURNACE SHOWING SINGLE AND DOUBLE ARCH CONSTRUCTION

Each pair of grates can be renewed separately and each section of the bar that grinds up and discharges the clinker and coarse refuse can be renewed separately and, if necessary, without putting the furnace out of commission or seriously interfering with its operation.

Air enters the fire chamber and is so admitted as to avoid overheating of the fire arch, arch plates and other parts, and insures instantaneous, complete combustion.

SWEET'S CATALOGUE

Draft—The Model Automatic furnace operates with either natural or induced draft.

There are Model Automatics where ample draft is available that have crowded 500 h.p. boilers to 1500 h.p., for days at a time, maintaining a clean stack.

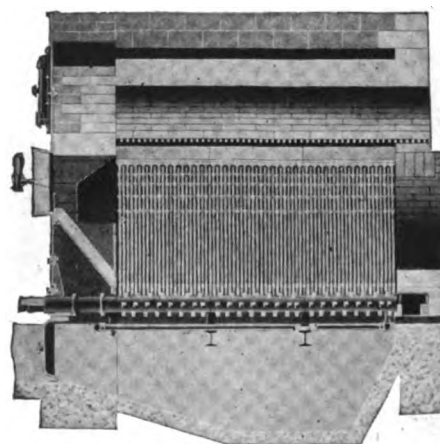
Automatic Regulation—A combination draft and fuel feed regulator can be applied, so that the rate of fuel feed, air supply and combustion correspond to the steam requirements.

No other mechanically operated furnace lends itself more advantageously to economic use of mechanical coal or ash handling. The clinker and other coarse refuse is broken up, so the ash is in suitable condition for any desired method or system of ash handling.

Repairs—The construction and arrangement of the Model Automatic furnace provides for maximum self-protection to all parts subject to damage by heat or wear, and there is therefore a minimum cost for maintenance. The fuel saving is sufficient to pay for the necessary repairs and also to give a large return on the cost of installation.

Operation—A small steam engine or electric motor is furnished with each furnace, battery, or row of furnaces driven through a set of double worm gears, thus giving ample power with use of little steam.

Mechanisms for operating both the stoking and



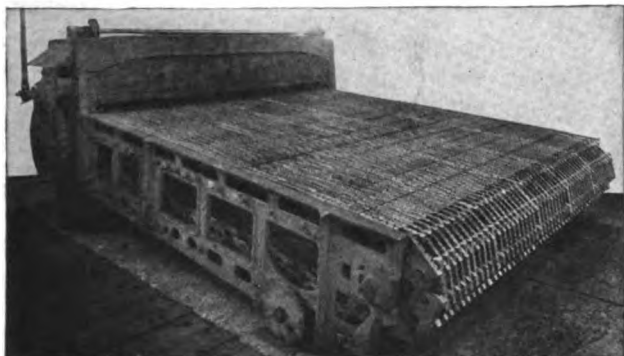
LONGITUDINAL SECTION THROUGH CENTER OF MODEL AUTOMATIC FURNACE

cleaning arrangements are on the outside of the front, not exposed to the heat of the fire. Each part can be disconnected or connected without stopping engine or motor. Motion of clinker grinder can be varied to suit amount of refuse in the coal by simply pulling out a single pin and replacing it in the desired position, to keep the fire clear of refuse and not waste combustible in the ash.

Continued on next page

Chain Grate.

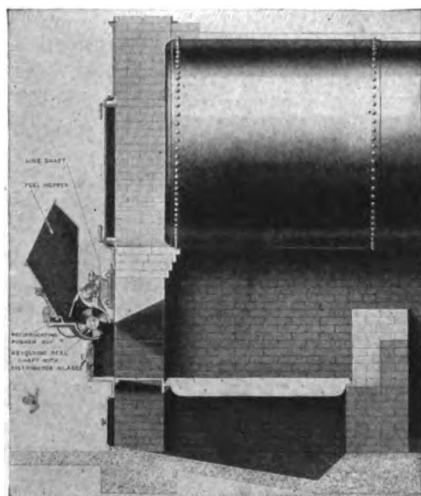
This company also manufactures the Model Chicago chain grate. It is of rugged, heavy construction and is designed to stand the trying service of boiler room equipment. Detailed description will be gladly sent on request.



CHAIN GRATE

Dayton Coal Feeder.

The Dayton coal feeder is designed to meet the requirements of small boilers. It gives a constant, light feed of coal and an even distribution over the grate surface, which results in increased efficiency and capacity, and the elimination of the *smoke nuisance*.



SHOWING DAYTON COAL FEEDER ATTACHED TO SMALL BOILER

Practically foolproof, it reduces the amount of labor required and assists in eliminating the human element. As it is not exposed to the heat of the fire maintenance is nil.

Culver Shaking and Dumping Grate.

Has both a shaking motion, which is sufficient to clean the grate surface of ash and clinker, and a dumping motion in which every other grate raises up and the others drop down. When in this position the grates can be rocked, which will break up the largest and hardest

of clinker, and as an 8-in. opening is afforded everything on the grate is dumped into the ash pit.



CULVER SHAKING AND DUMPING GRATE

The fire surface is made up of small clips which slip onto bar and lock in position. As the grate is of substantial design maintenance is reduced to a minimum.

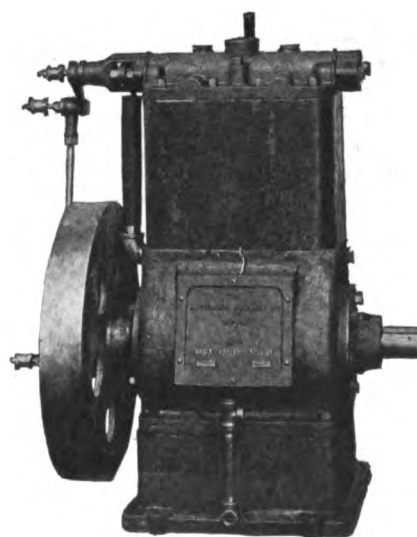
Model Acme Steam Engine.

Uses—There are now thousands of Acme engines in operation, and owing to their rugged construction, simple and durable design, they have no equal, operating as they do with the minimum amount of attention.

Description—Engine is of the single acting, two-cylinder type. Designed to operate under a steam pressure from 80 to 200 lbs. and a speed of 150 to 600 r. p. m. A pair of vertical cylinders are placed above an enclosed crank case which serves as a rigid foundation for the engine as well as a reservoir for the oil used in the automatic splash system of lubrication.

It is provided with generous sized ports for quick inlet and exhaust of steam. Valve is a one-piece casting ground to fit an accurately bored chamber, the latter piece also serving as a cylinder head. Automatic relief valves are provided in the top of the cylinder head to insure quick release of any water which may collect in the cylinders, thereby eliminating any chance of damage from this source.

All bearings of this engine are of ample size and are continuously lubricated by a positive splash system contained in the crank case.



MODEL ACME STEAM ENGINE

JOSEPH HARRINGTON, VICE-PRESIDENT AND ENGINEER

THE JAMES A. BRADY FOUNDRY COMPANY

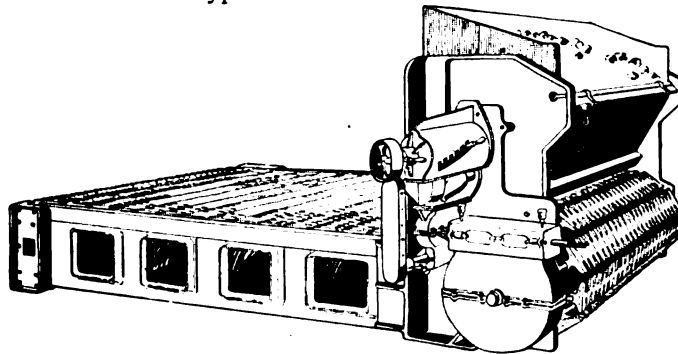
Stokers, Arches, Ash Conveyors and Heavy Castings

4504 South Western Boulevard
CHICAGO, ILL.**Products.**

Manufacturers of the HARRINGTON STOKER, the STEVENS ARCH, the BRADY ASH CONVEYOR and HEAVY CASTINGS.

Harrington Stoker.

The Harrington stoker construction embraces several distinctive features which render it a great improvement over other types of stokers.



HARRINGTON STOKER

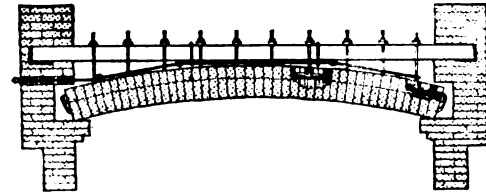
These points are explained in detail in the Brady Company's booklet "Twelve Fuel Facts," which will be sent on request. In brief the special features are as follows:

- (1) Allows fuel to remain quiet.
- (2) Burns inferior grades of coal; discharges all accumulation of refuse.
- (3) Periodically and completely cleans all air space.
- (4) Divided into compartments so that the air pressure is regulated to varying depths of fuel on the stoker.
- (5) Readily convertible to natural draft during low load periods.
- (6) No driving strain transmitted through the grate clips. They support the fuel—heavy driving links of semisteel traveling on rollers carry the grate forward.
- (7) All parts subjected to the fire are readily replaceable while stoker is in action.
- (8) Continuous motion to grate surface.
- (9) A non-sifting grate surface.
- (10) Stationary rear girder—no sprockets, shafts or rollers.
- (11) No wearing parts that do not come to the front at each revolution of the grate.
- (12) The factory behind the stoker is the best guarantee. Twenty years of experience combined with an organization of the foremost engineers of the United States backed by a responsible manufacturer.

Stevens Arch.

The arch embodies an entirely new principle in the construction of furnace roofs. It is formed of a series of rows interlocking one with another; each row consisting of a series of standard shaped brick tapering sufficiently to give a slight curvature to the arch, and to prevent any individual brick from falling out of the arch should it become cracked or detached from its proper support.

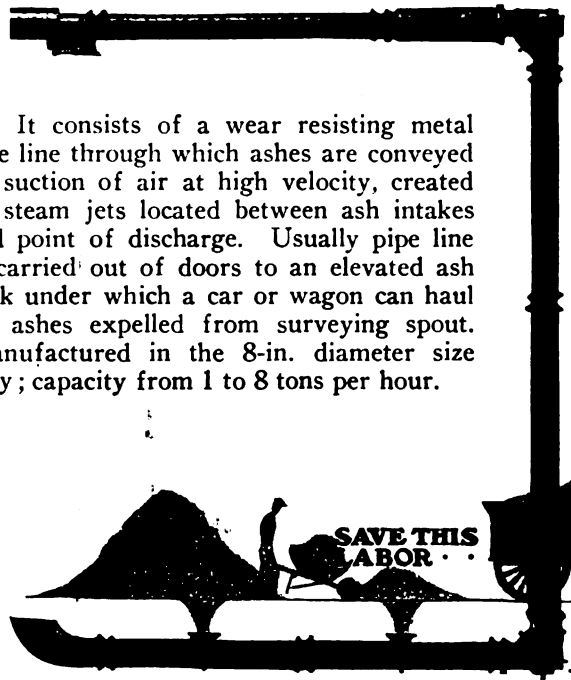
In principle, the Stevens arch is a decided departure from either the so-called flat arch or the sprung arch, retaining the advantages and eliminating the defects of both.



STEVENS ARCH

Brady Ash Conveyor.

The Brady ash conveyor is the means of tremendous economy in money and labor and increases efficiency in factories.



BRADY ASH CONVEYOR

It consists of a wear resisting metal pipe line through which ashes are conveyed by suction of air at high velocity, created by steam jets located between ash intakes and point of discharge. Usually pipe line is carried out of doors to an elevated ash tank under which a car or wagon can haul off ashes expelled from surveying spout. Manufactured in the 8-in. diameter size only; capacity from 1 to 8 tons per hour.

Heavy Castings.

THE JAMES A. BRADY FOUNDRY COMPANY have foundry facilities capable of turning out 100 tons of iron or semisteel castings per day, and single castings weighing up to 35 tons.

Co-operative Service.

THE JAMES A. BRADY FOUNDRY COMPANY maintain an engineering department for stoker installation which will furnish any information required, and submit drawings and proposals covering costs and guarantee of capacity. They will gladly call at any plant and suggest a layout. They will also send interesting literature on any of their products.

Write, wire, or telephone for information and estimates.

CYCLONE GRATE-BAR COMPANY

BUFFALO, N. Y.

NEW ENGLAND AGENT: WALTER H. SULLIVAN, 707 Stevens Street, LOWELL, MASS.
WESTERN AGENT: M. H. DETRICK COMPANY, 549 West Washington Boulevard, CHICAGO, ILL.

Products.

GRATE BARS, SHAKING and DUMPING GRATES.

Description.

The bars are constructed on the clip and truss plan, having two trusses lengthwise; and the clips are bridged across these trusses, each clip forming a double brace with the trusses. No other design can give such a uniform strength to the entire bar. It has no weak spots to warp or buckle. The illustrations will explain clearly the general construction of the grates.

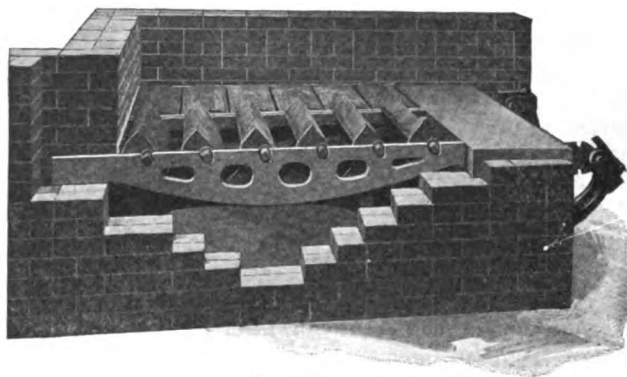
The trusses and clips are beveled from the top side to the underside as follows: The trusses on top side are $\frac{7}{8}$ in. tapering to $\frac{3}{8}$ in. at underside. The clips are $\frac{3}{8}$ in. at face (top) of the bar and beveled to $\frac{3}{16}$ in. at underside. The distance between the clips on the face of the bar is $\frac{3}{8}$ in. and on underside is $\frac{9}{16}$ in.

The bevel has three special advantages: First, all ash that passes through the face of the bar must drop directly through to the ash pit. Second, the openings being nearly twice as large at the underside as on the face side, it admits nearly double the volume of air than if the lines between the clips were parallel. Third, there is no friction on the air (draft) until it has reached the extreme top edge of the openings, or face of the bar, thus unbroken currents pass up through unobstructed air spaces, the result of which is too obvious to need explaining. This design is practically equal to a forced draft, as the large volume of air gathered through the larger air spaces at the underside of the grate can not escape except through the top side, at which point it is evenly distributed through the fuel. The bars rest in the frame on chilled axles, which are proof against wear.

The shaking device is strong, simple, and effective. The equalizing bar slides onto the trunnions of the arms, which run down from the ends of the bars, and are secured by cotter pins; while a wrought iron rod 1 in. in diameter connects the equalizing bar with the shaking and dumping arm on the front of the boiler. This arm locks into a lug which is secured to the front of the boiler by cap screws, and is fitted with a cast steel link which drops into a slot and locks the bars level.

The bars can be shaken as vigorously or gently as may be desired, according to the condition of the fire, having a motion of 4 ins. up and down without opening the spaces between the bars any farther than when the grate is locked level. No unburnt fuel can drop through it. The "filing movement" of the bars (owing to the fact that they set in the frame eccentrically) cuts the ash entirely off the bottom of the fire, making it possible to maintain the free circulation of air through the fire.

When it is desired to dump the residue of the fire, the shaking lever is pressed downward until the bars are thrown to such an angle that the entire contents of the firebox drop through between the openings, which are then about 4 ins. wide, into the ash pit. There are, of course, clinkers which, under certain conditions, no shaking grate can dump; but if the conditions of the firebox, bridge wall, combustion chamber, and grates are such as they should be, heavy clinkers may be avoided, for there is no other grate that will handle clinkers as effectively as the Cyclone.



CYCLONE GRATE BAR IN FIREBOX

Material.

It is a common fallacy that any kind of iron is good enough for grate bars, but the very opposite is the case. These grates are made from a mixture of iron which has been found from years of tests and experiments to be best suited for the purpose. We use this grade only. Grates are therefore of uniform quality, and many sets have shown no evidence of burning after 4 years of continual firing 24 hours a day.

Points of Superiority

It admits 68% of the available air.

It can not waste fuel when shaken, as the openings between the bars are no greater when shaken than when locked level.

When the bars are thrown to dumping position the residue of the fire drops directly into the ash pit, clear of all working parts of the grate.

It locks level; can not get out of adjustment. Damage by accident or careless handling has been fully provided against.

It will burn any kind of fuel; the bar furnished is best suited to the fuel which is cheapest, or most desirable, in any locality.

The bars are so braced and trussed that warping is a practical impossibility. There are no points or fingers to burn off.

The filing movement, when shaken, cuts the ash off without disturbing the fire. Cleans ashes from unburnt fuel without waste.

Evaporation—more water per pound of coal. The heavy smoke is consumed, therefore more perfect combustion is obtained.

Every detail in the construction and equipment of the Cyclone shaking and dumping grate has been studied with the view of conserving the three essential features of simplicity, durability and economy of fuel.



CYCLONE ROUND GRATE



CYCLONE ROUND GRATE BAR IN A DUMPING POSITION

DETROIT STOKER COMPANY

DETROIT, MICH.

Products.

Manufacturers of DETROIT "V" TYPE NATURAL DRAFT STOKER and DETROIT UNDERFEED STOKER.

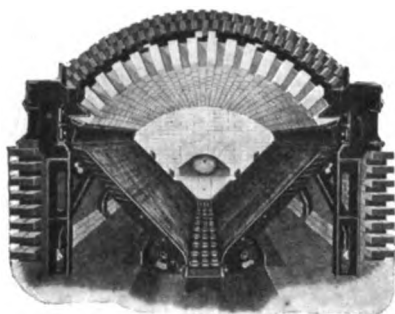
Detroit "V" Type Natural Draft Stoker.

For twenty years the Detroit "V" type stoker with its many refinements in design and construction has proved to be the most efficient stoker of its type on the market.

Adaptability—It is adaptable to all types and sizes of boilers. It burns economically all grades of bituminous coal.

Operation—The fuel is continuously fed from the coal magazines to the upper end of the grates. Each alternate grate has a slicing motion which prevents clinker from forming on the grate and keeps the entire fuel bed moving towards the clinker crusher at the bottom. The continuous motion of the clinker crusher grinds the clinkers and deposits the refuse in the ash pit below.

Advantages—Variable loads and heavy overloads are handled with a minimum of attention, and savings in fuel costs varying from 10% to 25% and labor savings of from 50% to 75% are effected.



DETROIT "V" TYPE STOKER WITH RADIAL SPRUNG ARCH



DETROIT "V" TYPE STOKER WITH DETRICK FLAT ARCH

Each tile is independently suspended from the center—allows free expansion and contraction; easily replaced without disturbing brickwork

The stoker is automatic in all its functions, continuously feeding and distributing the coal and removing the ash and refuse.

Adjustments are easily made, while stoker is in operation, to any conditions of load or grade of fuel.

Design—The Detroit "V" type stoker can be equipped with either the radial sprung arch or the Detrick flat suspended arch (see illustrations).

The arches are cooled by air admitted through openings in the stoker front. This being preheated passes into the furnace under control through the tuyeres over the coking coal, supplying the oxygen for combustion.

Detroit Underfeed Stoker.

In order to conserve fuel and labor, every boiler should be equipped with a mechanical stoker. Twenty years of experience in the manufacture of automatic stokers has taught us how these results can be easily produced.

A Detroit underfeed stoker installed under the boiler will reduce fuel and labor bills, eliminate the smoke from the chimney and make life worth living for the operator.

Adaptability—Adapted to all types and sizes of boilers.

Features of Construction—This design embodies features which have proved by experience to be the best.

A mechanically driven plunger or ram operated by reduction gears from a shaft below, and driven by a small engine or motor.

All gears are entirely machine finished, worms are thrust ball bearings and all moving parts are fully enclosed, running in oil and easily accessible.

The fire doors are equipped with Detroit stoker fire door locks, valuable in case of damage to the boiler.

Operation—Coal is fed through the retort by means of a plunger or ram connected to a square steel pusher rod and pusher blocks. They are located at the bottom of the retort below the fire and deliver the fuel uniformly the entire length of the retort.

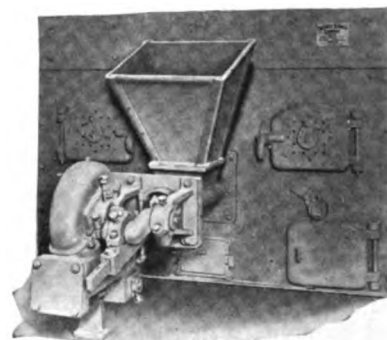
The coal hopper is designed to receive the coal by hand or from coal spouts.

An ash dump on each side of the stoker dumps the ash into a pit below. It can then be removed through the ash doors in front or be delivered to a hopper or ash conveyor. Illustration shows ash dump in dropped position.

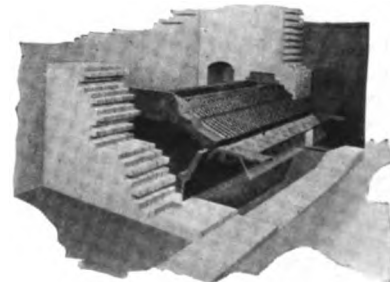
Advantages—The capacity can be increased without reducing boiler efficiency and a high overload can be carried.

The control of the air in the wind box and the convenient arrangement for regulating the amount of coal, to be burned, in accordance with required load, produces a uniform steam pressure in the boiler.

The feed regulation, and clinker and ash removal are both accomplished without interfering with the stoker operation.



DETROIT UNDERFEED STOKER
Front view



DETROIT UNDERFEED STOKER
Showing ash dump in dropped position

Information and Service.

Illustrated catalogues will be sent promptly on request.

This company will also be pleased to furnish complete information relative to the installation of Detroit stokers.

THE FREDERICK ENGINEERING COMPANY

Manufacturers of Stokers and Conveyors

FREDERICK, MD.

MAIN SALES OFFICE: 61 Broadway, New York, N. Y.

BRANCH OFFICES IN ALL PRINCIPAL CITIES

Products.

The FREDERICK "CENTRAL STATION," "SUPER-STATION" and "INDUSTRIAL TYPE" STOKERS; The FREDERICK STEAM JET ASH and DUST CONVEYORS.

Agent for Frederick Centrifugal Pumps.



TRADE-MARK

Frederick stoker is guaranteed to comply with the smoke laws of any city in the United States.

Service—We maintain a service department always ready to assist our customer in connection with operation of the stokers.

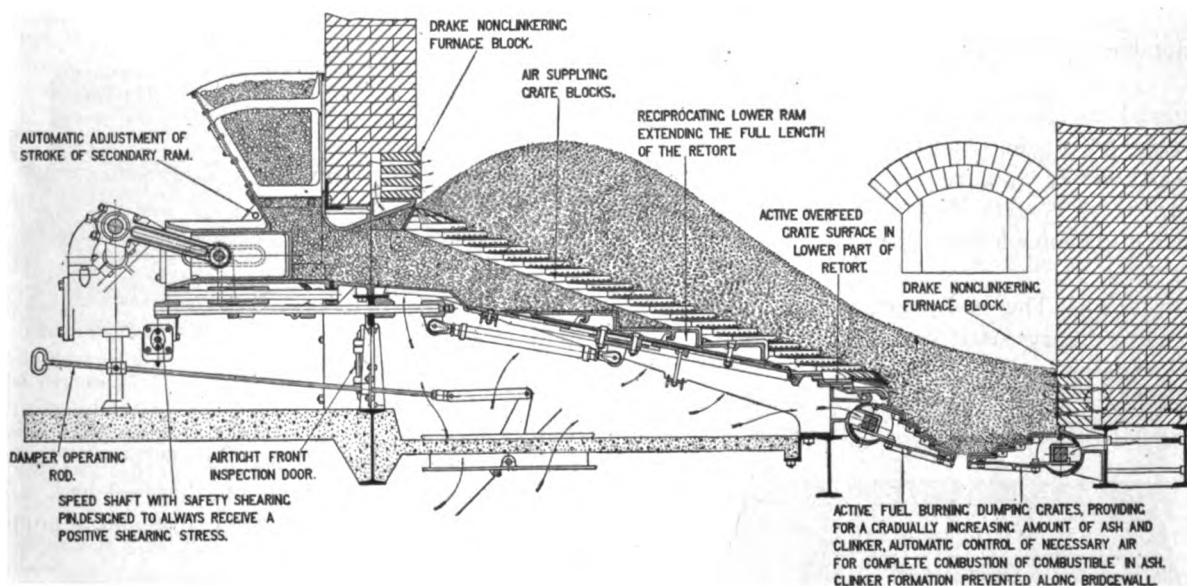
Installations—A few Frederick stoker installations:

Carnegie Steel Co.
United Gas Improvement Co.
Jamestown Street Railway Co.
Eastman Kodak Co.
LeRoy Hydraulic Gas & Electric Co.
U. S. Naval Air Station
Hagerstown and Frederick Railway Co.
Lord Construction Co.

and many others.

Stokers.

Construction—The Frederick "Central Station" type stoker is built on the inclined unit retort principle. The coal feed and air supply are automatically controlled to meet load demands. The ash and clinker is automatically deposited on the active dumping grates, which automatically provide space for the increasing amount of ash and clinkers and maintain the proper amount of air for complete combustion of the fuel at this point.



FREDERICK "CENTRAL STATION" TYPE UNDERFEED STOKER

Adaptability—Due to its simple construction with no operating parts below the floor line, the stoker is applicable to any type of boiler, and can be set to give a relatively large combustion space, under relatively low boiler settings.

Flexibility—The moving retort bottom acts on the entire fuel bed, distributing the fresh fuel over the air distributing tuyeres and quickly breaks up a banked fire. 250% of boiler rating can be obtained in less than five minutes from a banked boiler.

Capacity—Due to the large underfeed grate area per retort, the special design of the tuyeres used and the constant breaking up action of the moving retort bottom, the capacity which can be obtained with the Frederick stoker installed within ordinary furnace dimensions varies between 300% to 350% of boiler rating.

Smokelessness—Due to the principle of feeding the fuel and correct system of air admission complete combustion without smoke is the result at all times. The

Steam Jet Ash Conveyor.

Adaptability—The Frederick steam jet ash conveyor is a simple efficient means to dispose of ashes from stokers, grates, etc., especially for the industrial plant.

Installations—A few Frederick steam jet ash conveyor installations:

Timken Roller Bearing Co.
Carnegie Steel Co.
Champion Machine & Forging Co.
American Stove Co.
Hiram Walker & Sons, Ltd.
Fisher Body Co.
Valvoline Oil Co.
Franklin Quality Refining Co.
Rex Paper Co.

and a large number of other successful installations.

Steam Jet Dust Conveyor.

The Frederick steam jet dust conveyor is extensively used in connection with economizers, combustion chambers, smoke flues, etc. to remove the combustion waste and ash accumulating at such points.

KELLY FOUNDRY & MACHINE CO.

Manufacturers of Furnace Grates, Boiler Fronts and Power Plant Equipment

GOSHEN, IND.

Products.

ROCKING, DUMPING and STATIONARY FURNACE GRATES; BOILER FRONTS and ACCESSORIES.

Also manufacturers of Cast Iron Power Plant Equipment.



TRADE-MARK

Superior Features—The Kelly idea is to make the grates fit the conditions under which they are to work, and the utmost in fuel economy is attained by making the grates with air opening best suited to the fuel used.

The ventilated center-bearing bar is a feature not possessed by other grates. The air enters from either side below the grate surface, and passes through the openings on the surface. These openings are shown in plate No. 18.

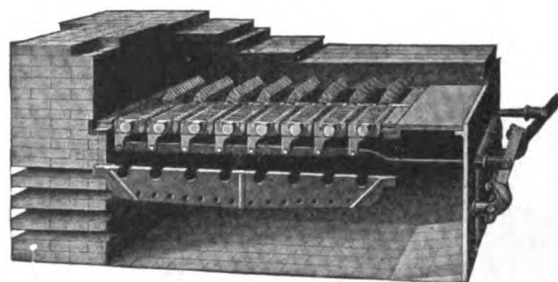
A steady, even fire can be maintained by rocking

Rocking and Dumping Grates (Style A).

Construction—The Kelly grates offer least resistance to the passage of air, and at the same time support the fuel; movable, for the sifting of ashes and dumping of clinkers, and operated easily and effectively; free from cumbersome or complicated parts and attachments, and adaptable to the various fuels and furnace conditions.

Material used has the greatest heat-resisting qualities. Grates are made in uniform pattern, will expand and contract evenly, and are not liable to warp. Entire framework is held together by pins, connecting the ends of the side and center-bearing bars with the ends of the tie bars.

Installation—The Kelly grates may be installed where any ordinary stationary grate has been used, without changing supports; sets on regular standard front and rear angle grate rests. Drilling required in boiler front for shaking attachment is 1-in. holes.



STYLE A. PLATE NO. 16

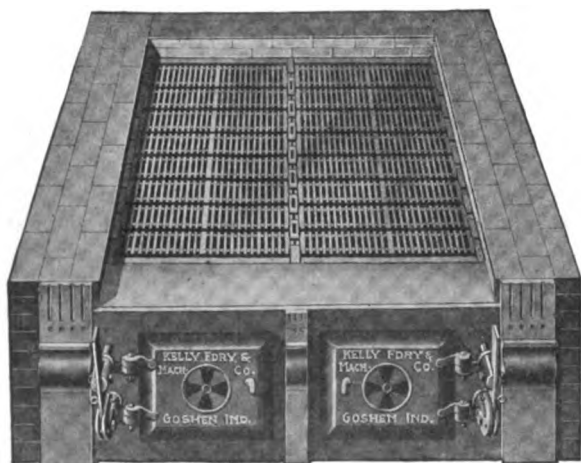
Side-bearing bar removed, giving a clear view of simple mechanical arrangement for rocking and dumping. Each section operated independently

the grates and keeping the air space open. Grates have a flat surface, and therefore operate with greater effect in disturbing and breaking up the fuel bed. Surface can be cleaned by shifting the fire and dumping one section at a time.

No fingers to burn off; will burn any kind of fuel, and burn it up clean; need no alterations in a regular furnace to install. Actual tests have proved that they will save from 5% to 25% in fuel.

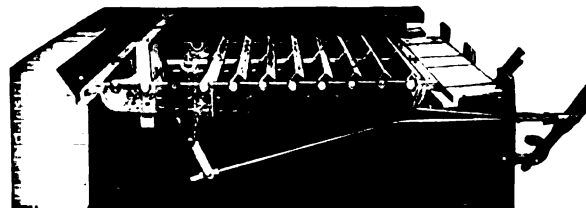
Rocking and Dumping Grates (Style B).

In this style the large dumping grate, at the rear of the furnace, operates independently in disposing of the residue of combustion at the rear of the furnace, where it accumulates next to the bridge wall.

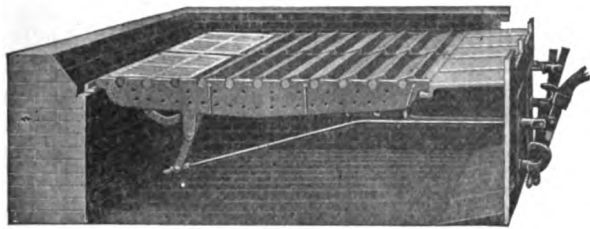


STYLE A. PLATE NO. 18
Standard installation

Operation—The rocking motion is confined to a certain limit, by a simple locking device, eliminating the possibility of wasting fuel or dumping the grates in the rocking operation; by releasing the lock pin, the grates may be dumped and thoroughly cleaned without opening the fire doors.

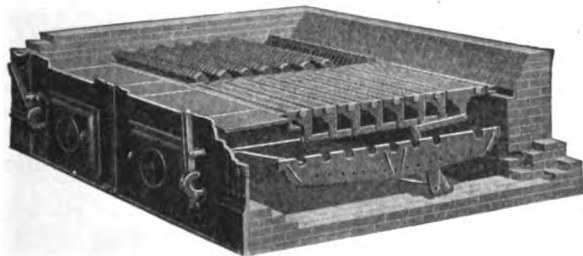


STYLE B. PLATE NO. 22
Full dumping position with 18-in. rear dump



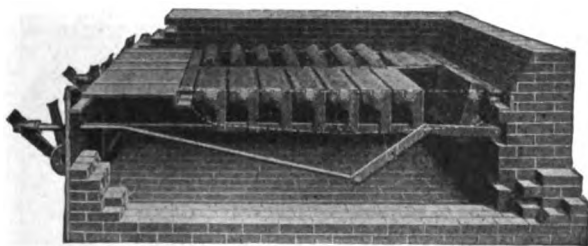
STYLE B. PLATE NO. 23

Rocking motion with rear dump grates locked in level position. With use of lock pin in shaker stand each section of grate can be locked in level position, 18-in. rear dump



STYLE B. PLATE NO. 15

Grate surface 5 ft. long by 5 ft. wide. One side-bearing bar removed from normal position to give view of mechanical arrangement of rocking and dumping operation. The shaking attachment is made at right- and left-hand sides. Each section requires two levers to operate



STYLE B. PLATE NO. 13

Front sections of grate surface are operated independently from double-capacity rear dumping grates, giving fireman every advantage for perfect control of fires. The dumping operation is accomplished by removing lock pin from shaker stand. 12-in. rear dump

Sizes, Styles A and B.

Standard sizes run in even feet and half feet in both width and depth, and are carried in stock. Grates are furnished for any size area and any number of sections wide on receipt of order, at no extra price per square foot.

"Kelly Improved" Grates, Stationary.

The air opening is continuous from one side of the furnace to the other, admitting 10% more air than any other grate. No dead surface. An equal volume of air to every square inch of the surface.

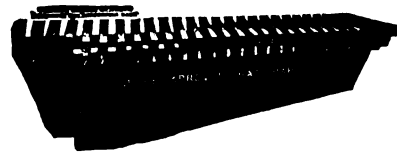


THE "KELLY IMPROVED" GRATE

Standard width 6 in., any length. Air openings $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$ and $\frac{3}{4}$ in.

SWEET'S CATALOGUE

The side, or support bar, does not come to the fire surface, but is 1 in. below it. This allows a draft circulation above the side bar, which keeps it cool and protects the strength of grate from the direct action of the heat, therefore it can not sag nor warp.



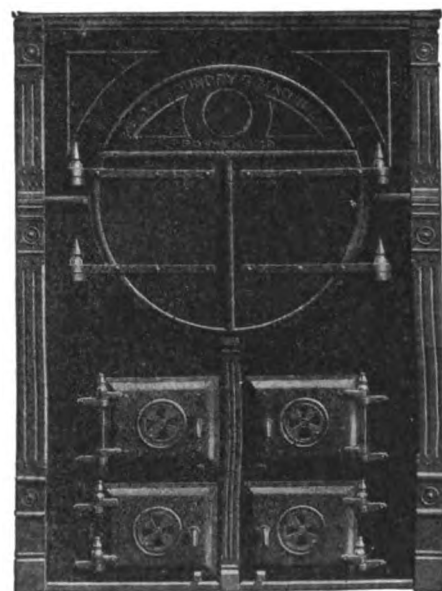
SECTION "KELLY IMPROVED" GRATE

Boiler Fronts and Trimmings.

Design, style and sizes of the Kelly boiler fronts and trimmings have been established for years and conform to the average power plant equipment. Many patterns have accumulated and special work can be furnished on short notice. Pattern and machine shops are well equipped to handle work from blue print or sketch.

Complete setting consists of front proper, fitted with flue, fire and ash doors, baffle plates fitted to fire doors, dead plate and liners, rear grate rest and grates, rear arch rest and arch bars, buckstays and diamond washers, soot door and frame, breeching frame and damper. Front accurately fitted and lettered.

Styles and Sizes—Ten different regular styles: full arch and half arch fronts; Dutch oven fronts; smoke extension fronts; full and half creamery fronts. Sizes: 30- to 84-in.



STANDARD NO. 1 BOILER FRONT

Catalogues.

Foundry catalogue is "G."
Grate catalogue is "C."

MARION FOUNDRY CORPORATION

Manufacturers of Shaking Grates

Marion National Bank Building
MARION, IND.

Product.

The CLEAR-CUT SHAKING GRATE.

Description.

The Clear-Cut Grate has four positions:

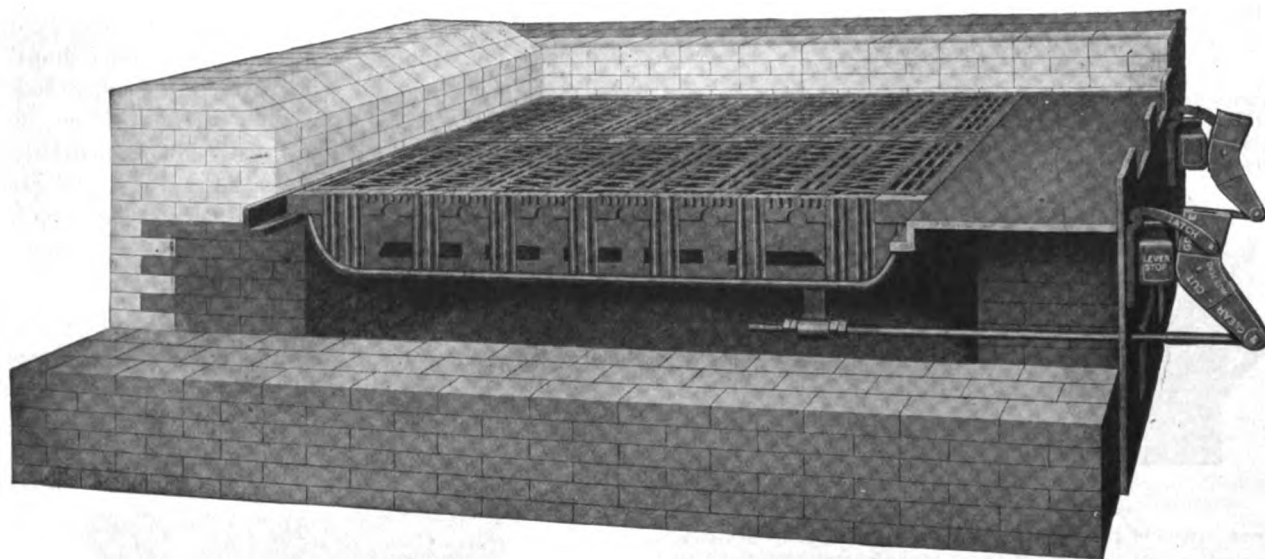
Level.

Ash sifting.

Semi-dumping or medium dumping.

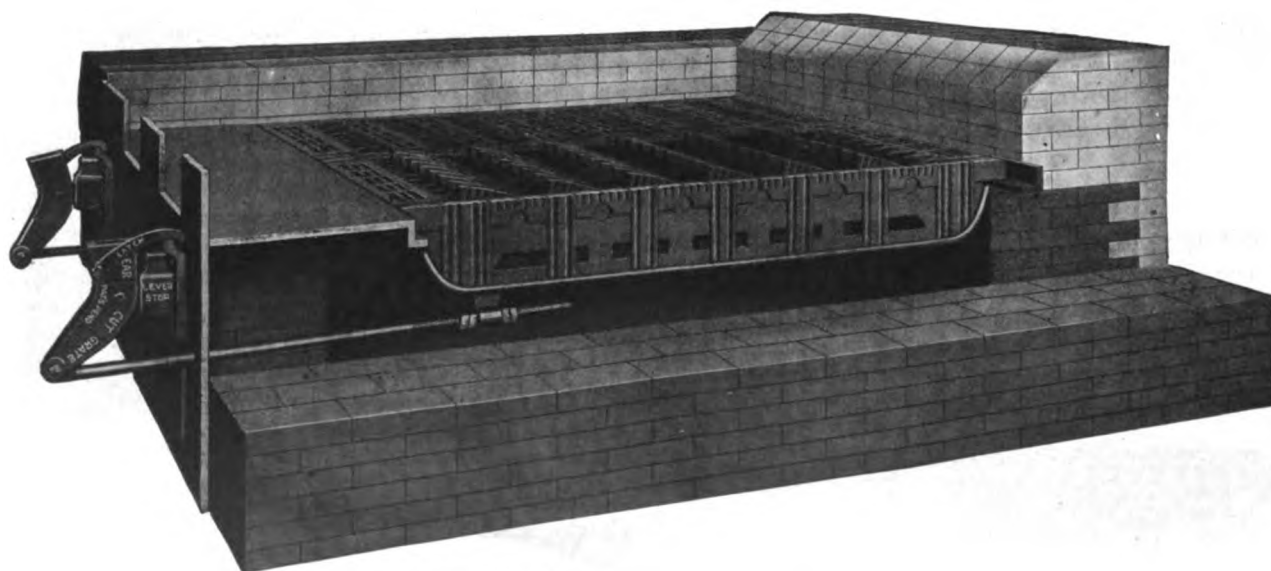
Full dumping.

The illustrations herewith show these four positions.



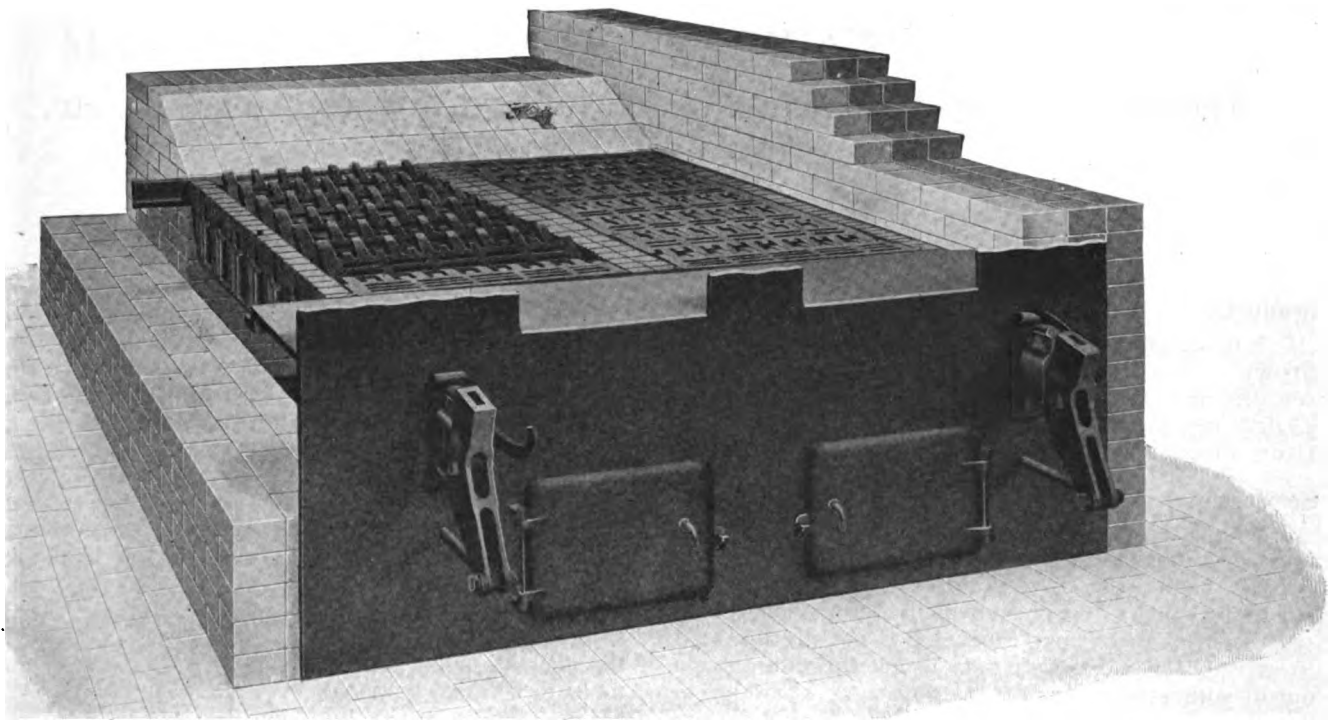
TWO-SECTION GRATE IN LEVEL POSITION

Grates are held level by the latch



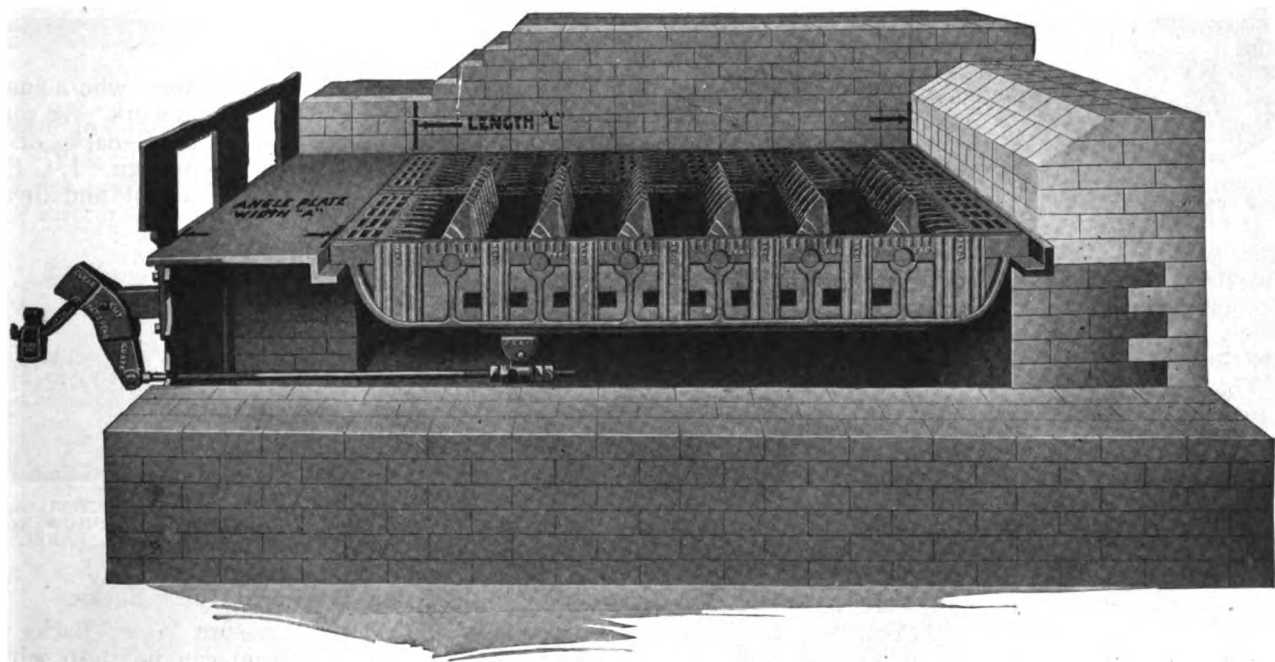
TWO-SECTION GRATE IN ASH SIFTING POSITION

Without throwing the latch the grates can rock forward and back to level without appreciable widening of the air openings



TWO-SECTION GRATE IN SEMI-DUMPING OR MEDIUM DUMPING POSITION

Latch is thrown back when this action is used. There is a 2-in. dumping clearance along the full length of the rocking bars. Clinkers too large to fall through this 2-in. opening may slide into the valleys between bars and are then cut up and pushed through by the knife edge fingers of the rocking grates. Locked shafts help to make this crushing action possible



TWO-SECTION GRATE IN FULL DUMPING POSITION

The lever stop is removed from fulcrum post to obtain this full dumping action, which gives a 5-in. dumping clearance along the full length of the rocking bars. This permits the fireman to clean the grate bare at one throw of the lever. The fireman is always master of his fires with a Clear-Cut Grate

ESTABLISHED 1844

LACLEDE-CHRISTY

Manufacturers of Automatic Stokers, Furnace Arches, Arch Tile, etc.

ST. LOUIS, MO.

BRANCH OFFICES

NEW YORK, N. Y., 504, 50 East 42nd Street CHICAGO, ILL., 1366 Peoples Gas Building
PITTSBURGH, PA., 901 Oliver Building

Products.

LACLEDE-CHRISTY CHAIN GRATE STOKER; STOWE STOKER; LACLEDE-CHRISTY FLAT ARCHES and FLAT ARCH TILE; ARCHNU, a High Temperature Cement; LACLEDE-CHRISTY HIGH PRESSURE WATER BACKS.



TRADE-MARK

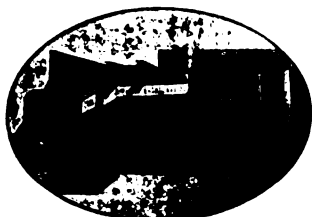
Services.

The attention given to *automatic stoker* installations is almost as important as the stoker itself—the two go hand-in-hand. Therefore, when we install a stoker in a plant, our responsibility in the matter has just begun. From that time on we are always ready to assist in every possible way to get the utmost value out of your stoker equipment.

Laclede-Christy Chain Grate Stoker.

This is a *natural-draft* type of stoker, for higher volatile coals, and is dominant in this field today.

Fully three-quarters of the stoker-fired boiler horsepower of the Western bituminous coal territory is equipped with chain grates, and this type will always continue to be in demand for these fuels. The Laclede-Christy Chain Grate Stoker represents the highest development of its type. It is of the self-cleaning link pattern, of high quality construction, and is installed with such capable engineering that the furnace, stoker and draft facilities as a coal-burning unit leaves nothing to be desired, whether from the viewpoint of economy, capacity, flexibility, or labor expense.



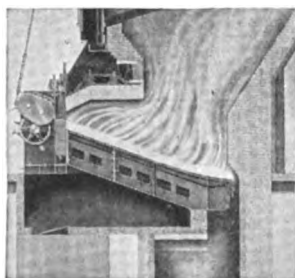
LACLEDE-CHRISTY CHAIN GRATE STOKER

Stowe Stoker.

This is a *forced-draft* type, whose fundamental principle is conveyor feed, positive in action from coal hopper to ash pit.

These are a few compelling features:

- (1) A single Stowe Stoker can be used for units up to 1500 h.p., thus doing away with the center furnace wall.
- (2) The tuyeres are provided with graduated air spaces arranged to proportion the air correctly to the gradually varying requirements of the burning fuel bed. The design of the tuyeres is such that drippage is reduced to a negligible minimum.
- (3) It is the *only* conveyor feed built on a decided incline and therefore excels in strong ignition temperatures.



STOWE STOKER

(4) It is the *only* conveyor feed that holds the nearly spent fuel back on the grate until every bit of combustible is consumed.

(5) It does not form clinkers, and it positively and automatically discharges the ash from the furnace.

Laclede-Christy Flat Arches.

The Laclede-Christy Flat Arch can be successfully used in any place where a crown or top is required for a hot furnace.

The design of the supporting structure of the arch is based on the multi-piece or sectional idea. This is an exclusive and patented feature which contributes to the strength and flexibility of the arch. This feature made possible the adoption of long arches. In fact, the sectional idea permits the structure to be readily adapted to a wide range of uses.



LACLEDE-CHRISTY FLAT ARCH

Laclede-Christy Flat Arch Tile.

We are the only arch manufacturers who actually manufacture the *tile* as well as the iron work. We carry in stock all of the most commonly-used shapes of all other brands of tile, in addition to our own. L-C Flat Arch Tile are made of absolutely dependable and always uniform materials.

Archnu.

This is a *high temperature* cement for repairing spalled or cracked furnace arches of every type. Heats of above 2600° Fahr. are essential to the proper development of Archnu. In addition to being the ideal cement for repairing arches, Archnu is just the thing for laying up fire brick, for patching furnace walls, for patching ledge tile, etc.



ARCHNU BAG, SHOWING LABEL

Laclede-Christy High Pressure Water Backs.

Laclede-Christy High Pressure Water Backs are circular in cross section. Steam can not trap within them, and circulation is direct and positive. Steel junction boxes provided with machined elliptical hand-hold plates seated from within make for safety. Fully tested before shipment.

Guarantee.

A guarantee can be worded so as to mean a great deal—or nothing at all. With us, the spirit, not the letter of the guarantee, is the vital thing. Briefly, *we guarantee satisfaction to every customer.*

MARION MACHINE, FOUNDRY & SUPPLY CO.

Manufacturers of Boiler Room Specialties

P. O. Box 995
MARION, IND.

Products.

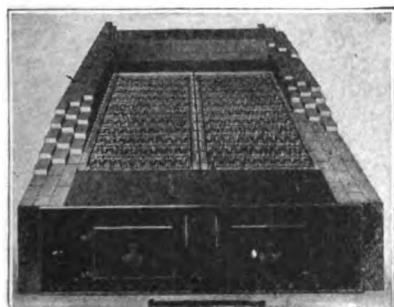
SHAKING GRATES: Interlocking and Non-interlocking.

HAND FIRED STOKERS; SOOT BLOWERS; COAL CRUSHERS.

Also manufacturers of Bagasse Grates; Power Plant Specialties; Coal and Coke Handling Machinery; Oil Well Machinery.

Shear-Klean Grates.

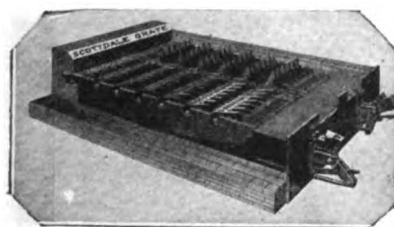
So named because of their lateral shearing action. When grates are moved fore and aft, alternate bars cause a shearing action, crushing the hardest clinkers without disturbing fuel bed above. Shear-Klean grates are built strongly and have stood the most severe tests wherever used. Levers placed at door of firebox make it an easy task to clean the fire of all ash and clinker.



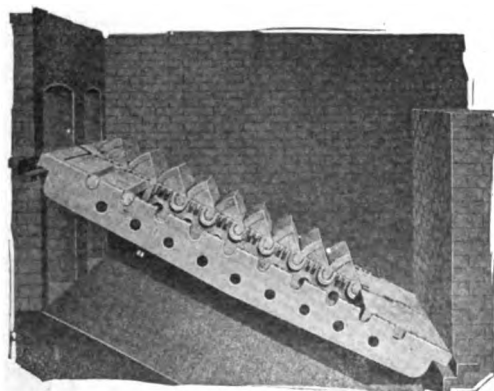
SHEAR-KLEAN GRATE

Scottdale Grates.

With Scottdale grates, the fireman can brighten up the fire, and sift out the ash by lifting the top latch of the fulcrum bracket and rocking the grates through a limited arc without increasing any opening of the grate. He can remove the clinker by lifting the latch attached to the bottom of the fulcrum bracket and allowing grates to open up as necessary.



SCOTSDALE GRATE



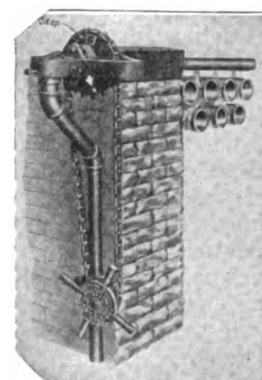
MARION HAND FIRED STOKER

Marion Hand Fired Stokers.

The most economical method of firing bituminous coals is the stoking method, in which coal is placed at front of grates and volatile gases distilled off gradually, and fuel then worked forward on the grates until the carbon is consumed and only ash and clinker remains. Marion hand fired stokers will handle lignites and low grade coals that slack and do not coke. A simple manipulation of levers at the fire doors is all that is necessary.

Planet Soot Blowers.

Designed for all types of water tube boilers, including vertical, horizontal and marine. The internally welded nozzles form an integral part of the blowing element and are so spaced as to clean the entire tube surface. These blowers are easily operated by a special hand wheel control which gives them a steady rotating movement.



PLANET SOOT BLOWER

Marion Rotary Soot Blowers.

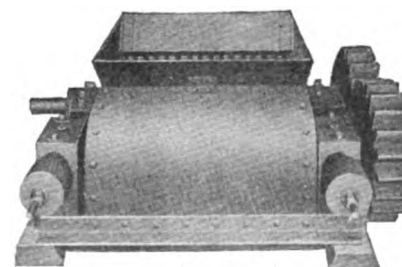
These single jet type blowers deliver a small volume of steam at high velocity through the flues, driving out all loose ash and soot. Steam nozzle contains a number of steam ports having different angles. Whole nozzle is rotated upon its axis, which allows each port to successively direct a steam jet against a fixed section of the flue area. Nozzles are made of a special mixture of cast iron which stands high temperatures.



MARION ROTARY SOOT BLOWER

Marion Coal Crushers.

Made in sizes to crush bituminous, semianthracite and bone coals and give a product from $\frac{3}{4}$ to $4\frac{1}{2}$ in. To accomplish this adjustment for various sizes of product, one roll is made floating or adjustable and is driven by special long tooth gears to insure proper meshing of teeth when roll is set for fine or coarse crushing. All rolls fully guaranteed.



MARION COAL CRUSHER

ESTABLISHED 1878

MURPHY IRON WORKS

Manufacturers of Automatic Stokers

DETROIT, MICH.

BRANCH OFFICES

BOSTON, MASS.
WORCESTER, MASS.NEW YORK, N. Y.
ST. PAUL, MINN.
BUFFALO, N. Y.PHILADELPHIA, PA.
PITTSBURGH, PA.
DENVER, COLO.CLEVELAND, OHIO
CINCINNATI, OHIO
CHICAGO, ILL.**Product.**

MURPHY AUTOMATIC STOKER.

Murphy Stoker.

Description—Forty-two years of fuel and power conserving service in hundreds of power plants have demonstrated the correctness of the principle upon which the construction of the Murphy automatic stoker is based.

Improvements have been made, which have increased its efficiency and durability; and today it stands, we believe, as the one automatic stoker which most completely fulfills the requirements of the modern boiler room.

At either side of stoker extending from front to rear is the coal magazine, into which coal may be introduced either by hand or mechanically. At bottom of this magazine is the coking plate, against which the inclined grates rest at their upper ends. Stoker boxes, operated by segment gear shafts and racks, push coal over coking plate and onto grates. Grates are made in pairs, one fixed and the other movable. Stationary grates at their lower ends rest on grate bearer, which also acts as a support for clinker grinder. Clinker grinder consists of a steel shaft, on which is slipped cast iron toothed segments, which are readily replaced in case of breakage.

Over the coking plate is the arch plate, from which a fire brick arch is sprung over entire stoker. On this arch plate are cast numerous ribs to form a series of air ducts immediately over the coking plate, conveying heated air from chamber above arch into combustion chamber. This arch plate also forms wall of magazine.

Stoker, or battery of stokers, can be operated by a small automatic engine, motor or by overhead shaft and ratchet drive. Arrangement is made for exhaust steam connections at lower end of grates for protection of this portion of grates and clinker grinders and for softening of clinker.

In connection with horizontal tubular boilers or water tube boilers horizontally baffled, the Murphy stoker can be installed with a flush front setting.

Adaptability—The Murphy stoker is adaptable to any type of boiler from 50 h.p. up to the larger units for which the multiple retort underfeed stoker is best suited.

Automatic—It is automatic in all its functions. Handles economically all grades of bituminous coal, feeds and distributes it, and removes all ash and refuse.

Combustion—The stoker feeds the coal, without opening fire doors, thus preventing admission of cold air with consequent lowering of stoker temperatures.

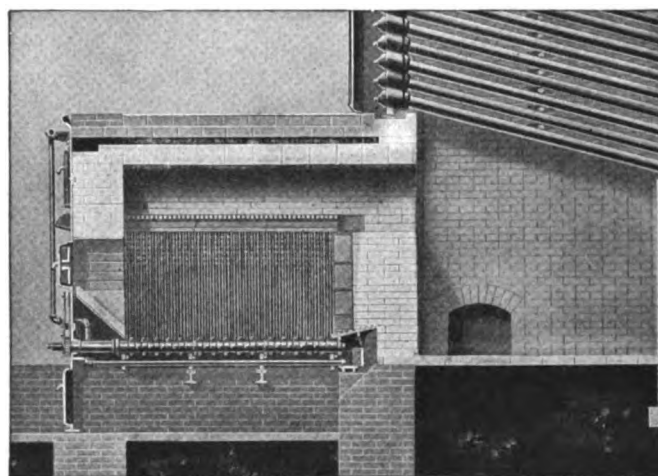
Efficiently handles variable loads and overloads up to 200% rating with minimum attention and without forced draft.

Practically Smokeless—The large coking area of the Murphy stoker drives off all volatile gases and insures perfect coking of coal before the ordinary processes of combustion begin. A proper mixture of these gases with air (both at high temperature) in the highly heated

combustion chamber completely consumes them and practically eliminates smoke.

Wide Usefulness.

Its usefulness is not limited to the economical generation of steam; for it gives excellent results in all operations requiring high temperatures, such as brick drying, cement burning, salt evaporation, calcining of soda ash, heating furnaces, etc.

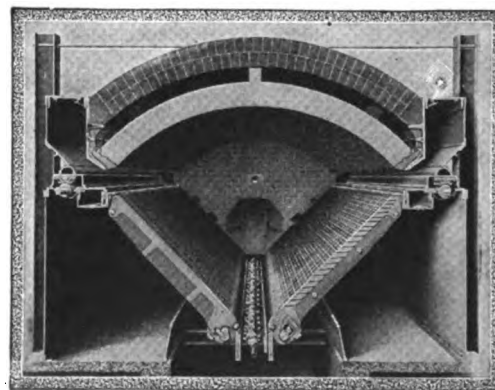


MURPHY AUTOMATIC STOKER
Dutch oven setting

Maintenance and Operation.

Maintenance cost is low, averaging about 10¢ per horsepower per year.

Operates with natural draft. Cost of actuation is less than 1% of total steam generated. Also effects greatest possible saving in labor.



MURPHY AUTOMATIC STOKER
Rear view

Designed to Meet Requirements.

Before making installation, this company thoroughly familiarizes itself with exact conditions under which the Murphy stoker is to be operated, and designs the stoker to meet the requirements.

An engineer will be sent to make an examination of any plant before submitting proposition.

Write for illustrated catalogue.

SANFORD RILEY STOKER CO.

WORCESTER, MASS.

BRANCH OFFICES

BOSTON

NEW YORK
CINCINNATIPHILADELPHIA
DETROITPITTSBURGH
CHICAGOBUFFALO
ST. PAULCLEVELAND
DENVER

Product.

The RILEY SELF-DUMPING UNDERFEED STOKER.

Adaptability.

Applied to any boiler, either water tube or fire tube; the Riley stoker is also adapted for heating and smelting furnaces.

Construction.

Stoker is of the inclined underfeed type; that is, the coal is forced up from beneath the point where air is admitted, and then is worked along toward bridge wall.

Instead of stationary dead plates, it has moving air supplying grates carried by reciprocating sides of retorts. These retort sides also move the overfeed grates which extend across the entire width of the stoker below the retorts. Beyond these are the rocker dump plates which continuously agitate, crush and discharge the ash. Motion of these reciprocating parts is adjustable, so as to control movement of fuel bed and dumping of refuse. This reciprocation of alternate retort sides, in opposite directions, is the distinctive feature of the Riley stoker.

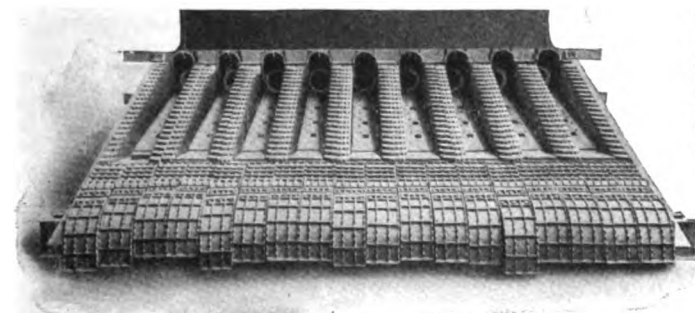
Smokelessness.

The stoker and its forced draft fan are so connected as to give the correct amount of air for fuel burned. Complete combustion, without smoke, results at all times. The Riley stoker is guaranteed to meet smoke laws of any city in the United States.

Capacity.

Constant movement of fuel and shearing action on fuel bed, caused by reciprocation of retort sides, tends to prevent formation of clinker and does not allow flow of gases to become choked. This insures brisk combustion over every square inch of fuel bearing surface, and causes the Riley stoker to excel all others in capacity.

The boiler capacity which can be obtained with the Riley stoker depends upon the number of retorts that can be installed. With boilers fired from one end 300% to 350% of rating is easily obtained during peaks. In other cases where the boiler is fired by two stokers set back to back 500% to 600% of rating is possible.



FURNACE VIEW OF A NINE-RETORT RILEY STOKER SHOWING RELATIVE MOVEMENT OF FURNACE PARTS

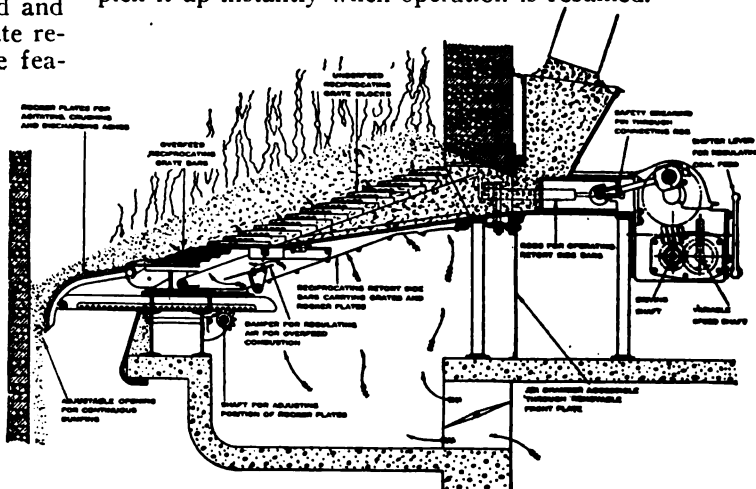


Safety.

Each plunger-connecting rod is provided with a shearing pin, which absolutely prevents damage to stoker in case plunger is blocked. This device is equally effective at all points in plunger stroke. Excessive pressure shears the pin, which allows rod to move freely without moving plunger. After obstruction has been removed, pin is easily replaced while crank passes its outer center.

Quick Response.

Moving grates in the Riley stoker give an ideal means of slicing and starting up quickly from a banked fire, fuel bed being instantly broken up and active combustion begun as soon as air is admitted. This feature makes the Riley stoker especially adapted for so-called "stand-by" plants. In case of factory loads, it enables stoker to drop load within two or three minutes and pick it up instantly when operation is resumed.



SECTIONAL VIEW OF RILEY STOKER SHOWING OPERATION

Installations.

A few installations of Riley stokers are:

Norton Company, Worcester, Mass.
Worcester Electric Light Co., Worcester, Mass.
Hood Rubber Company, Watertown, Mass.
Hartford Electric Light Co., Hartford, Conn.
Wanskuck Mills, Providence, R. I.
New York Central Railroad Co., Port Morris, N. Y.
Pierce-Arrow Motor Car Co., Buffalo, N. Y.
Buffalo General Electric Co., Buffalo, N. Y.
Public Service Electric Co., Newark and Burlington, N. J.
Vacuum Oil Co., Paulsboro, N. Y.
Goodyear Tire & Rubber Co., Akron, Ohio
B. F. Goodrich Co., Akron, Ohio
American Steel & Wire Co., Cleveland, Ohio
Youngstown Sheet & Tube Co., Youngstown, Ohio
Columbus Railway, Power & Light Co., Columbus, Ohio
Steel & Tube Company of America, Ironwood and Bessemer, Mich.
Kimberly-Clark Co., Neenah, Wis.
Pillsbury Flour Mills, Minneapolis, Minn.
City of Chicago Pumping Station, Chicago, Ill.
Union Electric Light and Power Co., St. Louis, Mo.
Memphis Gas and Electric Co., Memphis, Tenn.
Spokane Central Heating Co., Spokane, Wash.

THE UNDER-FEED STOKER COMPANY OF AMERICA

Book Building
DETROIT, MICH.

BRANCH OFFICES

NEW YORK, N. Y.	PHILADELPHIA, PA.	CHICAGO, ILL.	KANSAS CITY, MO.	CHARLOTTE, N. C.
CINCINNATI, OHIO	DENVER, COLO.	BUFFALO, N. Y.	MINNEAPOLIS, MINN.	NEW ORLEANS, LA.
PITTSBURGH, PA.	BOSTON, MASS.	SEATTLE, WASH.	SALT LAKE CITY, UTAH	CLEVELAND, OHIO

THE UNDER-FEED STOKER COMPANY OF CANADA, LTD.

TORONTO, 81 Victoria Street

Product.

Manufacturers of the JONES UNDER-FEED STOKER.

Adaptability.

The Jones stoker is made in "Standard" (direct cleaning) and "A-C" (automatic cleaning) types. Adaptable to any size of boiler and to any grade of bituminous coal. In addition to the generation of steam, its usefulness in any field where constant and easily controlled high temperatures are required has been demonstrated. It is being successfully used in heating, annealing, melting, welding and forging furnaces, drying kilns, etc.

Description.

Great simplicity characterizes the Jones stoker. Few moving parts, absolutely none in contact with the fire, explain the extremely low repair costs.

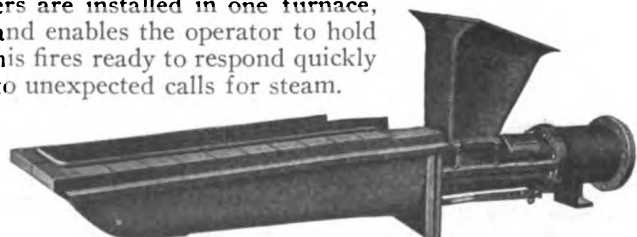
The retort or fuel magazine is installed inside the furnace. It consists of a heavy casting, along the top edge of which are arranged tuyere blocks through which air is supplied. An auxiliary ram and pusher rod in bottom of retort moves in conjunction with main ram and insures equal distribution of fuel in the furnace. Note that, being at the bottom, it is entirely covered by fresh coal when stoker is in use. A lost motion connection permits adjustment in the movement of the pusher rod to suit any fuel.

The operation is shown in the sectional views. The volatile matter or hydro-carbons driven off during the coking process are thoroughly mixed with air coming through the tuyere openings before reaching the incandescent zone. This insures complete and therefore smokeless combustion. Supply of air and fuel being automatically proportioned to each other, there are no unconsumed gases, neither is there any unconsumed fuel due to sifting through grates, the fuel and fire being carried on dead plates. In the automatic cleaning type, the ashes are carried to the rear of the furnace onto the dump plates, which, when dumped, drop the ashes into the ash pit below, as shown in the lower illustration.

Advantages.

The automatic features make possible remarkable results in fuel economy, smoke abatement, regularity of steam pressure and increased boiler capacity. For uncertainty of manual control is substituted mechanical regulation, automatic and positive.

The independent control of each stoker simplifies the care of the furnaces, particularly when two or more stokers are installed in one furnace, and enables the operator to hold his fires ready to respond quickly to unexpected calls for steam.



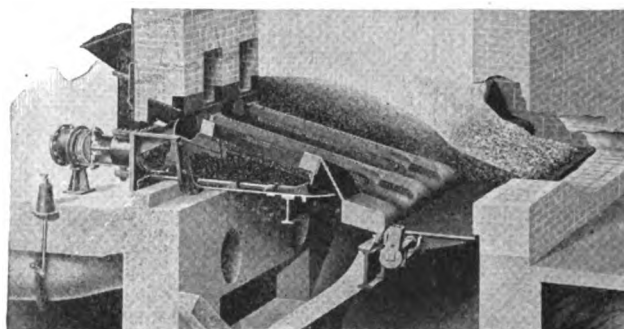
THE JONES "STANDARD" STOKER COMPLETE

SWEET'S CATALOGUE

The installation of a Jones stoker under a boiler already in use involves no disarrangement of the plant. No special brickwork is required.

Where stokers are installed at the time of setting the boilers, a direct saving is made in the omission of grates, grate bearing bars, door arches, and dead plates.

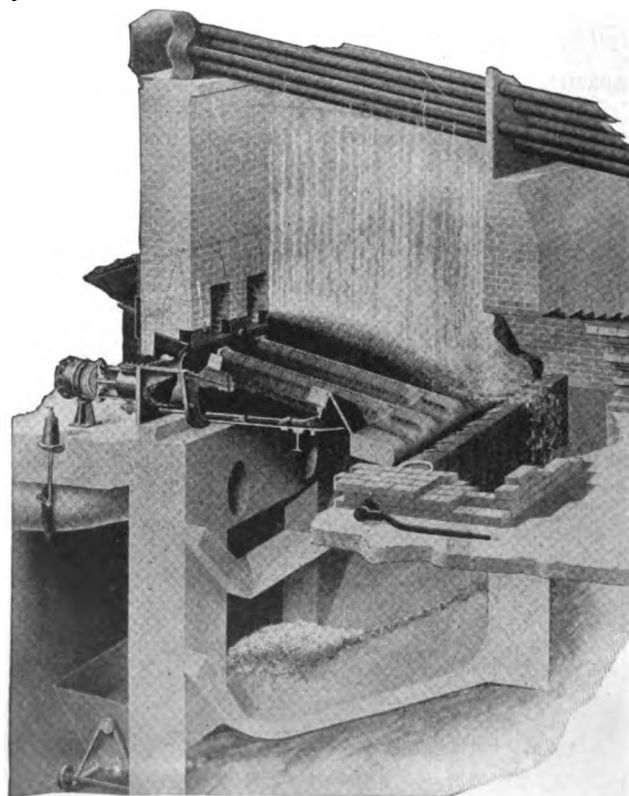
The blowing equipment can be located at any convenient point.



LONGITUDINAL SECTION THROUGH FURNACE AND JONES "A-C" STOKER

Steam admitted behind piston forces piston and ram forward, carrying portion of coal in hopper to retort. Pusher rod moves with ram to carry coal forward in retort, and thus secures even distribution of fuel.

Note that no moving part is in contact with fire; also that each stoker is a unit and regardless of number of units installed in a given furnace can be individually controlled, if desired, and fuel and air may be regulated to produce an even fire



DETAILS OF JONES "A-C" STOKER (AUTOMATIC CLEANING TYPE)

WASHBURN & GRANGER, INC.

Manufacturers of Grate Bars, Incinerators and Ash Can Hoists

50 Church Street
NEW YORK, N. Y.

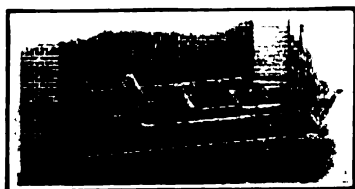
BRANCH OFFICE: BOSTON, MASS., 141 Milk Street
WORKS: MYERSTOWN, PA.

Products.

DUMPING and SHAKING GRATES; ASH HOPPER GATES; ASH CAN HOISTS: Telescopic, Air, Steam, Hydraulic, Electric or Hand Power; INCINERATORS; DESTRUCTORS; FLAT SUSPENDED ARCHES; FIRE BRICK LININGS for boiler furnaces.

Also manufacturers of Boiler Castings and Fronts, steel and cast iron; Boiler Room Floor Plates; Blast Gates; Ash Cans; Coal Chutes; Cast Iron Columns; Manhole, Trench and Sump Pit Covers, Frames and Plates; Ash Pit or Cleanout Doors; Sidewalk Safety Doors and Door Opening Devices; Sidewalk Elevators; Electric Hoists; Skip Hoists; Metal Ladders; Wood Patterns; Cast Iron Tanks; Cast Iron Industrial Track; Turntables; Cut-off or Hopper Valves.

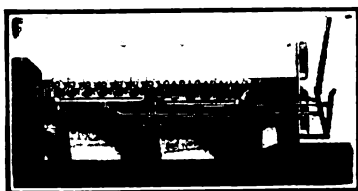
"Dean" Dumping Grates.



"DEAN" DUMPING GRATE

Built for burning the small sizes of anthracite coal with either natural or forced draft. Bars tip in tandem to an angle of 65° and are supported at both ends by a rectangular frame which eliminates entirely the tendency of the bars to hang downward on the ends. Air spaces $\frac{1}{8}$ - to $\frac{3}{8}$ -in. slot, and also built in the pinhole form with $\frac{1}{4}$ - or $\frac{1}{8}$ -in. diameter openings. Fires can be cleaned in one-half the time required with stationary bars. Catalogue No. 7 on request.

"Dean" Shaking Grates.



"DEAN" SHAKING GRATE

Used for bituminous and larger sizes of anthracite coal, both fuels requiring a grate with an oscillating or shaking movement. Supported by a frame resting on the ash pit floor independent of the brickwork, with bars placed on 8-in. centers, allowing ample opening for the largest clinkers. Journals self-locking, requiring no caps. The sides of the bars are made solid which is a necessity as 90% of the wear comes along these edges. Construction is of the most durable form, to withstand hard service. Catalogue No. 7 on request.

"Dean" Gates.

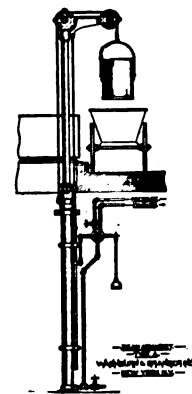


"DEAN" ASH HOPPER GATE

For ash hoppers. Made in two sizes, 24 by 24 in. and 24 by 36 in. They open full size and are heavily constructed for hard service.

"Dean" Ash Can Hoists.

Will lift a can of ashes or other material to the street level quickly, by means of air, steam, hydraulic, electric, or hand power. Operating valve simple in construction. Piston of polished steel tubing; cylinder of lap-welded pipe. Compact construction; nothing to get out of order. Automatic in action to retard piston speed and stop at limits of piston stroke without shock. Durable and efficient. Send for Bulletin C S W.



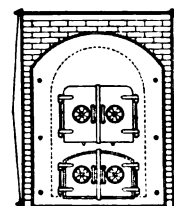
"DEAN" ASH CAN HOIST

Incinerators and Destructors.

We have patterns and designs for incinerators for burning rubbish and waste material, suitable for institutions, hotels, schools, apartment houses, museums, factories, etc.

We also build garbage destructors of the brickset type suitable for large hospitals and hotels and a portable type for use in large residences, clubs, restaurants, etc., designed with a steel casing and lined with fire brick to be operated with coal, gas or oil as fuel.

Send for catalogue No. 9 "Incineration."



INCINERATOR



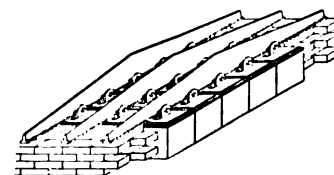
DESTRUCTOR

"Dean" Flat Suspended Arches.

For incinerators, furnaces, boilers, etc.

Fire brick blocks are 9 in. wide by 12 in. long by 10 in. high suspended by cast iron clips bolted to heavy cast iron T's.

Each block can be removed and replaced independent of all others.

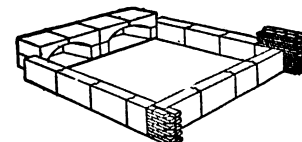


"DEAN" FLAT SUSPENDED ARCH

"Dean" Fire Brick Linings.

Made to withstand 3200° Fahr. of furnace temperature.

Standard side and bridge wall blocks are 24 by 18 by 8 in., with tongue and groove ends, thus minimizing number of joints and burning of furnace walls.



"DEAN" FIRE BRICK LINING

C. G. BUCHANAN CO., INC.

Crushing Machinery

90 West Street
NEW YORK, N. Y.

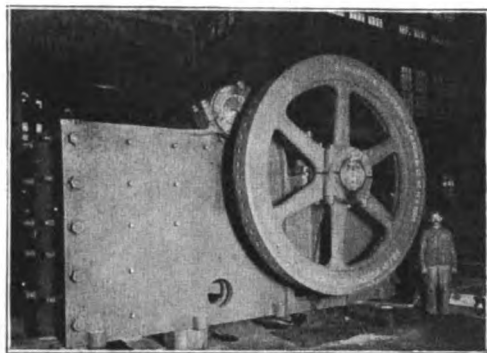
Products.

CRUSHERS and CRUSHING ROLLS.
REVOLVING SCREENS.
BUCKET ELEVATORS.
BELT CONVEYORS.
MAGNETIC SEPARATORS and HEAD PULLEYS.
Magnetic Ore Separation Plants a Specialty.

Buchanan All-steel Crushers.

Type "C"—This type Buchanan crusher is made in over 20 sizes to meet varying conditions. All bearings are water-jacketed and in the larger sizes are removable. Jaw, cheek plates and toggle bearings are manganese steel. Pitman is spring balanced and made parting with underfeed and overfeed lubrication provided for the bearings. All crushers fitted with our adjustable jaw stroke. Several sizes of Buchanan crushers are made sectional for convenience in handling for underground operations. All steel castings thoroughly annealed.

Adapted for preliminary crushing of rocks and ores to sizes suitable for feeding to secondary crushers. Fully described in Bulletin 10.



BUCHANAN TYPE "C" CRUSHER

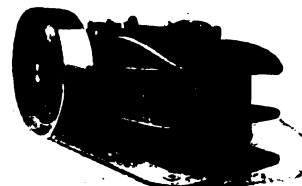
STANDARD SIZES, WEIGHTS, CAPACITIES, SPEEDS, ETC., TYPE "C" CRUSHER

Type	Jaw opening, in.	Approximate weight, lbs.	Revolutions per minute	Tons per hour to sizes below (Approximately)			Size of pulley	Approximate h. p. required
				Tons In.	Tons In.	Tons In.		
Box—Coarse.....	60x84	500,000	85	285 to 8	360 to 10	450 to 12	168x36	250-300
Box—Coarse.....	48x72	240,000	125	315 to 7	360 to 8	450 to 10	120x30	150-180
Box—Coarse.....	48x60	220,000	125	260 to 7	300 to 8	375 to 10	120x24	140-165
Box—Fine.....	42x72	238,000	125	225 to 5	270 to 6	315 to 7	120x36	150-180
Box—Fine.....	42x60	220,000	125	185 to 5	225 to 6	260 to 7	120x36	140-165
Box—Medium.....	42x54	190,000	150	250 to 7	290 to 8	360 to 10	90x36	125-150
Box—Fine.....	38x54	188,000	150	215 to 6	250 to 7	290 to 8	90x36	125-160
Panel—Coarse.....	42x48	160,500	150	225 to 7	260 to 8	320 to 10	90x30	110-140
Panel—Fine.....	38x48	158,500	150	160 to 5	190 to 6	225 to 7	90x30	110-140
Panel—Coarse.....	36x54	123,000	175	225 to 6	300 to 8	375 to 10	84x24	125-150
Panel—Fine.....	32x54	121,500	175	185 to 5	225 to 6	260 to 7	84x24	125-150
"Special" (Box)—Fine.....	36x48	152,500	175	130 to 4	165 to 5	200 to 6	84x24	125-150
Panel—Coarse.....	36x48	95,000	175	190 to 6	260 to 8	325 to 10	84x18	100-125
Panel—Fine.....	32x48	93,500	175	160 to 5	190 to 6	225 to 7	84x18	100-125
Panel—Coarse.....	36x42	92,200	175	175 to 6	235 to 8	290 to 10	84x18	90-115
Panel—Fine.....	32x42	92,000	175	145 to 5	175 to 7	200 to 7	84x18	90-115
Panel—Fine.....	30x48	92,000	175	145 to 4 1/2	190 to 6	225 to 7	84x24	100-125
Panel—Fine.....	30x42	91,000	175	115 to 4	145 to 5	175 to 6	84x20	90-115
Panel—Coarse "Special".....	30x42	62,500	200	175 to 6	200 to 7	235 to 8	70x24	90-115
Panel—Fine "Special".....	24x42	61,500	200	85 to 3	115 to 4	145 to 5	70x24	90-115
Panel—Fine "Special".....	24x48	110,000	200	100 to 3	135 to 4	200 to 6	70x24	110-135
Panel—Coarse.....	30x36	58,000	200	90 to 5	105 to 6	125 to 7	70x18	60-75
Panel—Fine.....	24x36	56,000	210	45 to 3	60 to 4	75 to 5	70x18	60-75
"Sectional".....	24x36	56,000	210	45 to 3	60 to 4	75 to 5	70x18	60-75

Type "B"—Constructed with main frame cast of steel in one solid piece. Made in 20 sizes from a 2 by 4 in. laboratory crusher to 24 by 36 in. for preliminary crushing. Jaw and cheek plates of manganese steel Pitman water-jacketed, and in larger sizes (over 12 by 20 in.) made parting. Equipped with our patent adjustable jaw stroke for increasing or decreasing stroke for fine or coarse crushing. Phosphor bronze removable bearings on all sizes up to and including 12 by 20 in. All steel castings thoroughly annealed.

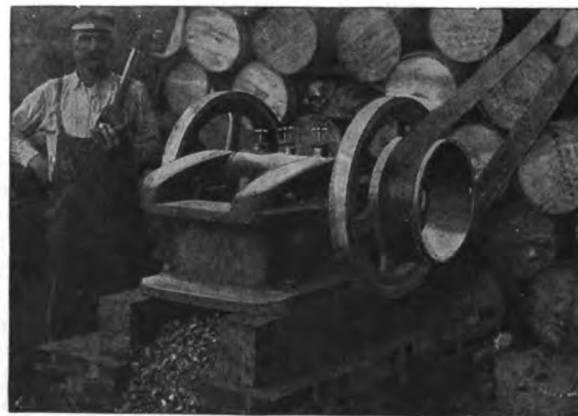
Detailed description in Bulletin 9.

FRONT VIEW BUCHANAN
18 BY 36 IN. TYPE "B"
CRUSHER



SIZES, WEIGHTS, CAPACITIES, SPEEDS, ETC., TYPE "B" CRUSHER

Size receiving capacity, in.	Approximate capacity in tons, per day of 10 hours to any one of sizes stated				Size of pulley, in.	Speed, r.p.m.	H.p.	Approximate total weight, lbs.
	Tons In.	Tons In.	Tons In.	Tons In.				
(a) 2 x 4							Belt or Hand	
4 x 12	30 to 2 1/2	20 to 1 1/2	15 to 1	8 to 1 1/2	18x 8	300	4-5	163
8 x 14	100 to 2 1/2	85 to 2	60 to 1 1/2	35 to 1	24x10 (1)	275-300	8-12	6,500
10 x 16	170 to 3	150 to 2 1/2	125 to 2	100 to 1 1/2	30x12 (1)	275-300	12-18	9,300
12 x 20	230 to 3	200 to 2 1/2	175 to 2	130 to 1 1/2	36x12 (1)	250-275	18-25	15,000
13 x 24	300 to 3	260 to 2 1/2	215 to 2	160 to 1 1/2	42x 8 (2)	250-275	20-30	24,600
(b) 15 x 24	400 to 4	350 to 3 1/2	300 to 3		42x 8 (2)	250-275	20-30	23,500
13 x 30	375 to 3	320 to 2 1/2	275 to 2	200 to 1 1/2	42x10 (2)	250-275	30-40	33,000
(c) 15 x 30	500 to 5	450 to 4	375 to 3		42x10 (2)	250-275	30-40	33,450
16 x 36	650 to 4	575 to 3 1/2	500 to 3	400 to 2	42x10 (2)	250-275	50-60	47,750
(d) 18 x 36	900 to 6	800 to 5	650 to 4	575 to 3 1/2	42x14 (2)	250-275	50-60	57,000
(e) 24 x 36	1000 to 6	850 to 5	750 to 4 1/2	700 to 4	48x14 (2)	250-275	50-60	57,000



A BUCHANAN CRUSHER REDUCING FERRO-MANGANESE

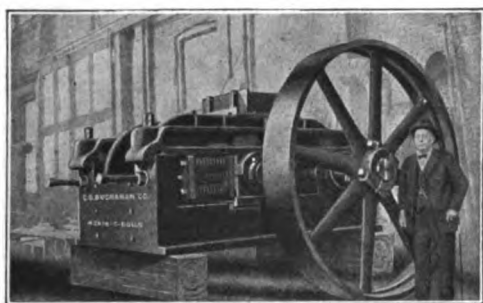
The crusher can be adjusted to produce a very uniform product of any desired degree of fineness, from 1 1/2- to 1/2-in. size, effecting a saving of from 20% to 25% of manganese. When manganese is crushed to a uniform size a much better and more intimate mixture can be made, thereby producing a much better quality of metal and at the same time effecting a very marked saving in the use of manganese.

A very important economy is the saving through the use of a crusher as compared with the old hand method of breaking up with hammers, with much waste.

Crushing Rolls.

These rolls are made in sizes from 18 by 12 in. to 42 by 16 in. and special from 36 by 18 in. to 72 by 36 in. Phosphor bronze bearings. Stationary roll provided with fleeting adjustment to provide moving roll side-ways to prevent grooving. The adjustable or moving roll is provided with our patent swivel pillow blocks to keep bearings in alignment and prevent cramping of the shafts when passing iron or other hard substances through the rolls.

Bulletin 13 gives further details and describes our other crushing rolls.

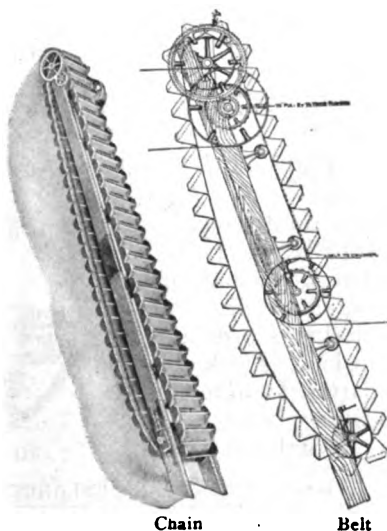


BUCHANAN TYPE "C" CRUSHING ROLLS

Bucket Elevators.

In crushing plants, elevators as a rule give more trouble and cause more loss of time than any other piece of equipment. The reason is, frequently the elevator or conveyor installed is not adapted for the work it is intended to perform. When properly designed and built the elevator will cause no more trouble than any other equipment exposed to the abrasive action of the material handled.

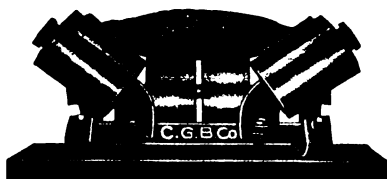
We build and have patterns for a full line of elevators, either chain or belt, using buckets from 4 to 6 in. up to and including 24 by 60 in., having capacities from 10 to 500 tons per hour.



BUCKET ELEVATORS

Belt Conveyors.

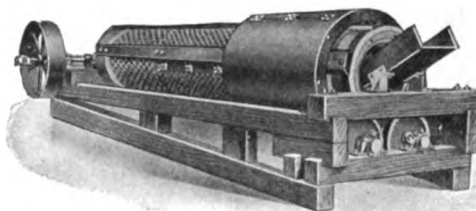
In connection with our crushing machinery, magnetic separators and magnetic head pulleys, we furnish belt conveyors of the most approved design, in all sizes, adapted for either fine or coarse material.



BELT CONVEYOR

Revolving Screens.

These screens are well designed and built of the best material for the purpose. They are largely used for screening coarse or medium fine material. Screen sections are removable for replacement without the necessity of taking entire screen apart. When desired dust jacket can be furnished for removal of dust.



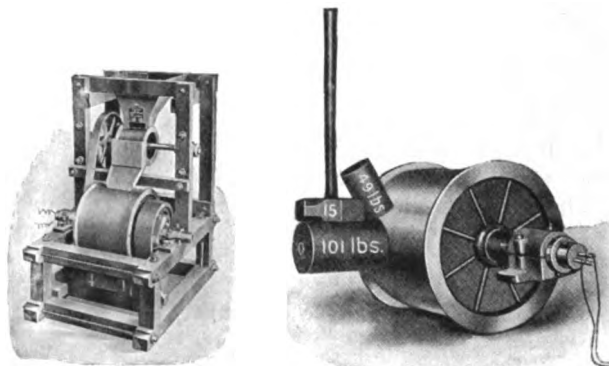
BUCHANAN GIRDER TYPE REVOLVING SCREEN

Made in a number of sizes, from 36 in. by 12 ft. up to and including 72 in. by 30 ft.

Magnetic Separators and Head Pulleys.

These separators are designed for use in the treatment of iron or other magnetic ores, also for separating iron from brass turnings or similar purposes. Another use is separating "tramp iron" from materials being pulverized.

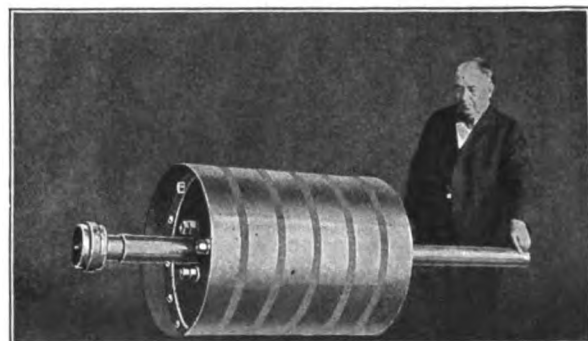
Drum Separator—The Buchanan standard. Has magnets with pole pieces of alternating polarity. Built in sizes from 14 by 6 in. to 36 by 24 in., with or without automatic feed.



BUCHANAN MAGNETIC DRUM SEPARATOR

ILLUSTRATING THE MAGNETIC INFLUENCE OF BUCHANAN DRUM

Head Pulleys—Buchanan magnetic head pulleys are made in sizes from 12 by 12 in. to 42 by 36 in. or wider if desired. Very strong and simple in construction. Used on conveyor belts in place of the regular head pulley.



BUCHANAN MAGNETIC HEAD PULLEY

STURTEVANT MILL COMPANY

Crushing, Grinding, Screening, Mixing and Elevating Machinery

CABLE ADDRESS:
"EMERYSTONE, BOSTON"

Harrison Square
BOSTON, MASS.

CODES USED:
Lieber's, Western Union
and Private

SALES OFFICES
NEW YORK, Singer Building
ATLANTA, Healey Building

CHICAGO, Peoples Gas Building

LONDON, ENG., Queen Victoria Street
DENVER, Colorado Building

Products.

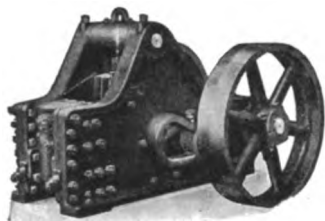
CRUSHING, PULVERIZING, GRINDING, SCREENING, SAMPLING, ELEVATING, CONVEYING, and MIXING MACHINERY.

Sturtevant Experience and Service.

Thirty-seven years of success in inventing, experimenting, designing, building, erecting and operating crushing, grinding, pulverizing, screening, sampling, elevating, conveying, and mixing machinery, and plants; the experience gained in observing the methods employed in hundreds of plants; the numerous problems which have been intrusted to it to solve; the erection of modern units; the improvements accomplished in older installations; and constant consultation with other engineers, superintendents, contractors, architects and practical operators, place the STURTEVANT MILL COMPANY in a position to know what others are accomplishing, the best methods, processes and machinery.

Realizing that no one machine or type is the best for all work and knowing the limitations of each device, it is the policy of the STURTEVANT MILL COMPANY to recommend the machine best suited for the purpose regardless of its maker, or competition with its own equipment. It will not attempt to supply a machine which can not fulfill the requirements satisfactorily.

The design and manufacture of Sturtevant products are the work of specialists, thus large and competent engineering, constructing and erecting forces are maintained, the knowledge and experience of which are at the disposal of prospective customers.



JAW TYPE CRUSHER

Crushers.

Jaw Type—For coarse, intermediate and fine crushing. Plate steel, cast steel or cast iron construction. Blake, Dodge and roll jaw actions. Cam and roll designs.

Catalogue No. 62.

DATA, STURTEVANT JAW TYPE CRUSHERS

Jaw opening, in.	2x6	4x8	5x10	6x15	8x10	10x15	6x20	12x26
Jaw setting, in.	1/4	1/4	1/4	1/4	1/4	1	3/4	1 1/2
*Capacity, tons per hour.	250 to 350 lbs.	1/2 to 1	1 to 1 1/2	2 to 3	3	8 to 10	5 to 7	12 to 15
Jaw setting, in.	1/4	1/2	3/4	1	2	2	2	2
*Capacity, tons per hour.	360 to 600 lbs.	1 to 1 1/2	2 to 3	3 to 4	6 to 10	12 to 18	16 to 20	20 to 30
Approx. h. p.	1	2 to 3	3 to 4	8 to 10	8 to 10	15	20	25
R.p.m.	350	250	170	160	160	155	160	140
Pulley, in.	18x3 1/2	30x4	30x6 1/2	36x8	30x6	48x10	48x10	60x10
Length over all, in.	33 1/2	46	58	72	61	90	68	117
Width over all, in.	22	38 1/2	36	55	39	60	63	84
Height over all, in.	22	35	40	45	40	52	41	74
Net weight, lbs.	900	2200	3600	7600	3500	11000	8750	22500
Shipping weight, lbs.	1000	3000	4000	8400	4000	12000	9500	25000
Finest setting, in.	1/4	1/4	1/2	1/2	1/2	1	3/4	1 1/2
Coarsest setting, in.	3/4	1	2	2	5	5	2	5

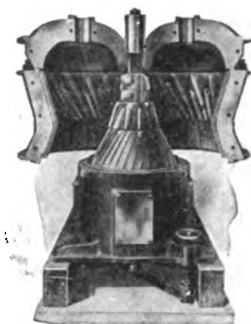
*Capacities vary according to conditions.

SWEET'S CATALOGUE

Rotary Type (not Gyra-tory)—For the fine reduction of soft and moderately hard materials, such as lime, gypsum, talc, soapstone, clay, coal, caustic soda, salt, etc. Open door, accessible construction and hand wheel adjustment.

Instantly adjustable while in operation. Inexpensive to buy, belt, erect and run. One of the most popular machines built by this company.

Catalogue No. 63.



ROTARY TYPE CRUSHER

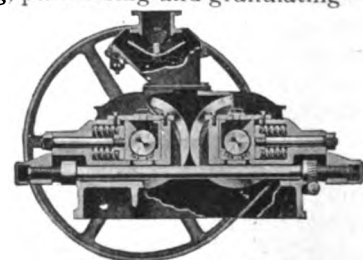
DATA, STURTEVANT ROTARY TYPE CRUSHERS

No.	00	0	1	1 1/2	2
*Hopper opening, in.	6x18	9x18	6x19	10x28	19x30
*Capacity, tons per hour.	1 to 1 1/2	1 to 2	2 to 5	5 to 8	8 to 15
Approx. h. p.	1 to 2	3 to 4	6 to 10	15	15 to 20
R. p. m.	300	250	300	200	250
Pulley diam. and face, in.	12x4	18x6	24x8	30x10	30x12
Length, in.	45	55	76	87	104
Width, in.	29	28	42	42	46
Height, in.	41	43	60	72	85
Finest setting, in.	1/4	1/4	1/4	1/4	1/4
Coarsest setting, in.	1/2	1/2	1	1	1
Net weight, lbs.	900	1300	4000	6000	9000
Shipping weight, lbs.	1050	1600	4700	7000	10500

*These approximate dimensions do not mean size of rock machine can grip.
*Capacities based on 1/4-in. setting and will necessarily vary according to conditions.

Rolls—For crushing, pulverizing and granulating—coarse or fine work. Balanced construction. Springs back of all four bearings give instant relief under breaking pressures; crushing shocks are quartered; automatic adjustments.

Catalogue No. 65.



ROLL TYPE CRUSHER

DATA, STURTEVANT BALANCED CRUSHING ROLLS

Size, in.	16x10	36x16	20x14	22x14	24x15	30x16
Pulley, in.	48x4	72x10	48x6	48x6	60x8 1/2	66x10
Approx. h.p.	3 to 4	14 to 18	7 to 10	7 to 10	8 to 12	12 to 15
*R.p.m.	200 to 270	60 to 85	150 to 215	150 to 215	115 to 160	80 to 100
Approx. length, in.	69	116	84	84	94	102
Approx. width, in.	64	108	80	80	87 1/2	102
Approx. height with fly-wheel, in.	54	78	60	60	66 1/2	74
Net weight, lbs.	6000	34000	10000	10600	13350	20000
Shipping weight, lbs.	7000	37500	11200	11800	14750	21500

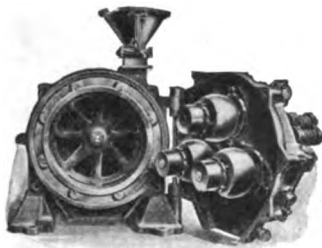
Size, in.	32x16	36x20	38x20	36x16	38x16	8x5	12x12
Pulley, in.	66x10	72x12 1/2	72x12 1/2	66x10	66x10	18x4	36x6
Approx. h.p.	12 to 15	16 to 20	16 to 20	14 to 18	14 to 18	1	3 to 4
*R.p.m.	80 to 100	60 to 85	60 to 85	60 to 85	60 to 85	150	150
Approx. length, in.	102	125	125	102	102	33	48
Approx. width, in.	102	122 1/2	122 1/2	96	96	29	56
Approx. height with fly-wheel, in.	74	72	72	77	77	22	38
Net weight, lbs.	20750	32400	33700	22000	22700	650	3000
Shipping weight, lbs.	22250	35000	36300	23500	24200	700	3500

*The speed of rolls varies according to size and kind of material.

Continued on next page

Pulverizers.

Ring-Roll Mills—For grinding hard, medium or soft material from 1½-in. size to from 10-mesh to 100-mesh. Used largely for grinding cement clinker, limestone, ores, granite, trap, phosphate, clay, shale, iron borings, feldspar, etc. Slow speed; durable and accessible. Wearing parts are a ring and 3 rolls, easily and quickly replaced. No clogging, no internal screens, no shields nor scrapers. Large capacity per horsepower and low upkeep. Catalogue No. 79.



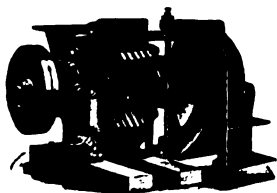
RING-ROLL MILL

DATA, STURTEVANT "OPEN DOOR" RING-ROLL MILLS

No.	0	1	2	1 Duplex	2 Duplex
Ring, diam. and face, in.	24x7	33x7	44x12	33x7	44x12
Rolls, diam. and face, in.	14x7	14x7	18x10	14x7	18x10
Pulley, diam. and face, in.	36x10	30x8	36x12	30x12	42x20
Pulley, r. p. m.	125	320	300	375	325
Ring, r. p. m.	125	80	63	80	64
Approx. h. p.	8 to 15	18 to 25	40 to 45	35 to 50	80 to 90
Approx. width, in.	48	63½	83	72	92
Approx. length, in.	121½	132	161	154	196
Approx. height, in.	54	71	88	74	90
Approx. net weight, lbs.	7000	13000	27000	21000	45000
Approx. shipping weight, lbs.	8000	14000	29000	24000	50000

Capacities vary so that it is impossible to give them here. Write for capacities, stating material and fineness desired.

Hinged Hammer Pulverizers—For reducing salt, clay, shells, fertilizers, chemicals and other soft or fibrous materials to a fineness of from ¼ in. to 20-mesh. A high speed, inexpensive mill, having large output with small horsepower.



"OPEN DOOR" HINGED HAMMER PULVERIZER

On sticky materials the gates are often omitted entirely or in part, thus giving the mill a free discharge to prevent clogging; and if separation is required, an outside screen is used, the oversize being returned to the mill for regrounding.

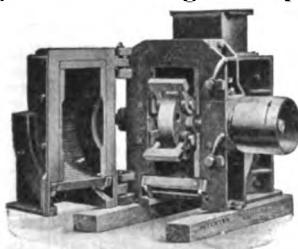
Catalogue No. 84.

DATA, STURTEVANT "OPEN DOOR" HINGED HAMMER PULVERIZER

No.	0
Length over all, door closed, in.	42
Length over all, door open, in.	52
Width over all, in.	50
Height over all, in.	30
Inside diam., in.	24
Inside width, in.	9
*Feed opening, in.	12½x12
Driving pulley, in.	12 x10½
Pulley, r.p.m.	1000 to 1200
Approx. h.p.	5 to 15
Approx. net weight, lbs.	1700
Approx. shipping weight, lbs.	2000

*Does not mean size of material machine will take.

Swing Sledge Mill—For reducing limestone, lime, coal, shale, clay, etc. to a fineness of from ½ in. to 20-mesh. "Open door" accessibility is shown in illustration and is of great importance in pulverizers of this class where adjustments and repairs are frequent. It is a great labor saver. Self-aligning ball bearings are another feature allowing the machine to run at very high speeds.



"OPEN DOOR" SWING SLEDGE MILL

Many kinds of hammers and sledges are used for various purposes.

Catalogue No. 84.

DATA, STURTEVANT "OPEN DOOR" SWING SLEDGE MILL

No.	00	0	1	2
Length over all, in.	23	48½	61	72½
Width over all, in.	30	49	65½	84
Height, over all, in.	18	42	44½	53
Inside diam., in.	12	24	30	36
Inside width, in.	5	10	20	30
*Feed opening, in.	6x4½	12½x11	17x20½	14½x30½
Driving pulley, in.	6x6½	12 x10½	15x12½	20 x16½
Pulley, r.p.m.	2000	1000	1200	1000
Approx. h.p.	3000	1200	1500	1200
Approx. capacity per hour, 10-mesh, tons.	6	12	40	80
Approx. net weight, lbs.	425	1 to 2	3 to 7	8 to 15
Approx. shipping weight, lbs.	500	3350	6300	12000
		3700	7000	14000

*Does not mean size of material machine will take.

Emery Mills—Vertical and horizontal types for grinding soft and moderately hard materials such as clay, shale, chalk, talc, salt, coal, facings, colors, lime, manganese, barytes, etc., to a fine powder. Economical in power and upkeep and are instantly accessible. Size of feed, ¼ in. and finer; range of output, 20- to 200-mesh.

On ordinary material, they will grind to 100-mesh without screens or separators. Finer than this, bolts, reels, screens or air separators are desirable. Run without vibration on any good floor. Furnished right- or left-hand discharge with automatic feeder.

Catalogue No. 64.



Vertical

Horizontal
ROCK-EMERY MILLS

DATA, STURTEVANT VERTICAL ROCK-EMERY MILLS

Size, in.	24	30	36	42
Length with track, in.	123	138	174	210
Length without track, in.	68	88	117	132
Width, in.	38	41	48	60
Height, in.	48	54	61	72
Pulley, in.	20x6	20x8	30x12	30x16
R.p.m.	700	650	550	350 to 450
Approx. h.p.	12 to 15	18 to 20	30 to 35	45 to 80
*Capacity per hour, tons.	¼ to 2	1 to 4	2 to 7	5 to 15
Approx. net weight, lbs.	2000	3500	6000	12000
Approx. shipping weight, lbs.	2300	4300	7000	13000

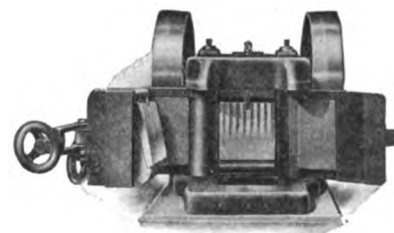
DATA, STURTEVANT HORIZONTAL ROCK-EMERY MILLS

Size, in.	42
Length, in.	60
Width, in.	60
Height, in.	60
Pulley, in.	30x10
R.p.m.	300
Approx. h.p.	18
*Capacity per hour, tons.	1 to 3
Approx. net weight, lbs.	5200
Approx. shipping weight, lbs.	5500

*Capacity is approximate and varies according to material and fineness.

Sampling and Laboratory Machinery.**Laboratory Roll Jaw Fine Crusher**

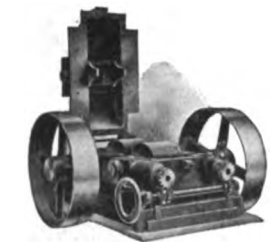
The most rugged machine built for sampling and used extensively in laboratories, assayer's offices, mining schools, steel mills, etc. "Open door" construction provides for quick and thorough cleaning. Catalogue No. 67.



ROLL JAW FINE CRUSHER

DATA, STURTEVANT LABORATORY ROLL JAW FINE CRUSHERS

Jaw opening, in.	2x6
Approx. capacity per hour, lbs.:	
With jaws set to 1/4 in.	250 to 350
With jaws set to 3/4 in.	350 to 600
Approx. h.p.	1
R.p.m.	350
Pulley, in.	18x3 1/2
Length over all, in.	33 1/2
Width over all, in.	34
Height over all, in.	34
Approx. net weight, lbs.	900
Approx. shipping weight, lbs.	1000



LABORATORY CRUSHING ROLLS

Laboratory Crushing Rolls—For crushing hard or soft rock and ores.

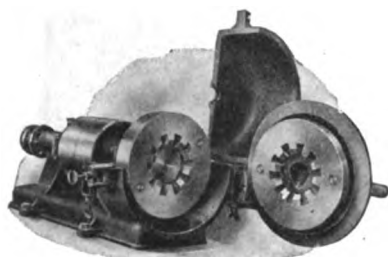
Usually installed to reduce crusher outputs to finer sizes.

Immediately accessible for cleaning. Automatic adjustments.

Catalogue No. 67.

DATA, STURTEVANT LABORATORY CRUSHING ROLLS

Size, in.	Pulley, in.	R.p.m.	Approx. h.p.	Approx. length, in.	Approx. width, in.	Approx. height, in.	Approx. net weight, lbs.	Approx. shipping weight, lbs.
8x5	18x4	150	1	33	29	22	650	700
12x12	36x6	150	3 to 4	48	56	38	3000	3500



"OPEN DOOR" SAMPLE GRINDER

Sample Grinders—For the fine grinding of rock and ore samples.

Open door construction for accessibility and thorough cleaning.

Catalogue No. 67.

DATA, STURTEVANT LABORATORY SAMPLE GRINDER

No.	Diam. grinding plate, in.	Approx. length, in.	Approx. width, in.	Approx. height, in.	Approx. h.p.	Pulley, in.	R.p.m.	Approx. net weight, lbs.
3	14	40	22	18	5	9x4	650	450
2	10	32	16	14 1/2	3	7x3	750	175
0	6	30	12	11 1/4	2	6x2 1/2	1200	150

Automatic Coal Crusher and Sampler—For

crushing and automatically sampling coal preparatory to analysis. Takes coal 3 in. in size or finer, crushes it to 1/4 in. and finer and at the same time automatically extracts a sample of 5%, 10% or 15% of the amount passing through the machine. This sample is an accurate representation of the whole.

Used by many plants purchasing fuel on a B. t. u. basis.

Catalogue No. 85.

AUTOMATIC COAL CRUSHER AND SAMPLER

DATA, STURTEVANT AUTOMATIC COAL CRUSHER AND SAMPLER

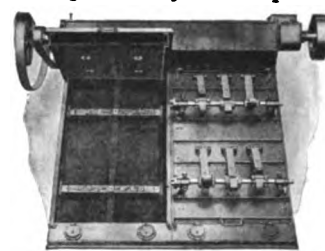
No.	Hopper opening, in.	Approx. length, in.	Approx. width, in.	Approx. height, in.	Approx. h.p.	Pulley, in.	R.p.m.	Approx. net weight, lbs.
WITH PULLEY								
00	6x18	45	28 1/2	41	1 to 2	12x4	300	900
WITH MOTOR								
00	6x18	69 1/2	28 1/2	41	1 to 2	..	..	1300

Screens.

Newaygo Superscreens—These inclined vibrating separators are of unit "open door" construction, capable of delivering from 1 to 4 products from one separator with a range of fineness from 1/2 in. to 180-mesh. All screening surfaces are on an angle of from 35° to 45°, therefore a comparatively coarse mesh delivers a much finer product than the dimension of its openings (see table below).

Complete accessibility; comparatively small parts; easily handled by one man; most efficient vibration transmitted to stretched taut screen wires; simple and durable mechanism; even feed; ease of adjustment and large, accurate output place these machines in a class by themselves.

Catalogue No. 77.



"OPEN DOOR" TWO-UNIT SCREEN

DATA, STYLE "M" NEWAYGO SUPERSCREENS

No. of units.	1	2	3	4	5	6
Approx. depth over all, in.	70	70	70	70	70	70
Approx. width over all, in.	70	110	151	204	242	285
Approx. height over all, in.	80	80	80	80	80	80
Driving pulley, in.	18 x 4	18 x 4	18 x 4	24 x 4	24 x 4	30 x 4
R. p. m.	110	110	110	110	110	110
Screening surface, sq. ft.	18	36	54	72	90	108
Approx. weight, lbs.	1000	1850	2700	3775	4625	5475

APPROXIMATE CAPACITIES, ETC., TO VARIOUS FINENESSES

Cloth mesh.	2	3	4	5	6	7	8
Diam. of wire, in.	.120	.092	.080	.072	.047	.054	.047
Opening, in.	.380	.241	.170	.128	.120	.089	.078
Approx. mesh of product.	4	6	8	10	12	14	16
Capacity, approx. lbs. per hour, *1-unit separator.	14,000	13,000	12,000	11,250	10,500	9500	9000
Cloth mesh.	10	12	14	16	18	20	
Diam. of wire, in.	.035	.032	.028	.023	.020	.018	
Opening, in.	.065	.051	.043	.0395	.0356	.032	
Approx. mesh of product.	20	24	28	30	35	40	
Capacity, approx. lbs. per hour, *1-unit separator.	8750	8500	8000	7500	7000	6500	

*For capacity of any number of combination of units, multiply capacity of a 1-unit screen by the number of units in battery.

"Bucking Broncho" Screens—Simple, durable, inclined screens built on principles never before attempted and which have proved a remarkable success. They combine the actions of all other screens with many additional slaps, kicks and jars of their own. Sticking or clogging of materials in the meshes is practically eliminated.

Range of output, 1/2 in. to 100-mesh. Capacity depends upon material and fineness of product desired.

Catalogue No. 77.



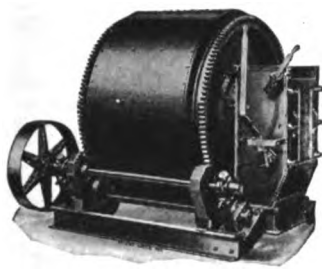
"BUCKING BRONCHO" SCREEN

DATA, "BUCKING BRONCHO" SCREENS

No.	0			1			2		
Style of feeder	Conveyor	Chute	Spout feed box	Conveyor	Chute	Spout feed box	Conveyor	Chute	Spout feed box
Approx. depth, in.	79	114	83	83	114	83	101	132	101
Cover closed.	104	114	95	104	114	95	126	132	116
Cover raised.	69	57	57	91	74	81	91	74	81
Approx. width, in.	76	150	62	76	150	62	87	175	74
Approx. height, in.	*18x4	30x6	30x6	*18x4	30x6	30x6	*18x4	30x6	30x6
Driving pulley, in.	110	40	40	110	40	40	110	40	40
R. p. m.	18	18	18	30	30	30	40	40	40
Screening surface, sq. ft.	1800	1700	1300	2000	2150	1550	2300	2460	1860
Approx. weight, lbs.	1800	1700	1300	2000	2150	1550	2300	2460	1860

*Also requires 30 x 6-in. pulley on cam shaft at 40 r.p.m.

Continued on next page



"OPEN DOOR" DRY MIXER

Dry Mixers.

For mixing fertilizer and other dry ingredients in batches from $\frac{1}{4}$ to 1 ton. Capacities from 4 to 30 tons per hour.

A simple and durable machine that accomplishes a thorough and rapid mixing.

Catalogue No. 80.

DATA, STURTEVANT DRY MIXERS

Size batch, tons	Drum capacity, cu. ft.	Height with hopper, in.	Length with hopper, in.	Height without hopper, in.	Length without hopper, in.	Width, in.
$\frac{1}{4}$	25	96	90	60	64 $\frac{3}{4}$	60 $\frac{3}{4}$
1	116	144	144	85	99	91 $\frac{1}{4}$
2	246	...	...	111	130	134

Size batch, tons	Pulley, in.	R.p.m.	H.p.	Capacity, tons per hour	Weight, lbs.	
					With hopper	Without hopper
$\frac{1}{4}$	24x4	120	3 to 5	4 to 5	2900	2660
1	36x8	75	5 to 10	20 to 30	7840	7300
2	36x8	100	10 to 12	50 to 60	...	11500

Elevating and Conveying Machinery.

Sturtevant engineers will co-operate in the design of that portion of a plant in which elevating and conveying machinery is to be installed, and will submit figures on the complete equipment, thus purchasers are assured of better fit, less dust, small installation costs, quicker erection and equipment of proper size and kind for special work.

Elevators—Sturtevant elevators are of the "one man, one minute, open door" design for use with crushing, grinding and screening machinery or for many other purposes. All steel, accessible construction so that one man in one minute can open any door without the use of tools and immediately get at all important parts. Self-contained, everything complete, ready to set up when received. Big, accessible discharge with fixed spillboard. Split head, heavy gears and pinions, ample shafts, ball and socket bearings. Automatic take-ups for quick, accurate foolproof adjustment, self-aligning bearings.

Unequalled for convenience, labor saving, quick replacements and cleaning.

Furnished in belt or chain, centrifugal, continuous or perfect discharge types, with steel or wood casings.

Conveyors—Belt, screw, pan, platform, drag, bucket, portable or special designs.

Valves and Gates—Single or duplex; lever or rack and pinion types.

Catalogue No. 61.

SWEET'S CATALOGUE

Fertilizer Mixing Units.

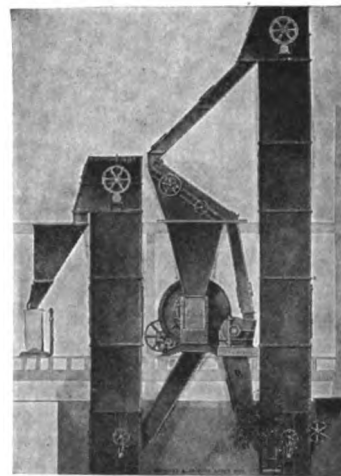
Consist of elevators, mixer, pulverizer, screen, scales, chutes and feeders—complete, ready to set up.

Special units embodying present machines will be built to improve present conditions.

All-steel construction, practically dustless and fire-proof. Extensive building changes generally not required. Every machine designed for the fertilizer industry and to work in perfect unison. All elevators, spouts and machines of "open door" construction to allow instant accessibility for cleaning, etc.

Spouts are steep and large to prevent clogging. Additional clean-out doors supplied if desired. Dust collecting systems supplied for special conditions, if desired.

Many Types of Units—Sturtevant complete fertilizer units may be had in the following types: mixing; combination mixing and shipping; combination mixing, shipping and grinding; shipping; grinding units for bone, fish scrap, tankage, etc., with or without dust collecting systems; rock grinding units with screens or air separators; also such other labor saving devices as elevators, conveyors, chutes, valves, scales, mixers, pulverizers, etc. of many types and kinds.



FERTILIZER MIXING UNIT

Air Separators.

Simple, durable, slow speed air separators for removing the fines from the products of grinding mills within a range of from 60- to 100-mesh. Coarser than this, a screen is better suited, and for finer work, special air separators are made. If the product of a pulverizer is coarse and contains only a small percentage of fines to be removed, a scalper screen placed above the separator is desirable.

Sturtevant separators are of the "open door" construction, allowing instant accessibility for cleaning. They are simple, easily installed and operated. Fineness of products is regulated by turning a hand wheel. There is nothing to get out of order or give trouble.

Catalogue No. 87.



"OPEN DOOR" AIR SEPARATOR

DATA, AIR SEPARATORS

Diam., ft.	Approx. capacity in tons per hour, 95% 100-mesh	Approx. h.p.	Pulley, in.	R.p.m.	Approx. height over all, in.	Approx. width over all, in.	Approx. weight, lbs.
4	1 to 2	2	18 x 4	350-400	92	62	1800
10	6 to 8	5 to 8	24 x 6	250-300	176 $\frac{1}{2}$	138	6100
12	8 to 12	8 to 10	24 x 6	350-400	194 $\frac{1}{2}$	162	9000

HARDINGE COMPANY

Manufacturers of Crushing, Grinding and Pulverizing Equipment

120 Broadway
NEW YORK, N.Y.

BRANCH OFFICES

SALT LAKE CITY, UTAH, Newhouse Building
SPOKANE, WASH., First National Bank Building

DENVER, COLO., U. S. National Bank Building
LONDON, ENGLAND, 11 Southampton Row, W. C. 1

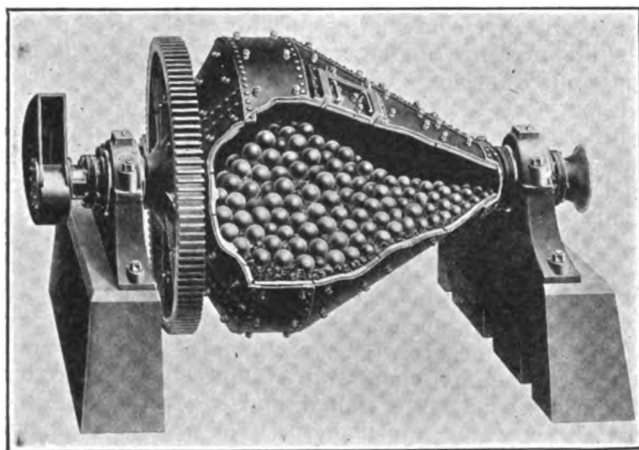
Products and Service.

Manufacturers of HARDINGE CONICAL BALL and PEBBLE MILLS.

ENGINEERS for the erection and design of industrial plants.

Sizes and Capacities.

The Hardinge Conical Ball and Pebble Mill is made in sizes from 20 in. in diameter to 10 ft. in diameter, with capacities ranging from a few pounds per hour to 50 tons an hour. Ball mills are used to take a rock-crusher product and grind to pass 20-, 40-, 80- or 200-mesh. Pebble mills are used to take a $\frac{1}{2}$ -in. feed and grind to any fineness. Steel consumption in the ball mill is practically negligible, and pebbles in the pebble mill do not contaminate the material being ground.



HARDINGE CONICAL MILL

Note how the conical discharge cone segregates the balls

Materials Ground.

Materials being successfully ground in the Hardinge mill are:

Phosphate rock	Limestone for cement	Iron ores
Feldspar	Cement clinker	Graphite ores
Talc	Coal	Chrome ores
Silica	Coke	Manganese ores
Fullers' earth	Brass ashes	Molybdenum ores
Glass	Sulphur	Tungsten ores
Clay	Slags	Zinc ores
Graphite	Mattes	Copper ores
Chemicals	Lead skimmings	Silver ores
Colors	Zinc skimmings	Gold ores
Mica	Aluminum dross	Platinum ores
Barytes	Copper skimmings	Brass turnings
Ferro alloys	Iron borings	Steel turnings

Action in the Hardinge Mill.

In the Hardinge mill, due to the action of the cone, the coarse material on entering the machine gravitates to the point of largest diameter. Here it comes in contact with, and is broken by, the largest balls moving at the highest velocity and falling from the greatest height. As the particles are broken, they automatically work their way forward, being subjected to a gradually diminishing breaking and crushing effect as they decrease in

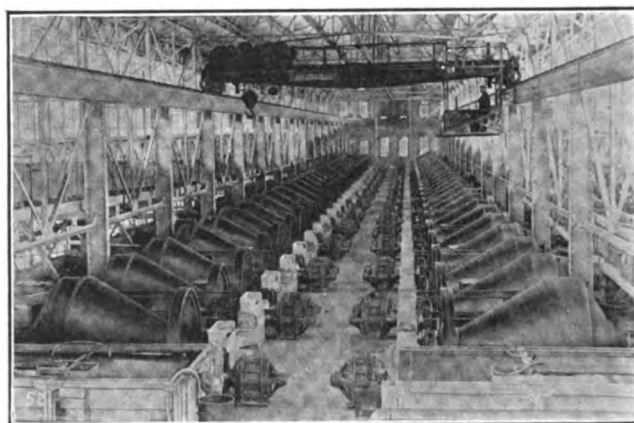
size. The particles undergoing reduction reach the required degree of fineness and arrive at the discharge end of the mill at the same time. Thus it is seen that this automatic classification, both of the material being reduced and of the grinding mediums, as well as their height of fall, proportions the energy expended or exerted in crushing to the work required to be performed. In this way, we obtain an ideal step or stage reduction in a single machine, which is conducive to a maximum crushing effect for a minimum expenditure of power.

Wet Grinding in the Hardinge Conical Mill.

The Hardinge mill is grinding nearly every class of material where it is necessary to reduce its size. Due to its extreme flexibility and simplicity of operation, the power and repairs required to effect the necessary reduction are unusually low. By adjustment of the mill, the product may be varied so that it will be discharged in uniform granular particles, or an extremely fine powder can be produced if desired, containing no grit whatever.

Dry Grinding in the Hardinge Conical Mill.

The same type of Hardinge mill is used when grinding dry as when grinding wet. Therefore, if it is desired to change from one class of grinding to another, the same mill can be used in either case. As in the case of wet grinding, either a very uniform granular product may be obtained or extremely fine dust produced, simply by making minor changes in the method of operation. Abrasive materials have but little effect on the life of the very few wearing parts of the Hardinge conical mill. Many original linings are still in mills which have been operating for more than 10 years.



LARGEST SINGLE GRINDING INSTALLATION IN THE WORLD
64 Hardinge Mills operated by only two men per shift

Information Required.

- Character of material (send 2- or 3-oz. sample of feed).
- Capacity required in tons per hour.
- Size of feed to Hardinge mill.
- Fineness of finished product desired.
- Grinding to be done wet or dry (percentage of moisture in feed).
- Machines now used to effect the same reduction.

RAYMOND BROS. IMPACT PULVERIZER CO.

Manufacturers of Grinding, Pulverizing and Air Separating Machinery

OFFICE AND WORKS
1316 North Branch Street
CHICAGO, ILL.

Products.

ROLLER MILLS, AUTOMATIC PULVERIZERS, VACUUM AIR SEPARATORS, for the fine grinding of all dry materials to a powder.

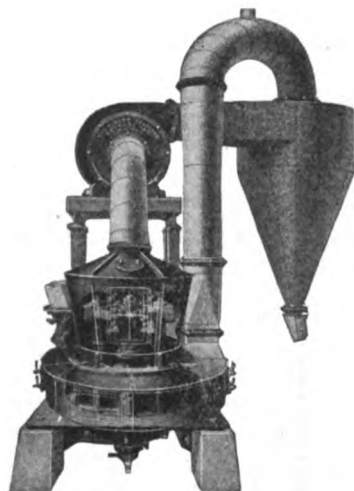
Special Exhaust Fans and Dust Collectors.

Roller Mills.

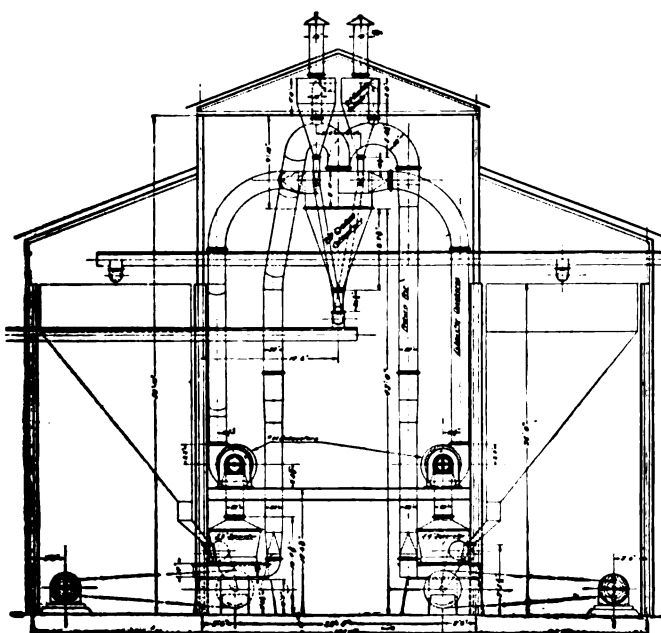
These are built for capacities of from 1 to 10 tons per hour and for fine or coarse grinding.

They are of the suspended roller type, crushing and pulverizing the material by centrifugal force. The fine material is carried away from the grinding chamber by our air separation principle as fast as it is made, eliminating the clogging effect produced by screen separation. In this way the rolls are always working on coarse material.

Raymond roller mills have been adopted as standard equipment by many large industrial corporations for grinding materials such as coal, coke, gypsum, limestone, phosphate rock, etc., to 100-mesh; and talc, graphite, barytes, caustic lime, lithopone, etc., to 200-mesh and finer.



RAYMOND ROLLER MILL



TYPICAL ROLLER MILL INSTALLATION FOR GRINDING COAL

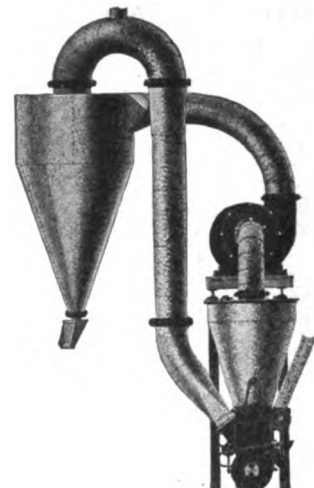
SWEET'S CATALOGUE

Automatic Pulverizers.

These, like the roller mills, are equipped with air separation for the production of uniform fine products, but they are of the high speed type and therefore used for softer materials like clay, dry colors, hydrated lime, litharge, etc.

They are built in several sizes and will grind to any fineness by a simple adjustment in the air separator.

They can also be equipped with our special automatic throw-out attachment for separating impurities from such materials as hydrated lime, litharge, etc.



RAYMOND AUTOMATIC PULVERIZER

Special Features and Advantages.

The installation shown is typical of the Raymond system, as in all cases the piping can be arranged to allow placing the collector at almost any point where the material is to be discharged.

This discharge can be made into any convenient storage bin or conveyor and requires no extra power for operation.

In some of these installations the collector is set as high as 100 ft., and at a distance from the mill, eliminating at least one elevator and sometimes a conveyor.

No Screens or Bolters—The mills shown require no screens or bolters to produce the required fineness, as this is obtained automatically by the use of our patented air separators.

These separators after once being adjusted require no attention and produce absolutely uniform fine products containing no lumps or oversizes. They will give any fineness desired by a simple adjustment.

How to Specify.

To properly quote prices and guarantees on the right machinery, it is necessary to have all the information that can be supplied in regard to the proposition.

Always include the material to be ground and the capacity and fineness required. In this connection we would like to have some small mail samples, showing the crude material intended for the mill and the finished product to be duplicated.

If there is no sample of the finished product, kindly advise, in the terms of the Tyler standard screen scale, the fineness required.

THE DUST RECOVERING & CONVEYING CO.

Dust Collecting Equipment

Engineers Building
CLEVELAND, OHIO

BRANCH OFFICE: Boston Building, DENVER, COLO.

Product.

"PERFECTO" SUCTION FILTERS for all Dry Dust Collecting Problems.

For Pneumatic Conveyors, see pages 730-31.

"Perfecto" Suction Filters.

In the "Perfecto" process, the dust-laden air or gas is passed through sets of closely woven cloth sleeves, contained in a dust-tight cylinder.

It is apparent that to get all the dust, or nearly all, a very finely woven filter cloth is necessary. And inasmuch as a fine cloth fills very quickly, it is essential that, to develop any mechanical efficiency, the bags should be cleaned frequently and thoroughly.

The definite value of "Perfecto" filters is based on the effective combination of these two principles—a fine filtering element, and frequent, effective, automatic cleaning.

The bags, usually in sets of 12, are hung inside of heavily built, airtight metal cylinders. A battery of cylinders can contain any number from 2 up, depending on the conditions to be met and capacities required.

The air or gas, dust laden, enters at A (see illustration below), passes up into the bags and out through the filtering cloth, depositing the solid inside the screen. Clean air passes out at B.

Cleaning the filter bags must be frequent and thorough. About every one or two minutes a current of compressed air, controlled by an automatic distributing valve, shuts the damper at B, and, operating a small air motor, centrally located on each compartment, violently shakes the head frame to which the 12 sieves are

fastened. When the outlet at B is closed outside air rushes in at B'.

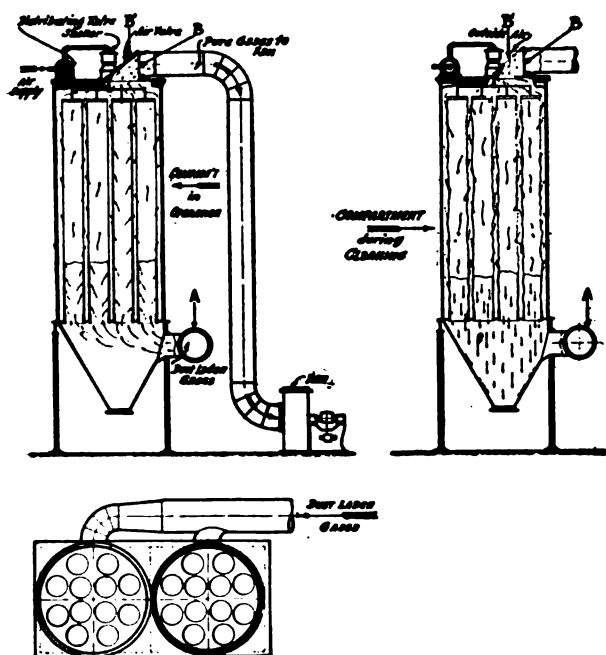
This clean air, pulled in by the vacuum maintained in the operating compartments, follows a reverse course, and passes from the outside to the inside of the bags. This air current, with the shaking, loosens the dust and carries it to the hopper at the bottom of the compartment where the dust is sacked or automatically discharged into a conveyor.

Shaking or cleaning the bags lasts but a few seconds. The air valve automatically opens the gate at B, (shutting B'), and the compartment is again filtering.

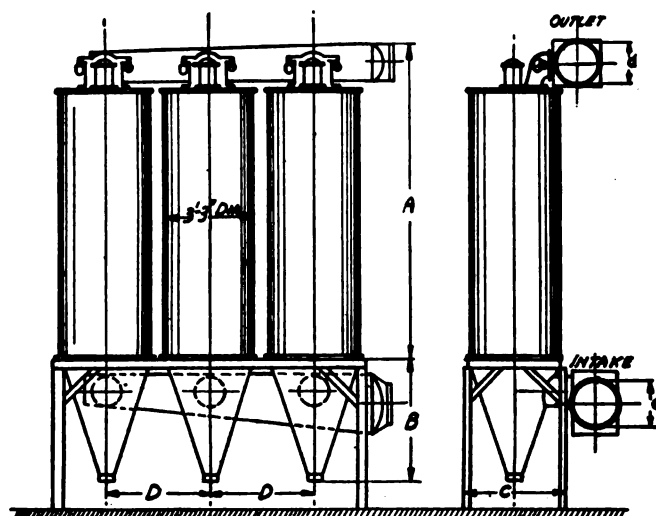
The next compartment is then automatically cut out for cleaning, and so on.

Cleaning is timed and operated by the little distributing valve shown on top plate, which is the only part of machine requiring a drive. The valve can be placed anywhere.

Consumption of compressed air for cleaning is about 2 cu. ft. per minute per compartment at about 35 lbs. pressure.



FILTERING AND AUTOMATIC CLEANING OPERATION OF "PERFECTO" FILTERS



ELEVATION OF TYPICAL "PERFECTO" SUCTION FILTER

DIMENSIONS, WEIGHTS AND CAPACITIES "PERFECTO" SUCTION FILTERS

No.	Filter area, sq. ft.	Overall dimensions				Diam. outlet d	Diam. intake e	Capacities				Approx. weight, lbs.
		A	B	C	D			7.5 cu. ft. per sq. ft.	10 cu. ft. per sq. ft.	12.5 cu. ft. per sq. ft.	15 cu. ft. per sq. ft.	
2	384	124"	4' 0"	3' 8"	3' 6 1/2"	15"	15"	2980	3840	4900	5750	3000
3	576	128"	4' 0"	3' 8"	3' 6 1/2"	18"	18"	4300	5760	7200	8650	4500
4	768	129"	4' 0"	3' 8"	3' 6 1/2"	20"	21"	5750	7680	9600	11500	6000
5	960	130"	4' 0"	3' 8"	3' 6 1/2"	22 1/2"	23"	7200	9600	12000	14300	7500
6	1152	132"	4' 0"	3' 8"	3' 6 1/2"	24 1/2"	25"	8700	11520	14400	17300	9000
7	1344	132"	4' 0"	3' 8"	3' 6 1/2"	26 1/2"	27"	10200	13440	16800	20100	10600
8	1536	134"	4' 0"	3' 8"	3' 6 1/2"	28 1/2"	29"	11500	15360	19150	23000	12000
9	1728	134"	4' 0"	3' 8"	3' 6 1/2"	30"	30 1/2"	13000	17280	21600	26000	13500
10	1920	136"	4' 0"	3' 8"	3' 6 1/2"	31 1/2"	32"	14400	19200	24000	28800	15000

NOTE—Minimum size—2 compartments.
Maximum—no limit, made to suit requirements.

Data Required for Estimates.

As in the case of Dracco pneumatic conveying, the problems of dust collection and fume recovery involve large number of detail facts, so we can not undertake to answer intelligently facts in a preliminary way, unless the enquirer gives the data covered in the following questionnaire, or so much of it as applies to this type of operation. For your convenience this questionnaire will be mailed in blank form if so desired.

- (1) Name of concern. Date.
- (2) Nature of business.
- (3) Nature of operation upon which our equipment is sought. (A sketch or drawing of the plant should accompany this answer.)

(4) Drawings sent: Enclosed? Separate cover? Date?

- (5) Give description of problem to be met.
- (6) Is the required operation now being done or attempted by some other type of apparatus? If so, what?
- (7) The principal object in desiring new equipment:

- (a) To improve sanitation and cleanliness in the plant?
- (b) To improve labor conditions?
- (c) To recover valuable substances?
- (d) To free the neighborhood from dust discharge?

(8) Power used in plant:

- (a) If electric power, describe voltage, cycle and phase.

(9) For recovery of dust from grinding, screening or crushing, please give special attention to the following points:

- (a) Material or materials.
- (b) Type of machine. (Send picture if convenient.)
- (c) Number of machines.
- (d) Nature of operation.
- (e) If volume of air required is already known, give this.
- (f) Best information of volume or weight to be collected per hour, if this can be estimated.

(10) For recovery of dust and fumes from drying operations please give special attention to following points:

- (g) Material or materials.
- (h) Type of dryer, size, make, etc.
- (i) Number of dryers.
- (j) Volume of gases leaving dryer per unit of time.
- (k) Temperature of gases (highest and lowest).
- (l) If fan is used, give size, make, type and speed.
- (m) If gases are exhausted into stack, give diameter, height and draft in inches of water, or coal consumption per hour.

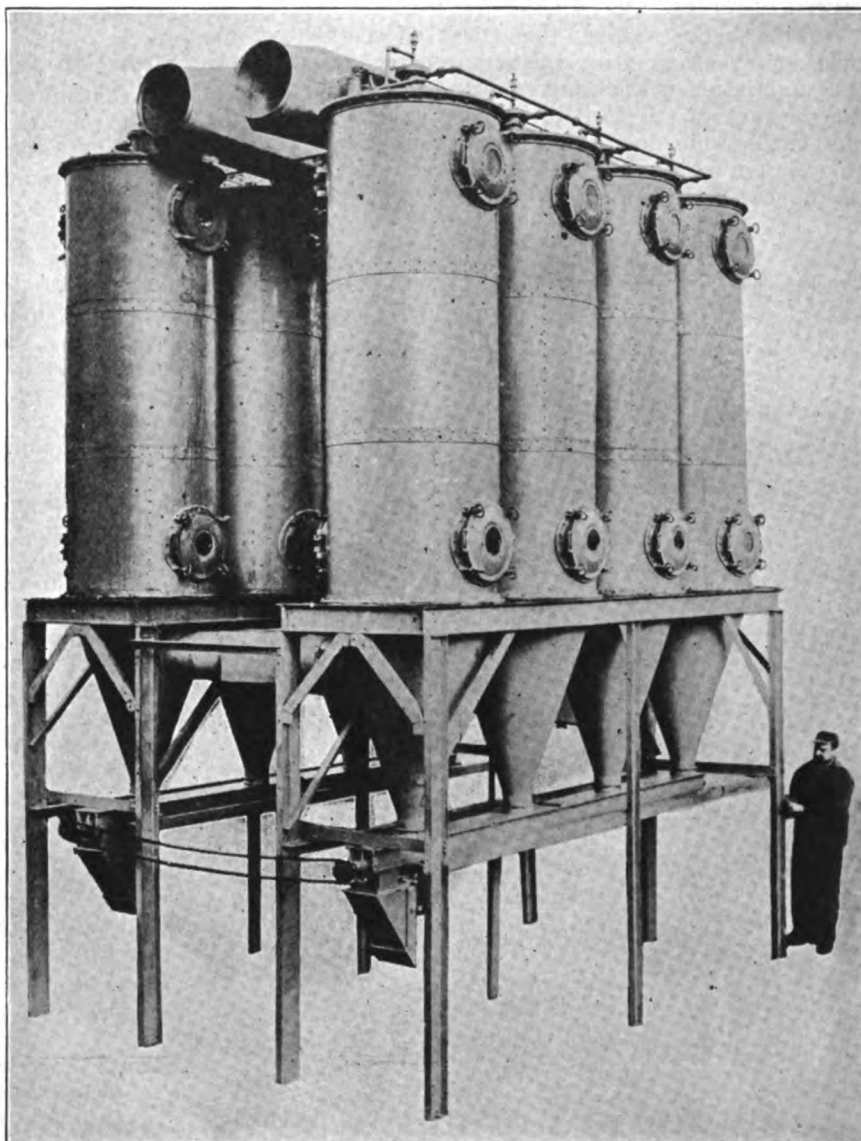
(n) Volume of weight of material passing through dryer, per hour, and percentage of water driven off.

(11) For smelting operations, please give attention to following points:

- (o) Nature of smelting operation.
- (p) Type of smelter.
- (q) Nature of dust to be recovered.
- (r) Volume of gas given off per unit of time.
- (s) Temperature of gas.
- (t) Size, make and type of fan equipment.
- (u) If gases are now exhausted into stack, give diameter, height and draft in inches of water, or coal consumption per hour.

(12) Please suggest here any other information we ought to have.

Note: The information which is sent us will be held strictly confidential and used only for the purpose contemplated in the inquiry.



A BATTERY OF EIGHT COMPARTMENTS, "PERFECTO" FILTERS

E. H. STROUD & COMPANY

ESTABLISHED 1896

Engineers and Manufacturers of Crushing, Pulverizing and Stoking Machinery

928, 930, 932 and 934 Fullerton Avenue
CHICAGO, ILL.

Products.

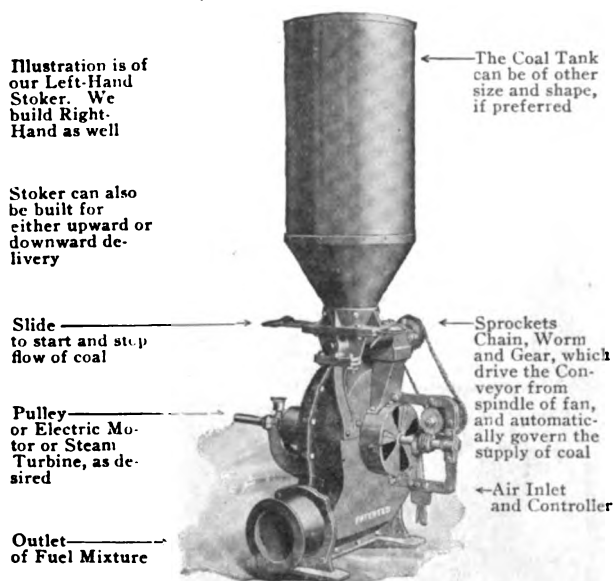
Machinery for the reduction of all sorts of DRY GRINDABLE MATERIALS, ANIMAL, CHEMICAL, MINERAL and VEGETABLE and some that carry 6% to 8% of MOISTURE. Also POWDERED COAL BURNING EQUIPMENT.

Pioneers.

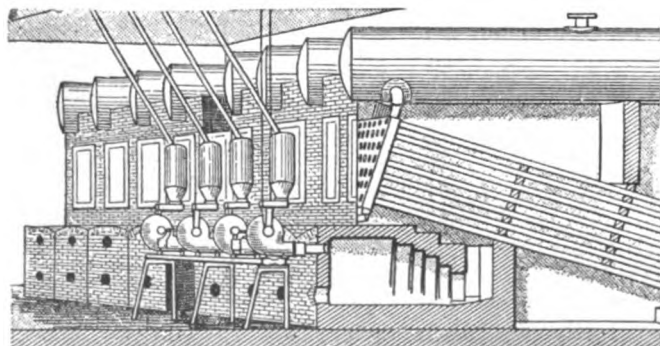
Pioneers in the art of pulverizing, stoking and burning powdered coal under boilers and some other heating units.

Stroud Powdered Coal Stoker and Burner.

This device receives the powdered coal, draws its own supply of air from the atmosphere, measures the coal and the air as used, mixes them thoroughly, delivers the mixture to the furnace (where it ignites at once) and enables the operator to have complete control of furnace temperatures and to make records from which to duplicate his results at will.



STROUD POWDERED COAL STOKER AND BURNER



ROUGH SKETCH OF A TYPICAL STROUD POWDERED COAL INSTALLATION

We have purposely made an incorrect drawing of the furnace and some other details because we do not



wish to advertise or give away gratis information which has cost us considerable time and money and effort.

Our installation is as simple as that shown, and gives entire satisfaction.

All persons are warned that the ideas embodied in the "Stroud Powdered Coal Stoker and Burner" are well covered by fundamental patents.

Sizes and Capacities—Sizes and capacities from 15 lbs. to 5000 lbs. of coal per hour per stoker with all the air needed for combustion.

Write for Bulletins A and No. 107.

Stroud Air Separation Pulverizers.

The illustration shows a product collector attached to the pulverizer. We build air vent chambers too.

These mills give a finished product direct which, without subsequent sieving, is so uniformly fine that 95% or 98% or all of it, as wanted, will, if tested when dry, pass through a horizontal brass wire cloth testing sieve of the desired mesh, which can be any mesh from say 40x40 down to the most impalpable powders, far finer than a 200x200 mesh.

They are without exception the most efficient pulverizers made.

Dustless in operation.

Difficult to clog.

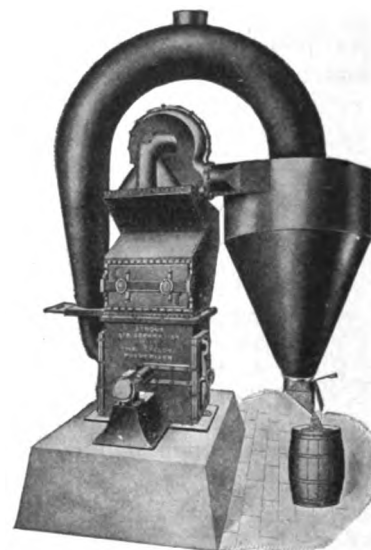
Easy to clean.

A cool pulverizer for chemicals.

So automatic in feeding and operation that one man can attend to at least half a dozen mills.

Cost of milling is very low.

Ask for Bulletin No. 101-A.



STROUD AIR SEPARATION PULVERIZER

Throw-out-Box-End-Door.

For cleansing materials from imperfect and foreign matter during process of pulverization.

Ask for Bulletin No. 101-B.

Stroud Screen Separation Crushing and Grinding and Shredding Mills.

Ask for Bulletin No. 102-B.

Crushing and Granulating Roller Mills.

With either pointed or chisel shaped cutters, or fluted rollers, one pair, two pairs or three pairs of rolls high, per mill.

Ask for Bulletin No. 200.

THE BONNOT COMPANY

Pulverized Coal Systems

CANTON, OHIO

Products.

HOLBECK PULVERIZED COAL SYSTEMS.

Also Bonnot Pulverizers, Rotary Kilns, Dryers and Coolers, and Bonnot Clay Working Machinery.

Holbeck Pulverized Coal Systems.

THE BONNOT COMPANY has passed into the sixth year of the successful manufacture and installation of the Holbeck system. The company can speak with experience and confidence of the good results that can be obtained, but the fact that many of the best known and most successful corporations have adopted the Holbeck system expresses more eloquently the reception accorded it.

The fundamental advantages of the use of pulverized coal are due to the coal particles being so finely divided that they readily mix with oxygen for combustion, thus requiring only the minimum amount of air.

Pulverized coal, when mixed with the proper amount of air, burns without smoke, not unlike gas; either reducing or oxidizing flames being obtainable. The fire is started with a swab of oiled waste; combustion readily taking place in a cold furnace. It can be turned on or off, up or down, to meet the temperature and conditions required.

The Holbeck system saves the labor required for unloading, wheeling and stoking the coal, also about 90% of the labor required for removing the ashes, clinkers and unburned coal. It requires no labor outside of the operators who stop and start the equipment, keep the bearings adjusted and lubricated.

The pulverized coal is delivered automatically as required to the different furnaces. After the coal is pulverized and delivered to the pulverized coal storage bins, the only equipment used is a screw conveyor to feed the coal from the bin, a blower to propel the air, an air indicator to indicate the quantity of air required, and an automatic regulator that works in conjunction with the air indicator to control the speed of the feeder that feeds the pulverized coal into the system.

Holbeck systems have been installed in almost every field of furnace heating, embracing the operation of steam boilers, open hearth, continuous billet heating, ingot heating, forging, malleable iron and cast steel annealing, busheling, fagoting, drop forging, nut, bolt and rivet making, rivet and plate heating, bull-dozer, sheet and pair and tinning, core drying, copper and lead reverberatory furnaces, roasters, rotary kilns, dryers and many other types of furnaces.

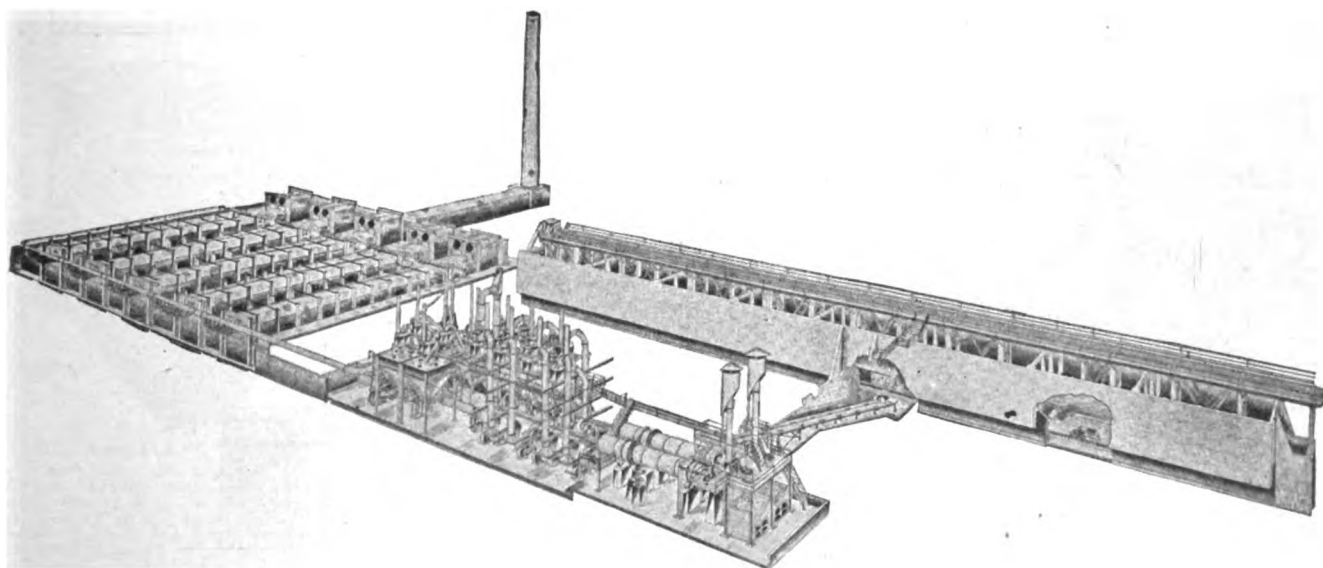
In every case, saving has been effected over the fuel previously used.

The perspective illustrated shows the Holbeck system as installed in a large copper smelter where it has been operating for more than two years.

More complete information will be sent to interested parties and the engineers of this company will make estimates on the possible economy of using pulverized coal.

Bonnot Pulverizers, Rotary Kilns, Bonnot Clay Working Machinery, etc.

Complete information and catalogue will be sent on request.



PERSPECTIVE OF HOLBECK PULVERIZED COAL SYSTEM INSTALLED IN LARGE COPPER SMELTER

GRINDLE FUEL EQUIPMENT COMPANY

FORMERLY COMBUSTION ECONOMY CORPORATION

Complete Powdered Fuel Equipment

1903 South Rockwell Street
CHICAGO, ILL.

Products and Services.

GRINDLE SYSTEM POWDERED COAL BURNING EQUIPMENT, all capacities, including: Dryers, Pulverizers, Pneumatic Coal Conveyors; Elevating, Conveying and Power Transmission Machinery; as applied to melting, annealing, forging and heating furnaces and all types of boilers, etc.

POWDERED COAL PLANTS are designed and installed complete for any desired, practical purpose.

Owing to the varied design and capacities of furnaces, boilers, etc., to which the "Grindle System" is adaptable, it is suggested that parties interested avail themselves of the service offered by our engineers, who are at all times ready to furnish suggestions, estimates and details. If powdered coal can be successfully used, our Engineers can make the installation satisfactorily and every installation is guaranteed to operate as claimed.

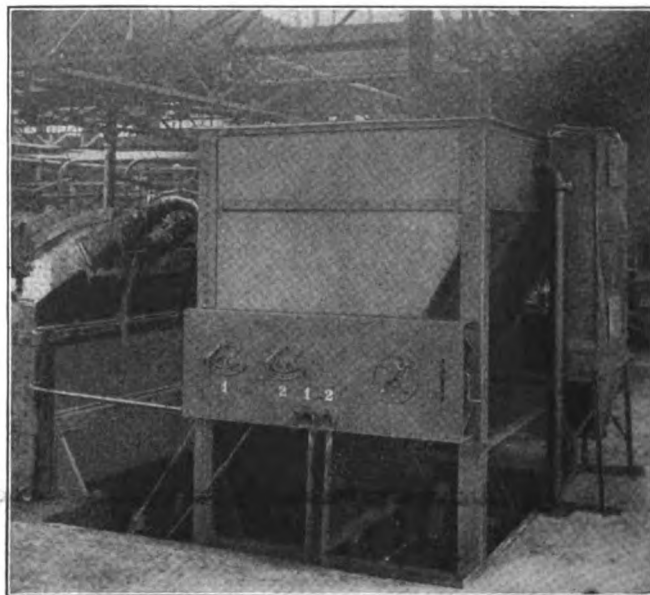
Powdered Coal Firing Equipment.

The powdered coal firing equipment is made in units with capacities from 2 oz. to 200 lbs. of coal per minute. All is automatic and under perfect control.

Special Features—The specially designed feed screw gives a uniform feed of coal to carburetors, which mix the coal with the air so thoroughly that it can be lighted with a piece of oily waste.

Operation of the Grindle System of Conveying Powdered Coal.

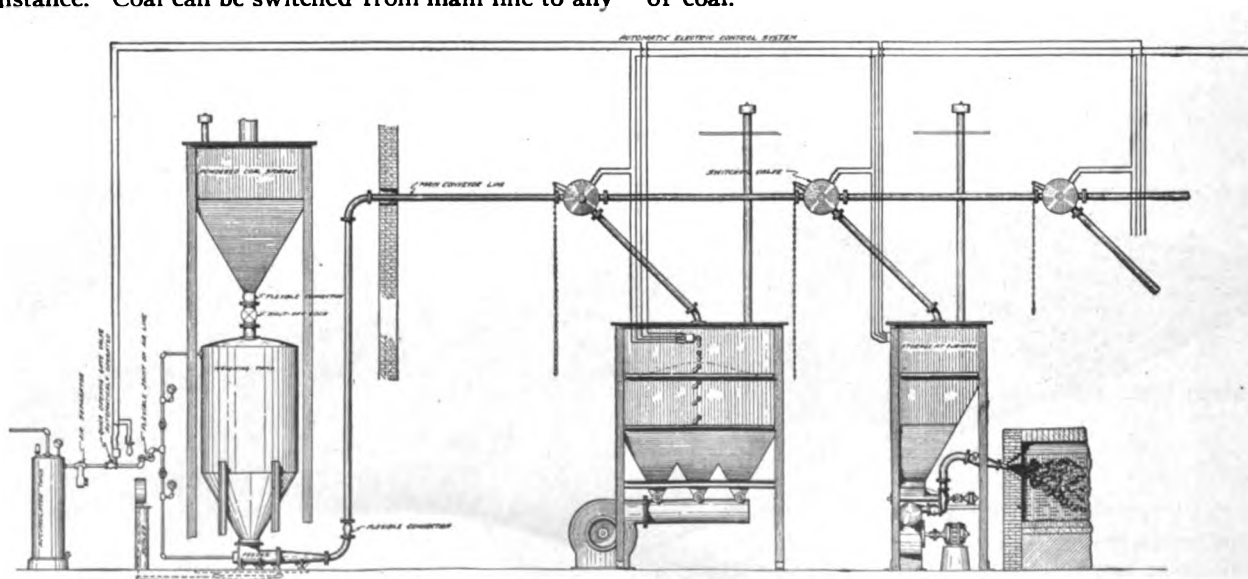
Powdered coal passes by gravity to a weighing tank and then is conveyed by compressed air through standard pipe at the rate of 33 to 1500 lbs. per minute, 10 to 40 lbs. pressure, 200 cu. ft. per ton conveyed; no limit to distance. Coal can be switched from main line to any



STANDARD FIRING UNIT NO. 10—60 APPLIED TO 30-TON MALLEABLE IRON MELTING FURNACE, SET IN PIT TO ALLOW CRANE TO PASS OVER

Note conveyor line entering from under floor. Absolutely dustless

desired number of storage hoppers at furnaces. Both front and side views of the furnace storage hoppers are shown below. The arrow indicators to be seen on the front of the hopper show the height of the coal received. When the hopper is filled and the top arrow is turned, it makes an electrical connection which closes a switch valve in the conveyor line, thereby stopping the inflow of coal.



DETAILS OF THE GRINDLE SYSTEM OF CONVEYING POWDERED COAL

AUTOMATIC WEIGHING MACHINE CO.

134-140 Commerce Street
NEWARK, N. J.

LONDON, ENG., WILLIAMS & PELL, Old Sergeants Inn Chambers, 5 Chancery Lane

PARIS, FRANCE, CIE. FRANÇAISE DE MACHINES POUR MANUTENTIONS AUTOMATIQUES, 22 Rue Bergère 9

Products.

AUTOMATIC WEIGHING MACHINERY for Weighing, Packing, Sealing and Conveying raw and manufactured products.

"Automatic" Scales.

These simple, speedy, durable and accurate scales have proved necessary factors for economical production and are being used by the leading manufacturers in the United States.

They are made in various standard models and sizes for everyday weighing and packing needs, only a few of which are illustrated below. Special machines designed and constructed. Consult this company's engineers for particulars.

All machines are sold under a liberal guarantee.

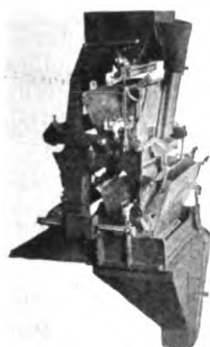
Wide Range of Adaptability—"Automatic" scales are adapted to the use of manufacturers and packers of:

Sugar	Flour	Cottonseed	Rock dust
Coffee	Rice	Cottonseed meal	Clinker
Spices	Wheat	Powders	Gypsum
Washing powder	Rolled oats	Tobacco	Coal
Starch	Salt	Cement	Tacks
Seeds	Drugs	Clay	Nails
Cereals	Fertilizers	Limestone	Malt, etc.

Carton Sealing Machines.

This company offers carton gluing and sealing machines which are unequalled for combined qualities of speed, accuracy, simplicity, durability and low cost of maintenance.

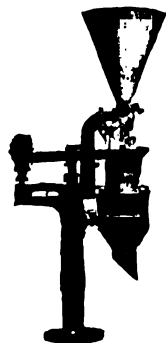
Salient features are: most economical disposition of floor space; entire absence of air and steam lines; shortest time consumption when changing from one size carton to another; entire absence of rapidly moving parts; absence of spoiled cartons; all flaps folded when carton is stationary; operation entirely automatic.



**"AUTOMATIC"
GRANULATED
SUGAR SCALE**

Used by the largest sugar refiners. Capacity, 2 to 5½ lbs.; 18 discharges per min.

Gravity actuated; no power required. Hand tripped or automatic



**GRAVITY FEED
SCALE**

Hand or automatic operation. Capacity, 10 oz. to 1½ lbs.; 15 to 20 weighings per min. Requires no power or mechanical attention. Only one adjustment necessary for change of weights



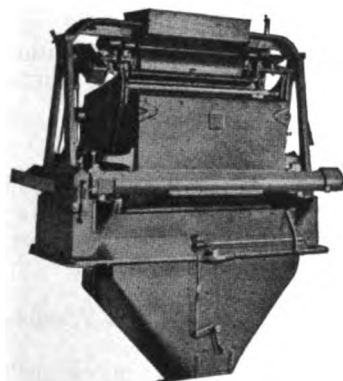
BAGGING SCALE

Gravity feed. Capacity, 50 to 200 lbs., 5 to 6 sacks per min. Can be supported from floor, either stationary or portable or suspended from overhead, either bin or trolley



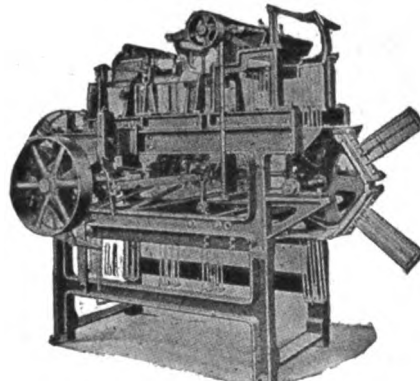
**POWDER AND COM-
POUND SCALE**

For weighing powdered and granular materials where a varying and wide range of weights is desired. Capacity, 1 to 60 lbs.; 3 weighings or more per min. Heavy preliminary and light final feeding mechanisms. Hand or automatic discharge or at timed intervals



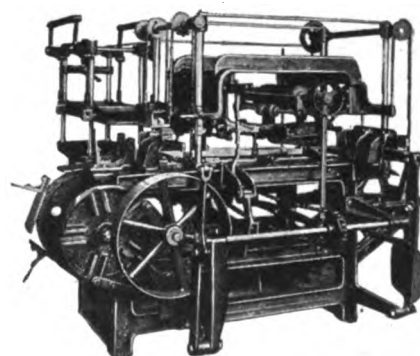
MILL AND ELEVATOR SCALE

For grains and free flowing materials. Gravity feed. Various sizes and models; 4 to 10 weighings per min. Can be supported from overhead track or from floor. Automatic or hand tripped



Machine for Automatically Sealing Bottom Ends of Cartons

Speed, 25 to 35 cartons per min. Requires ½ h.p. and 100 x 45 in. of floor space. One operator required



Machine for Automatically Sealing Top Ends of Cartons

Speed, 25 to 35 cartons per min. Requires ½ h.p. and 84 x 68 in. of floor space. No operator required

CARTON SEALING MACHINES

Complete outfit consists of bottom sealer, scale and top sealer, connected with a suitable conveyor, handling all one size carton, or various sizes of cartons

MERRICK SCALE MFG. CO.

Designers of Weighing and Conveying Installations

CABLE ADDRESS:
"WEIGHTOM, PASSAIC, N. J."

178 Autumn Street
PASSAIC, N. J.

CODES:
ABC, Western Union

Product.

The MERRICK WEIGHTOMETER.

Description.

The Weightometer consists of a pair of weighing levers, L, and a steelyard or beam, B, similar to that of the platform scale, but of special design, so that a short section of the conveyor can be suspended from the weighing levers. The load on this suspended portion, however distributed, is always automatically counterbalanced by the buoyancy of a cylindrical iron float immersed in a mercury bath and suspended from the long end of the weighing beam. This float allows the beam to move from its position, when the conveyor is empty, in exact proportion to the weight of material on the suspended portion of the conveyor at any moment. A mechanical integrator totalizes the movement of the beam, with a factor obtained from the travel of the conveyor by means of suitable gearing from the bend pulley or sprocket wheel. The result obtained from the product of two quantities, one proportional to the weight of the material suspended and the other to the travel, therefore represents accurately the total weight of material moved. This is plainly indicated, by a register, in units and decimals of either a short ton, long ton, metric ton or other desired units.

Applications.

In the past 12 years 460 Weightometers have been installed and are now operating. Materials weighed in domestic and foreign service include coal, coke, hog fuel, stone, gravel, sand, limestone, and iron, silver, zinc, lead, copper, gold, telluride ores and metallic ore concentrates, ammonium sulphate, caliche, copra, cement rock, clinker and finished cement, phosphate rock or pebbles, wood chips, sulphite pulp lumps, fish or fish products, slaughter house tankage, sugar beet cossettes and asbestos rock.

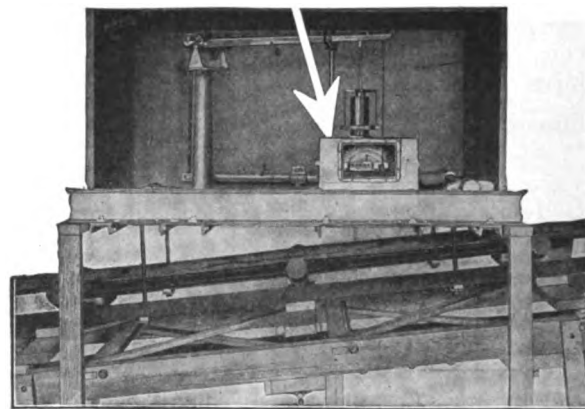
Accuracy.

This company guarantees, when this machine is erected and operated in accordance with instructions, that the accuracy shall be within 1% of the actual weight of material carried over the conveyor at a rate of not less than one-half of the maximum capacity for which the Weightometer is designed. This is not limited to a uniform continuous load, as portions of the conveyor may be loaded to full capacity of the Weightometer with empty portions intervening.

In testing, at least sufficient material must pass over the conveyor to register 5 or more unit figures on the counter.

Guarantee.

This company guarantees to replace by new ones, free of charge, f. o. b. factory, Passaic, N. J., any parts breaking or wearing out from ordinary use within one year's time, providing the defective part or parts be returned with transportation prepaid within a reasonable time after receipt of new part.



VIEW OF WEIGHTOMETER ON BELT CONVEYOR
Front sheet of casing removed

Registration.

Weight to be registered by 5-figure counter in tons of 2000 lbs. and decimals thereof, unless otherwise requested. Registration can be made in other units, as long tons, metric tons, barrels of a certain number of pounds, etc.

Material Furnished.

The Weightometer includes all weighing levers, beam, mercury balance and integrator enclosed in a sheet iron removable casing.

For belt conveyors, all parts for suspending the idlers and driving the integrator with snub pulley from return conveyor belt, are furnished.

For pan conveyors, suspension rods and brackets for suspending the track, and sprocket chain with sprocket to attach to one of the conveyor sprocket shafts, are furnished.

Material Not Furnished.

Uprights and cross members on which the Weightometer is placed.

Magnetic Counters.

One or more magnetic counters, for duplicating the readings of the register on the scale at distant points, can be supplied.

Durability.

Many of these machines have been in practical service for ten years, without appreciable expense for replacements and still maintain their original accuracy.

Essential Features.

The important advantages of the Merrick Weightometer are:

Easy installation; automatic operation; no expense for attendance; durability; simplicity; sheet iron enclosure for all working parts, thereby eliminating exposure to dust and interference by tampering; weighing without interruption of conveyor service, and a high degree of accuracy, whether the load be intermittent or uniform.

RICHARDSON SCALE COMPANY

Manufacturers of Automatic Scales

MAIN OFFICE AND FACTORIES
PASSAIC, N. J.

BRANCH OFFICES

NEW YORK, N. Y.
ATLANTA, GA.

BOSTON, MASS.
MEMPHIS, TENN.

OMAHA, NEBR.
MINNEAPOLIS, MINN.

BUFFALO, N. Y.

CHICAGO, ILL.
WICHITA, KANS.

Products.

RICHARDSON AUTOMATIC SCALES for many varieties of Crushed, Granular, and Powdered Materials, for bulk weighing and sacking.

Richardson Automatic Coal Scale.

Previous models of RICHARDSON AUTOMATIC COAL SCALES were designed to weigh *coal*, and weighed *coal*. They were not, however, satisfactory machines for handling the low grade culm bank mud that is being sold today as coal, and that costs more than the real coal used to.

The new 1921 model RICHARDSON AUTOMATIC COAL SCALE is designed to overcome every difficulty presented by poor quality of coal that has cropped up in the past few years, and it has proved itself *an amazing success*.

This new machine can be depended on absolutely to maintain an even feed from overhead bunkers to stokers at all times, and it can not be phased by oversize lumps

of coal or other foreign matter. Simply and substantially designed, it is *sulphurproof, moistureproof, dust-, mud-, and dirtproof, chokeproof, and loadproof*.

Features—The new RICHARDSON AUTOMATIC COAL SCALE can be depended on to operate day and night automatically without supervision.

It can be belt or motor driven.

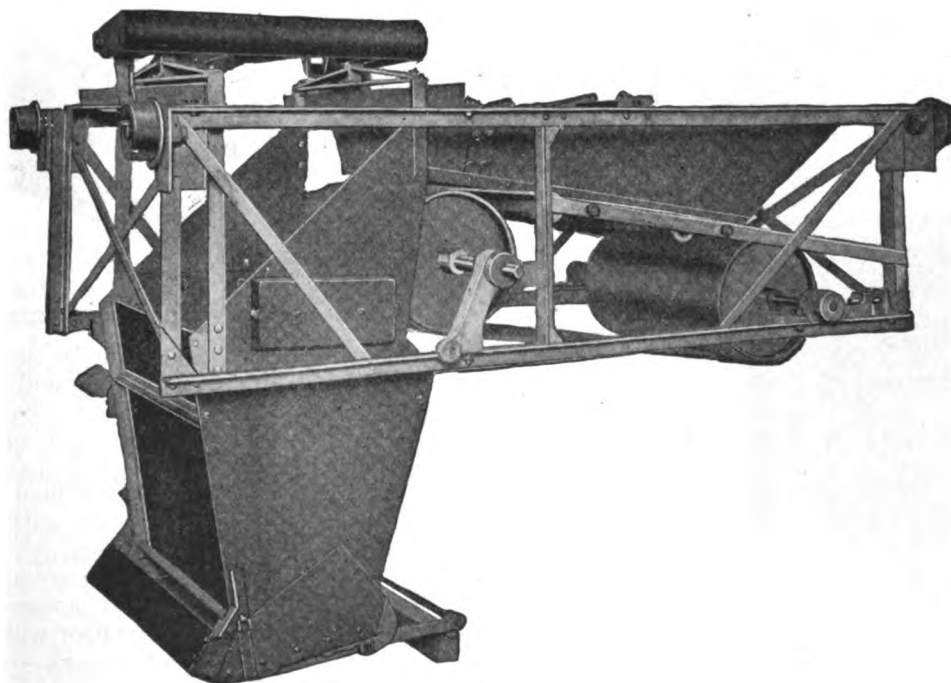
Its transmission gears, like those of an automobile, are carried in an oil bath.

It has a positive conveyor belt feed; is self-testing, self-registering, and it can not pass coal unweighed.

There can be no starved fires and its coal delivery is automatically regulated to the rate at which the coal is consumed by the stokers.

A full automatic machine, compact in construction and with nothing to get out of order, it registers evenly and accurately the exact consumption of fuel per boiler on every shift.

The new Richardson offers an attractive discount on your coal bills.



THE NEW RICHARDSON AUTOMATIC COAL SCALE

The ideal foolproof medium for checking the coal consumption of individual boilers

NATIONAL SCALE COMPANY

21 Race Street
CHICOPEE FALLS, MASS.

REPRESENTATIVES

BOSTON, MASS.
DETROIT, MICH.

PHILADELPHIA, PA.
CLEVELAND, OHIO
PERMANENT EXHIBIT, Grand Central Palace, NEW YORK, N. Y.

PITTSBURGH, PA.
PORTLAND, ORE.

CHICAGO, ILL.
MONTREAL, QUE.

Products.

NATIONAL COUNTING and WEIGHING MACHINES; NATIONAL-CHAPMAN ELEVATING SHOP TRUCKS; NATIONAL-CHAPMAN SCALE-ELEVATING TRUCKS; NATIONAL ELECTRIC CALLING SYSTEMS; NATIONAL ADJUSTABLE STEEL SHELVEING.

National Counting and Weighing Machines.

National counting and weighing machines give an accurate and quick count of any commodity, consisting of similar parts or pieces, without the use of tabulated figures of weights, mental calculation, or figuring of any kind. The total count of the contents of any box, barrel, bag, truck, or barrow containing an unknown number of like parts or pieces can be determined accurately and almost instantly.

The method is one of ratio balance, scientifically applied in a simple machine of few parts, which any ordinary laborer can operate and understand. While knowledge of the weight of the material handled is at no time a feature in obtaining count, yet whenever it is so desired, weight and count may be secured at practically one operation.

National counting machines are used for counting various classes of manufactured material, and material in process of manufacture or to obtain a lineal or square foot count.

Types and Capacities—National counting machines are made in 4 general styles: counter machines, port-



NATIONAL COUNTING AND WEIGHING MACHINE

NATIONAL FACTORY SYSTEMS
COUNTING FACTORY FINDING TILING STOCK
MATERIAL TRUCKING MEN WANTED AND MATERIALS
TRADE-MARK

able platform machines, dormants and mono-rail machines, which operate with all overhead mono-rail systems.

COUNTER COUNTING MACHINES—Made in 6 different types, with load capacities 5 lbs. up to 300 lbs. and which handle pieces 1/250 oz. up to 1/4 oz. in weight.

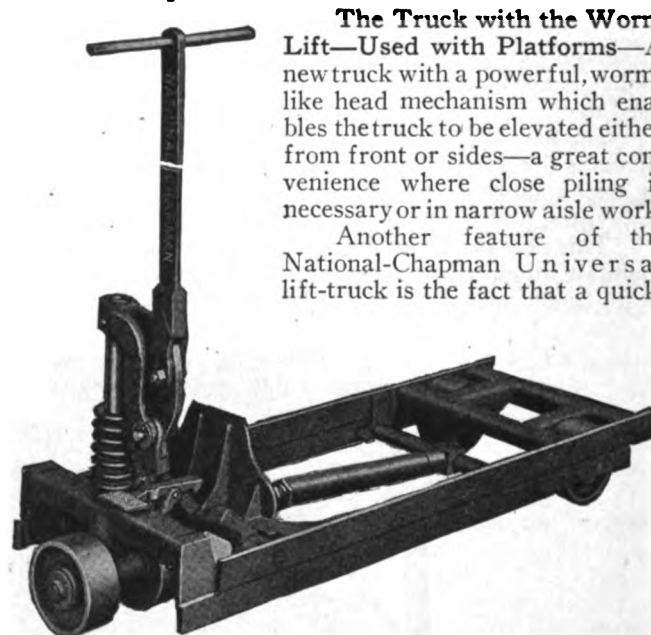
PORTABLE PLATFORM COUNTING MACHINES—Made in 10 different types with load capacities 600 lbs. up to 2000 lbs., and which handle pieces 1 oz. in weight upward.

DORMANT COUNTING MACHINES—Made in 16 different types with load capacities 2000 lbs. up to 40,000 lbs., and which handle pieces 2 oz. in weight upward.

MONO-RAIL MACHINES—Made for capacities 2000 lbs., 2500 lbs., and 3000 lbs., handling pieces 2 oz. in weight upward.

Counting—National counting machines are graduated to count in units. Special machines are furnished to count by dozen or gross.

National-Chapman Universal Lift-trucks.



NATIONAL-CHAPMAN UNIVERSAL LIFT-TRUCK

The Truck with the Worm Lift—Used with Platforms—A new truck with a powerful, worm-like head mechanism which enables the truck to be elevated either from front or sides—a great convenience where close piling is necessary or in narrow aisle work.

Another feature of the National-Chapman Universal lift-truck is the fact that a quick,

single down thrust of the handle elevates it. Consequently, this truck is on its way with a load before a truck elevated by jack or pump mechanism has its burden in position for transport. In addition, this new truck, without extra exertion on the part of the operator, lifts a load higher off the floor than any other truck of direct lift type—an obvious advantage on rough floors or in going over door sills.

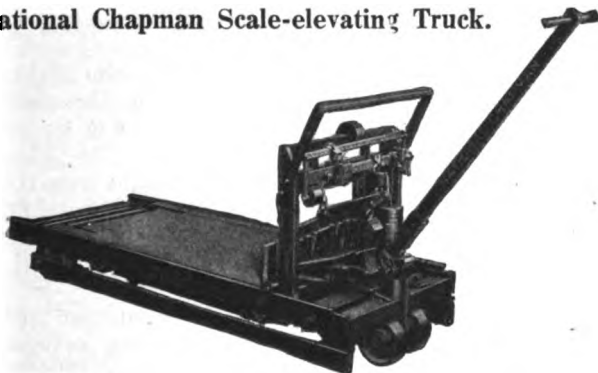
The National-Chapman Universal lift-truck is an all-steel truck equipped with a powerful hydraulic check which eases loads to the floor without a jar. This check contains no leather washers or other trouble makers but is reamed to gauge and fitted with pistons to gauge, also piston rings. Wheels are made of steel, with cold chilled rims. All wheels turn on Hyatt roller bearings.

SIZES, DIMENSIONS AND CAPACITIES OF NATIONAL-CHAPMAN UNIVERSAL LIFT-TRUCKS
(Dimensions given are standard)

Models.....	00	10	10B	20	30	40-	50	60	60A	70	80
Capacity.....	2500 lbs.	2500 lbs.	4000 lbs.	3500 lbs.	2500 lbs.	2500 lbs.	3500 lbs.	3500 lbs.	4000 lbs.	3500 lbs.	4000 lbs.
Width.....	17"	17"	17 1/4"	17"	17"	24"	24"	24"	24"	30"	30"
Length of load space.....	31 1/4"	37 1/4"	37 1/4"	37 1/4"	37 1/4"	37 1/4"	37 1/4"	37 1/4"	37 1/4"	37 1/4"	37 1/4"
Height, lowered.....	6"	6"	6"	6"	6"	6"	6"	6"	6"	6"	6"
Height, raised.....	8"	8"	8"	9"	11"	8"	9"	11"	11"	9"	11"
Clearance of side bars from floor.....	2 1/4"	2 1/4"	2 1/4"	2 1/4"	3 1/2"	2 1/4"	2 1/4"	3 1/2"	3 1/2"	2 1/4"	3 1/2"
Diameter of wheels.....	6"	6"	6"	7"	9"	6"	7"	9"	9"	7"	9"
Face of front wheels.....	2 1/4"	2 1/4"	2 1/4"	2 1/4"	2"	2 1/4"	2 1/4"	2"	2 1/4"	2 1/4"	2 1/4"
Face of rear wheels.....	2 3/4"	2 3/4"	2 3/4"	2 3/4"	2 1/2"	2 3/4"	2 3/4"	2 1/2"	2 3/4"	2 3/4"	2 3/4"
Wheel base.....	36"	40"	40"	39"	39"	40"	39"	39"	39"	39"	39"
Approximate weight.....	200 lbs.	217 lbs.	247 lbs.	257 lbs.	314 lbs.	253 lbs.	297 lbs.	324 lbs.	348 lbs.	332 lbs.	357 lbs.
Platform, maximum.....	33" x 41"	33" x 48"	33" x 48"	33" x 48"	33" x 48"	45" x 48"	45" x 48"	45" x 48"	45" x 48"	60" x 48"	60" x 48"
Platform, minimum.....	24" x 25"	24" x 30"	24" x 30"	24" x 30"	24" x 30"	30" x 30"	30" x 30"	30" x 30"	30" x 30"	38" x 30"	38" x 30"

Note—Trucks in special lengths and heights furnished on order. For trucks having 3/4-in. higher lift, specify "Z" model of number desired.

National Chapman Scale-elevating Truck.



NATIONAL-CHAPMAN SCALE-ELEVATING TRUCK

The National-Chapman scale-elevating truck is a complete National-Chapman elevating truck into which has been built an accurate National beam scale. Material loaded on wooden platforms can be weighed accurately while resting on the truck, and gross, net and tare weights quickly determined.

These trucks are built in 6 regular sizes known as Nos. 1-B, 2, 3, 5, 6A, and 8. The capacity of the 1-B truck is 3500 lbs.; with this exception, dimensions and capacities are identical with those shown for Nos. 10B, 20, 30, 50, 60A and 80 in the above table.

National Electric Calling System.

The National calling system is the "Instant Man Finder." It enables executives to leave their desks at any time with the certain assurance that they will be signalled instantly if wanted, no matter whether they go into the next room or to a remote part of plant or yards. When signalled, department telephones are used to answer the call and get the message.

The National calling system may also be used with a program clock to sound assembling and dismissal signals automatically.

The system is primarily the operating instrument, which is connected by wiring to a line of signals consisting of either bells, horns, buzzers, lights or whatever other electrical devices it is desired to use. These signals are distributed throughout the establishment.



Showing Operating Instrument Located Near Telephone Switchboard



Set to Call Code Number 32. OPERATING INSTRUMENT OF NATIONAL CALLING SYSTEM

The system operates on a voltage of either 110 or 220, A.C. or D.C. It is always in service and there are no batteries to cause trouble or to be recharged and consumption of current is very slight.

The operating instrument has a calling capacity up to 45 different code number combinations. A relay is used in connection with this system and there is no limit to the number of signals it will operate. Estimates, wiring diagrams, etc., are furnished on request.

National Adjustable Steel Shelving.

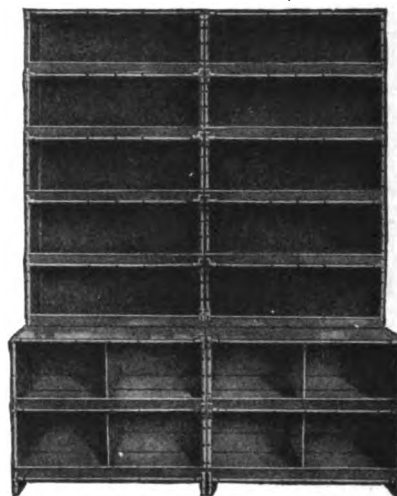
National adjustable steel shelving makes up into stacks of plain shelves, with or without backs, or into bin sections suitable for different kinds of material and equipped with drawers when desired. Shelves raised or lowered at will. Bin sections adjustable to different widths.

Parts are standardized and interchangeable. Stacks may be made up singly or arranged in series. All parts bolt together securely.

The best grade of full pickled, full cold rolled steel is used in this shelving. Its most noticeable feature of construction is the tubular edges of the uprights and shelves. This adds tremendous strength. Finish is plain steel or olive green baked enamel.

National Tool Racks—These racks have subdivided sloping compartments, also small drawers for filing hand and small machine tools.

Standard Measurements—National adjustable shelving is made in standard widths of 36 in. between uprights with total heights as desired. Standard depths of shelves are 10, 12, 14, 16, and 18 in. When depths greater than 18 in. are desired, 2 stacks to make the required depth are fastened securely together. Surveys and Dimension Charts, Plans and Estimates furnished on request.



NATIONAL ADJUSTABLE STEEL SHELVING



NATIONAL TOOL AND MATERIAL BINS

RELIANCE WEIGHING MACHINE DIVISION

STEARNS MOTOR MFG. COMPANY
GENERAL OFFICES AND FACTORY
LUDINGTON, MICH.

REPRESENTATIVES IN PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

Products.

RELIANCE COAL WEIGHING MACHINE.

RELIANCE GRAVITY TYPE WEIGHING MACHINE designed for free-flowing bulk materials such as corn, wheat, oats, rice, dry chemicals, sand, lime, gravel, etc.

RELIANCE SACKING MACHINES.

RELIANCE APPORTIONING MACHINES.

The Importance of Coal Conservation.

The enormous demand and increasing cost of coal, which is the most expensive single item entering into the cost of production, makes it imperative for plant operators and executives to provide an accurate means of checking coal as received and also to install and maintain dependable apparatus for weighing, recording and indicating the exact amount of coal consumed by each boiler unit.

Good engineering practice demands that this be done in a simple, effective and mathematically accurate manner, so that the engineering data produced can be relied on, while the work of the boiler room is not encumbered with new experimental devices.

Reliance Weighing Machine for Coal.

What it Does—

It will automatically weigh, record and indicate *without human attention* or manual effort all the coal delivered and consumed, with the mathematical precision that manual weighing can not approach.

The Reliance weighing machine is a distinct, self-contained unit, sturdily constructed, so nearly perfect in design and so flexible of application that it will readily meet any existing plant conditions. Its adaptability is almost universal and its installation in existing plants or new construction can be effected with ease and economy.

Correct Design

—The arrangement of the various working and rigid parts permit the pre-determination of any desired amount of individual weighment, the range of

operation varying with the size of the coal. It is possible to set the machine to deliver a steady stream of weighments of from 50 to 200 lbs. each.

The number of weighments per minute or per hour is governed by the rate of coal consumption—providing a constant supply is available.

To meet peculiar, local conditions, the Reliance weighing machine can be varied by making the installation either suspended or supported, portable or semi-portable, or fixed.

Sturdy Construction—A heavy, angle iron frame of box section constitutes the base from which all other parts are supported. This design obviates possibility of distortion and consequent inaccurate operation of the weighing elements.

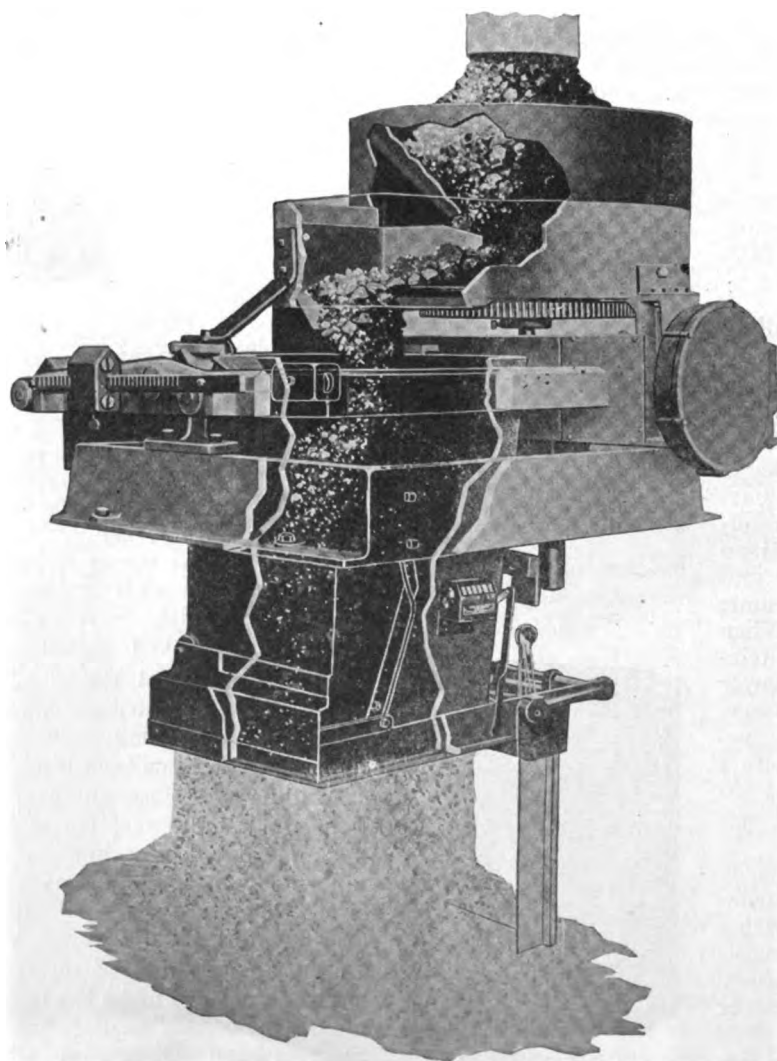
The weigh beam is of heavy construction and of the four-to-one ratio, thereby reducing the amount of counterweight necessary to balance the weigh hopper and weighing parts, and very materially reducing the stress on the wearing surfaces.

The knife edges on which the weigh beam and weigh hopper are balanced are of hardened steel and completely housed in dustproof, cast iron boxes. The parts which control the accuracy of the weighment are rendered dustproof by special design of self-shedding section.

Each machine can be separately operated by an individual back geared motor, or a battery of machines can be driven from one motor by means of a line shaft with sprockets and chain.

The operating shaft and clutch, together with the disengaging levers are fully enclosed in a dustproof housing. The horizontal bearings are of genuine bab-bitted metal. The vertical shafts are carried on ball bearing thrust bearings of superlative quality.

Driving gear and motor pinion are cut cast iron spur gears fully enclosed. Miter gears are cut steel.



SECTIONAL VIEW OF THE RELIANCE COAL WEIGHING MACHINE
SHOWING OPERATION

Disk driving pinions are cut cast iron spur gears. Operating shaft is amply provided with push oilers insuring proper lubrication.

Each machine is furnished with a recording, counting device of approved design which may be attached directly to each machine or placed at a remote point, (on a central gage board if desired) so that records may be read either locally, or by those in charge of plant operation.

All parts of the Reliance weighing machine which come in contact with the coal are of cast iron, to avoid corrosion resulting from the action of coal.

The assembly of all the parts is in strict accordance with definite details of design, insuring a machine at once mechanically correct in delineation, rigid and substantial in fabrication and accurate in operation.

CAPACITIES AND WEIGHTS OF COAL WEIGHING MACHINES

Model No.	Max. hopper capacity, lbs.	Max. hopper capacity, tons per hour	Hopper capacity, cu. ft.	Weights, per minute
RPL	100	18	2.0	4-6
RPL	200	36	4.0	4-6
RPS	1000	180	20.0	4-6

Reliance Gravity Type Weighing Machines.

Built in sizes to handle from 60 to 3000 bushels per hour.

Designed especially for the handling of free-flowing bulk materials, such as corn, wheat, oats, rice, dry chemicals, sand, gravel, lime, etc. Due to the specially designed reserve hopper, it is possible to weigh this class of material with an accuracy of $\frac{1}{10}$ of 1% continuously and automatically. This equipment, made in the same workmanlike manner as the power driven machines, assures a continuity of accurate operation and will result in great economies in the handling of these materials.

Reliance Sacking Machines.

Manufactured in two types, the gravity and power driven for handling free-flowing materials and the power driven for non-free-flowing materials. The power driven is the same as the machine illustrated on preceding page with the addition of the sacking attachment. These machines are admirably adapted for sacking the large variety of materials usually handled in this form and

are built in sizes suitable for the various sizes of sacks, bags or barrels, depending on the nature of the commodity and the weight per unit required. This sacking attachment can be attached to any Reliance grain scale.

Reliance Apportioning Machines.

These machines are designed especially for plants where the manufacturing process involves the correct apportioning of various ingredients.

They are made up in batteries of any desired number with any combination of sizes capable of weighing from 1 to 300 lbs. each, so arranged that the entire battery is discharged upon the completion of the largest weightment.

Reference is made to our most recent installation of 17 apportioning scales for the Quaker Oats Co., Memphis, Tenn.

Accurate Testing.

To make a certainty of the performance of the desired function and that guarantees will be met, all Reliance weighing machines are subjected to severe, rigid tests and are accurately adjusted before shipment. The test is made on a specially designed testing platform equipped with a Standard Howe Scale which is frequently tested with U. S. Standard Weights to insure constant accuracy.

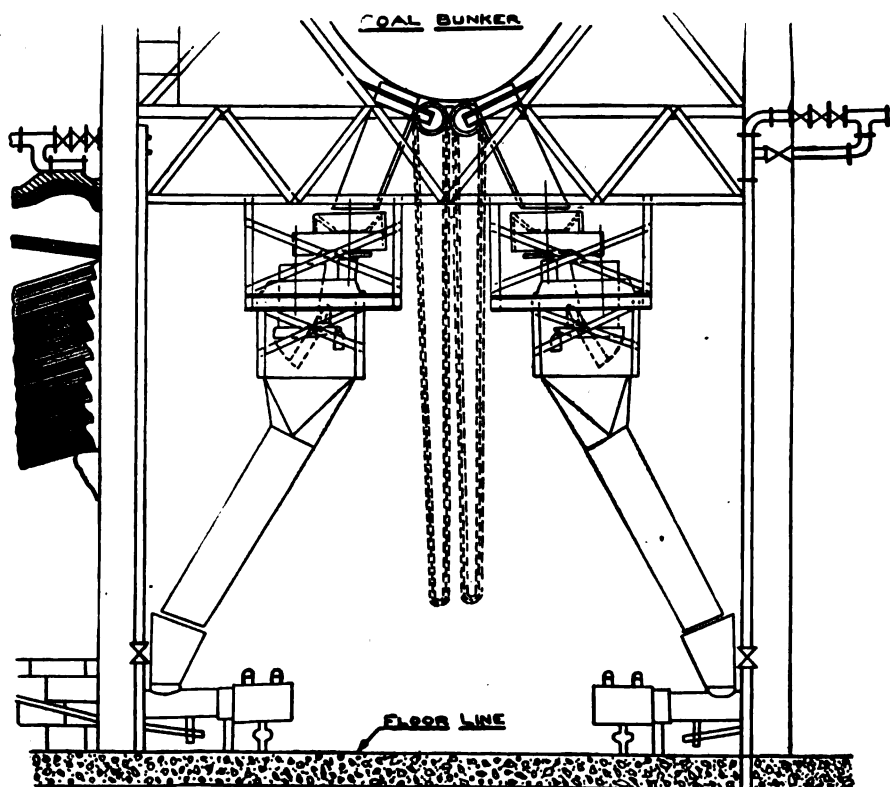
Co-operative Engineering Service.

Each installation presents a different problem and must be carefully considered from an engineering standpoint.

The company is prepared, and will be glad to co-operate with plant operators and engineers in the solution of difficult problems affecting the measuring, apportioning, weighing and recording of amounts of coal,

gravel, cereal grains, etc.

If possible send sketch showing head-room available—such as distances from bottom of bunker to top of stoker and to boiler room floor, showing all openings and clearances. Also state whether scale is to be used for boilers, and if so, how many are normally used with the normal and maximum hourly quantities of coal each will consume. If scale is to be used for receiving, a sketch showing head-room available will be required.



TYPICAL SUSPENDED INSTALLATION OF RELIANCE COAL WEIGHING MACHINE

Similar to installations made in power plants of Continental Motors; Milwaukee Electric Railway and Lighting Co.; Halcomb Steel; Brown Hoisting Machinery Co.; U. S. Food Products Corporation and many others

TOLEDO SCALE COMPANY

TOLEDO, OHIO

CANADIAN TOLEDO SCALE CO., LTD., WINDSOR, ONTARIO

Branch Offices and Service Stations in One Hundred and Six Cities in the United States and Canada; Others in Thirty-four Foreign Countries

Products.

AUTOMATIC SCALES of the following types, for Weighing, Computing, Counting, Testing and Checking purposes and other special operations: Counter, Bench, Portable, Dormant, Monorail, Tank and Truck Scales.

Largest automatic scale manufacturers in the world.

Toledo Springless Industrial Scales—Automatic and Instantaneous.

Tons may now be weighed with the same speed as pounds. Instantly indicating correct weight on their easily-read, clock-faced dials, Toledo scales make accuracy of heavy weighing automatic and uniform, instead of being dependent upon the patience and skill of the individual operator.

Although the saving effected by the modern weighing method in the nation's industries is already an enormous sum, the losses chargeable to antiquated methods of weighing are still tremendous.

In fact, wherever progress and leadership in any line of industrial endeavor is found, there you find Toledos have replaced the old beam types and weighing is now an automatic operation.

Rugged, simple in operation, always reliable, Toledo industrial scales guard profits, speed production, simplify factory problems, prevent waste, facilitate shipping. No more shifting of weights and peering at indistinct numerals on slow balancing beams. Instead, roll the load on the platform, glance at the big figures on the dial and the job is done.

Special Operations.

The Toledo industrial scale is more than merely a fast weighing machine. Its uses for special operations in factories are numerous and important.

Besides Toledo automatic scales for general weighing purposes, there are Toledos for compounding mixtures; measuring horsepower produced; testing the compression of piston rings and of springs; for balancing connecting rods and reciprocating parts; for determining moisture content of raw wool and similar materials; for packing predetermined quantities of material in containers; for counting small parts; for determining the weight of textiles per square or per running yard in ounces; for measuring coal or oil consumption; for grading grains; for measuring liquids; and for solving many other perplexing problems of testing and measurement in foundries, mills, factories and warehouses.

Built on the same never-varying pendulum principle, measuring gravity with gravity itself, are the Toledo springless automatic computing scales for retail stores and the Toledo springless automatic computing parcel post and mailing scales.

Detailed information concerning the uses and applications of Toledo scales, and their exclusive features and construction will be given on request.

Engineering Department.

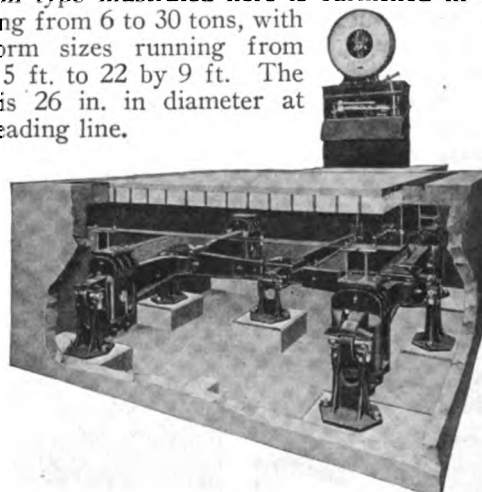
The TOLEDO SCALE COMPANY has the most highly skilled scale engineers and factory experts obtainable, whose knowledge, skill and services are always available for the solution of weighing, measuring, counting and checking problems.

Service Department.

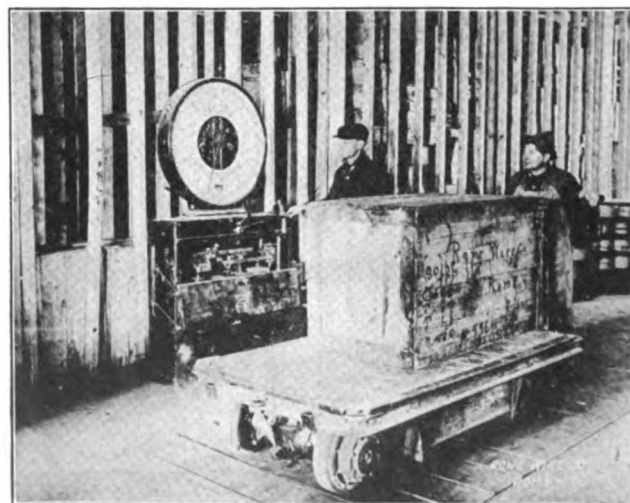
All Toledo scales are backed by an efficient service organization which insures Toledo users maximum protection and satisfaction at all times in case of accidents, or whenever a skilled scale mechanic is required.

Toledo Automatic Heavy Duty Scales.

The Toledo automatic heavy duty scale of the built-in type illustrated here is furnished in capacities ranging from 6 to 30 tons, with platform sizes running from 5 by 5 ft. to 22 by 9 ft. The dial is 26 in. in diameter at the reading line.

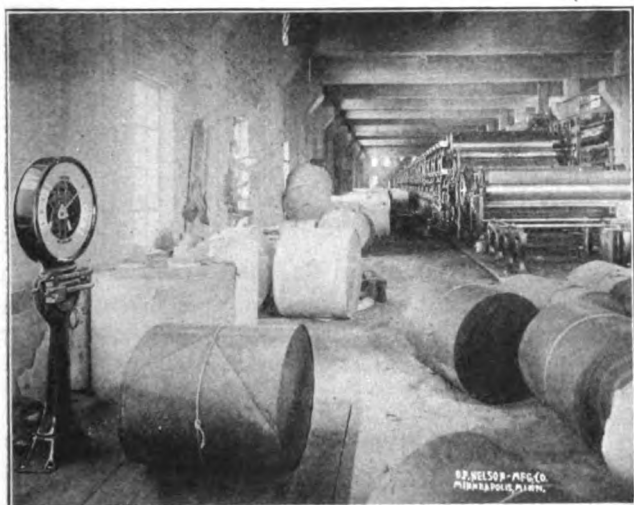


TOLEDO AUTOMATIC HEAVY DUTY SCALE
Built-in type



WEIGHING ELECTRIC TRUCK WITH LOAD

No time lost with the Toledo automatic heavy duty scale. No fussing with beams and loose weights for a balance, and no sacrifice of accuracy for speed.



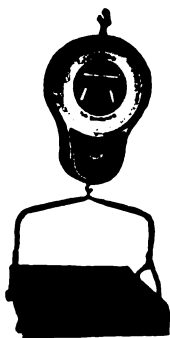
DORMANT SCALES IN USE IN LARGE PAPER MILL

Toledo Self-contained Single Column Dormant Scale.

The illustration above shows a scale of this type. They are built in capacities from 250 to 3800 lbs., with or without tare and capacity beams, as desired. Dial is 20 in. in diameter at reading line. Platforms run in light sizes from 46 by 33 in. to 76 by 54 in.

Toledo Automatic Hanging Scales.

Built in three capacities: 50 lbs., 100 lbs., and 150 lbs., with graduations as fine as 1/10 lb. The scale is hung from a swivel hook which permits its facing in any convenient direction. Choice of equipment is as follows: square galvanized pan, as shown; galvanized scoop; commodity hook; tire hook; round porcelain bowl; and galvanized lap for weighing cotton.



AUTOMATIC HANGING SCALE

Toledo Automatic Self-contained Heavy Duty Scales.

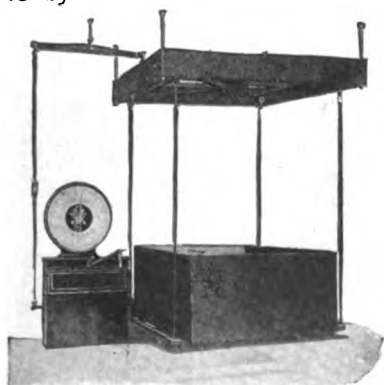
All steel construction in capacities to a maximum of 6250 lbs. There are six platform sizes, from 48 by 48 in. to 76 by 54 in.



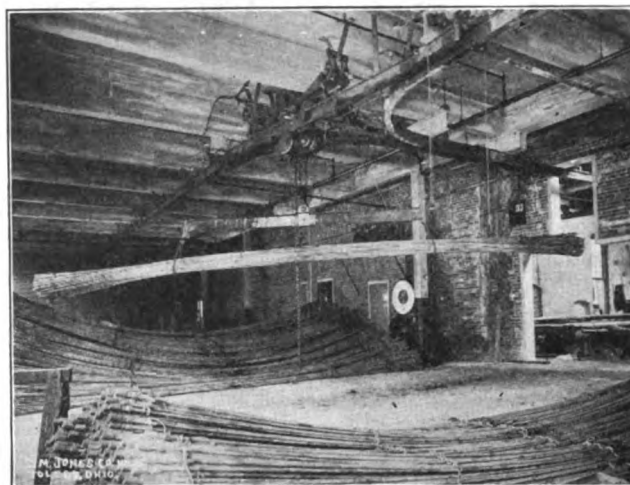
AUTOMATIC SELF-CONTAINED HEAVY DUTY SCALE

Toledo Automatic Tank Scales.

May be supplied with the cabinet style head as shown, in capacities up to 6250 lbs. With the style head as shown opposite, maximum capacity is 2500 lbs. Platform may be substituted for tank construction.



AUTOMATIC TANK SCALE



MONORAIL SCALES

Toledo Monorail Scales.

The monorail scale shown is used to check the count of bundles of a flexible, unwieldy product. Cabinet head has a maximum capacity of 6250 lbs. Single column head has an extreme capacity of 2500 lbs. It is adaptable to a great variety of factory operations.

Toledo Automatic Counting Scales.

May be used for automatically counting duplicate parts or pieces, or it may be used as an automatic scale for regular weighing operations. Furnished either in short column style for bench work, or in long column, as desired. Write for details and description.



AUTOMATIC COUNTING SCALES

Toledo Automatic Portable Scales.

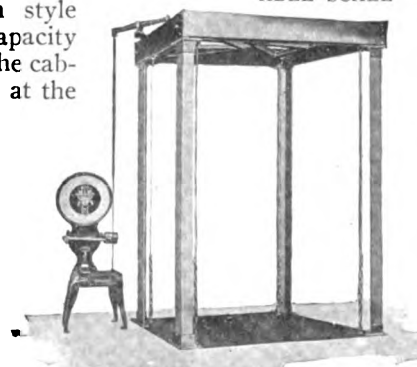
Furnished in capacities from 100 to 1500 lbs. Supplied without beams; with tare beam only; or with both tare and capacity beams. Dial, which is 20 in. in diameter at reading line, may face platform or may be at right angles to it, or may be on opposite side. Long column, as shown here, measures 37 in. Short column for bench work measures 20 in. Scale is furnished with or without wheels. Platform sizes 21 by 29 in. or 21 by 14 in.



AUTOMATIC PORTABLE SCALE

Toledo Suspended Platform Scales.

Single column style head has extreme capacity of 2500 lbs. With the cabinet head as shown at the left, the maximum capacity is 6250 lbs. Tank may be substituted for platform. Overhead levers may be supported on posts from floor, or hung from ceiling.



SUSPENDED PLATFORM SCALE

THE STANDARD SCALE & SUPPLY CO.

1631 Liberty Avenue
PITTSBURGH, PA.

STORES AND WAREHOUSES

CHICAGO, ILL., 169 North May Street
PHILADELPHIA, PA., 523 Arch Street

NEW YORK, N. Y., 145 Chambers Street
CLEVELAND, OHIO, 1541 Columbus Road
DALLAS, TEX., 3027 Elm Street

Products.

SCALES.

Also manufacturers of Gasoline and Oil Engines, Contractor's Hoists, Pumps, Hand and Trailer Trucks, Dump Wagons, Cars, Scrapers, etc.

For Concrete Mixers, see page 121.

General.

"The Standard" line of scales includes practically all types for every industry, in sizes from the portable platform, dormant, mine, wagon, motor truck, etc., to railroad track scales of the heaviest capacity and longest platform. This company specializes particularly on the heavier type of scales for steel mills, mines, grain elevators, etc.

Experience.

Over 25 years' experience in manufacturing scales, and the company's location in the geographical center of the industrial field places it in a position to furnish manufacturers with the right scales for every requirement and at prices in line with the grade of scales required.



"THE STANDARD" MOTOR TRUCK SCALE

Scientifically designed and constructed to withstand the heavy strain imposed upon it by the concentration of from 70% to 90% of the motor truck load on its rear axle

Partial List of "Standard" Scales.

Abattoir	Mine or tipple
Army and Navy	Miners and transportation
Bag rack, portable	Motor truck
Bathroom	Parcel post
Beams, balance	Personal
Beams, meat	Physicians
Bundling bench	Platform counter
Butter	Portable platform
Ceiling suspension	Portable pitless suspension scale
Charging	Portable warehouse
Cheese factory	Postal
Coal	Quick weighing attachment
Cotton	Railroad track
Counting	Recording beams
Creamery and dairy	Rolling mill
Drop lever	Salt meat and fish
Druggist	Special
Dump	Spice
Express package	Stock charging
Flour, dormant	Stock
Glass blower	Union or family
Grain dealers	Wagon
Grain hopper	Wagon dump
Grocery	Warehouse, dormant
Grain testers	
Iron warehouse	
Milk	
	Wheelbarrow

"The Standard" Modern Railroad Track Scale.

These scales are of massive and scientific design assuring durability, accuracy, economical maintenance, avoidance of breakdowns and the consequent delays, and the elimination of losses and possible disputes. Scales are readily accessible for inspection and attention.

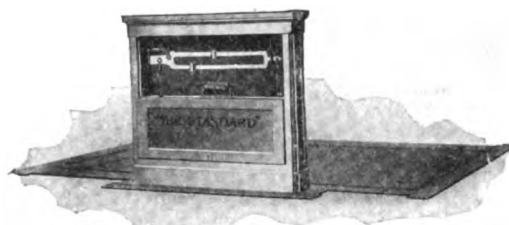
Manufactured in capacities up to 300 tons and



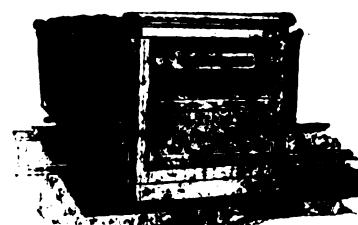
RAILROAD TRACK SCALE

lengths of platforms running from 6 ft. up. This company is prepared to furnish a specially heavy type where the scale is called upon to perform particularly heavy duty, or where it is necessary for a locomotive to pass over it. With the lighter pattern, a dead rail is usually provided. A single full capacity beam, graduated from 20 lbs. up to the capacity of the scale, either with or without recording attachment, is usually furnished. Double, triple or special beams are frequently used and this company is prepared to meet all demands.

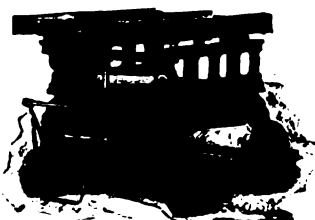
Catalogue No. 89 will be sent on request. Please specify the type of scale in which interested so that full information can be furnished.



WAGON SCALE

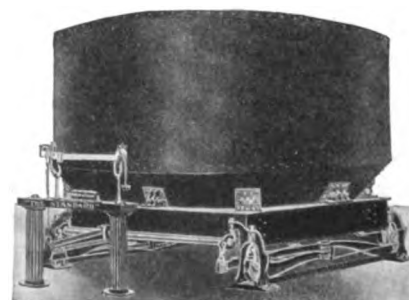


MINE OR TIPPLE SCALE



MONITOR ROLLING MILL SCALE

Equipped with short iron pillar and raised platform. Permits weighing of heavy castings, large plates, etc., handled by cranes



TANK OR HOPPER SCALE

AMES IRON WORKS

Manufacturers of Engines and Boilers

OSWEGO, N. Y.

BRANCHES IN ALL PRINCIPAL CITIES

Products.

AMES ENGINES include various types of Una-flow; Automatic and Throttling, Single Valve Center and Side Crank; Twin Variable Speed for paper mill drive.

AMES BOILERS include Horizontal Return Tubular; Return Tubular Portable; Locomotive; Upright; Portables on wheels and skids; also special types to order.

Also manufacturers of Smokestacks, Tanks and Special Plate Work.

Ames Engines.

Ames Una-flow Engines—Built in "Fixed" and "Controlled Compression" types from 50 to 1000 h.p. for non-condensing and condensing service, and to meet all operating conditions, including highly superheated steam, and to exhaust against moderately high back pressures. These engines can be furnished for constant and variable speed operation, for direct shaft connection to ammonia compressors, centrifugal pumps and other equipment.

Ames Una-flow engines will be furnished of proper type to secure maxi-

mum fuel economy as referred to specified conditions.

Ames Side and Center Crank, Single Valve, Automatic Engines—For medium and high speed operation in sizes up to 500 h.p. For direct and belted connection to generators, line shafts, blowers, pumps and other equipment.

Ames Twin Variable Speed Engines—The most efficient and reliable of their type. Highly recommended for Paper Mill drives.

Ames Boilers.

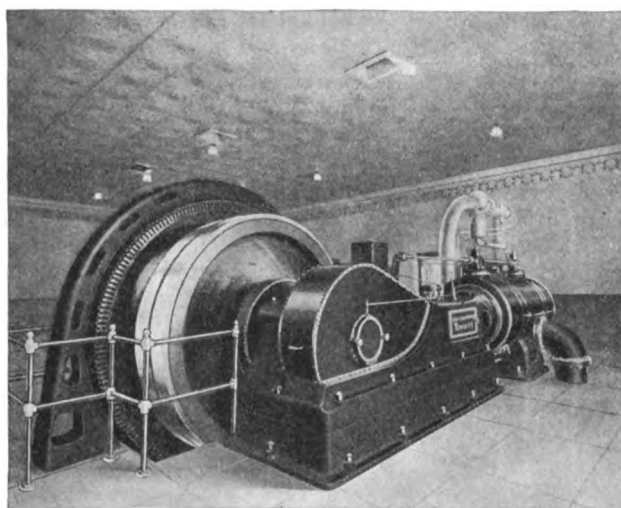
Built for all pressures and to meet all commercial requirements.

Horizontal Return Tubular Boilers—With flush and arch fronts for brick settings and of lug and suspended types, also steel cased suspended types. Sizes, 15 to 200 h.p.

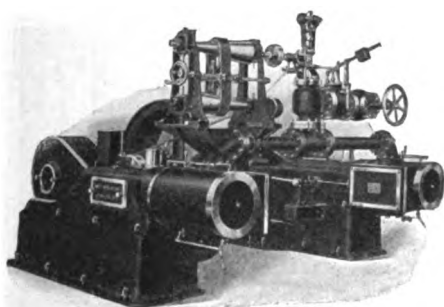
"Empire" Return Tubular Portable Boilers—Self-contained type for either portable or permanent settings. Built for low and high pressure service. Sizes, 15 to 150 h.p.

Bulletins.

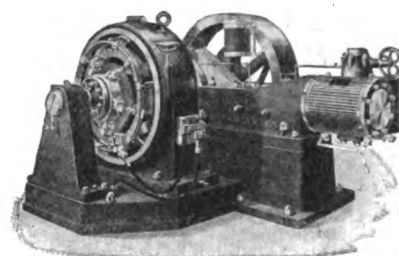
Will be sent on request.



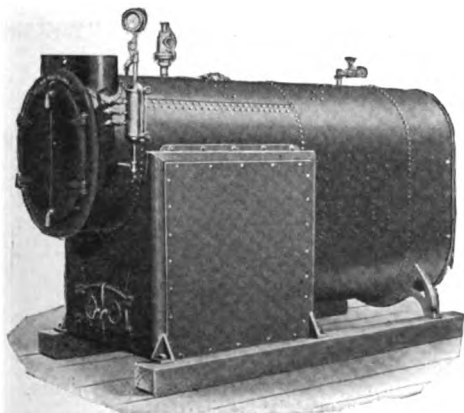
UNA-FLOW ENGINE DIRECT CONNECTED TO 450 KW. GENERATOR



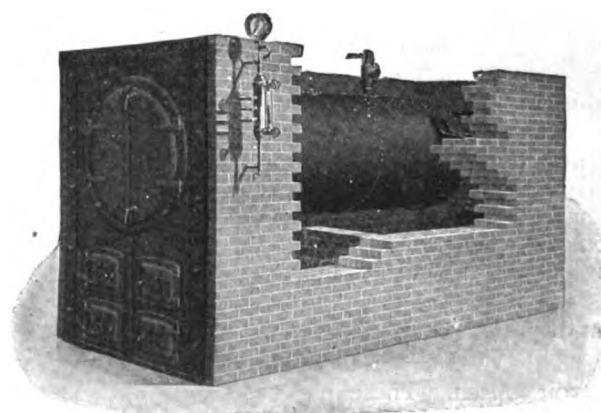
VARIABLE SPEED TWIN SINGLE VALVE ENGINE FOR PAPER MILL DRIVE



CENTER CRANK AUTOMATIC ENGINE FOR BELTED AND DIRECT CONNECTED GENERATOR SERVICE



"EMPIRE" RETURN TUBULAR PORTABLE BOILER



HORIZONTAL TUBULAR BOILER

ESTABLISHED 1845

THE HOOVEN, OWENS, RENTSCHLER CO.

Engines and Machinery

HAMILTON, OHIO

OFFICES IN MOST LARGE CITIES

Products.

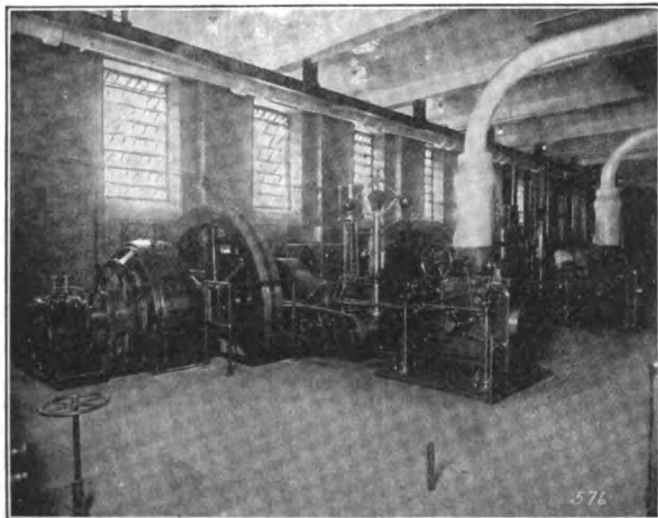
HAMILTON CORLISS ENGINES, POPPET FOUR-VALVE and UNIFLOW ENGINES, GAS and GAS-STEAM ENGINES, MARINE ENGINES, SUGAR MILLS and CRUSHERS.

Also Hamilton Pumping Engines, horizontal and vertical; Blowing Engines for blast furnaces; special heavy Cast Iron and Semisteel Castings.

Hamilton Corliss Engines.

For slow and medium speeds, with releasing gear. Hamilton Corliss Engines have been made since 1882. The first engine built is still in perfect running order. Nearly 5000 have been installed in hundreds of industries.

For heavy work where absolute reliability counts, for plants where steam is used for heating, for all conditions where shutdowns would be costly, the Hamilton Corliss Engine is the ideal power producer. Particularly suitable for paper mills, iron and steel plants, hotels and office buildings, textile industries, etc. Send for bulletin.



CORLISS ENGINES, NOS. 4052, 4053 AND 4054

Three 16x30 simple heavy duty Hamilton Corliss Engines direct connected to 200 kw. generators. Installed in the new Hamilton Co. Court House, Cincinnati, Ohio

Hamilton Poppet Four-valve and Uniflow Engines.

The latest improvements are incorporated in the Hamilton Poppet Four-valve and Uniflow Engines. They permit use of higher steam pressures with higher steam temperatures and greater rotative speeds. For economical efficiency the highest type developed in steam engine field. Send for bulletin.

Hamilton Gas and Gas-steam Engines.

This company built Henry Ford's power plant at Detroit, Mich. These big gas-steam units aggregate nearly 60,000 h.p. Nothing is too big for THE HOOVEN, OWENS, RENTSCHLER Co. to undertake with their large

HAMILTON

TRADE-MARK

human and mechanical facilities. Send for detailed technical information.

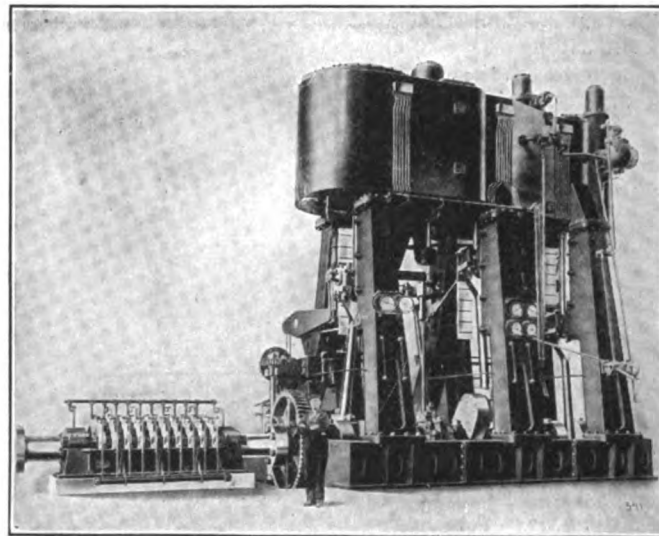
Hamilton Marine Engines.

Standardized production on marine engines from 500 to 5000 h.p. During the war 200 en-



INTERIOR FORD POWER PLANT

gines were built for the Emergency Fleet Corporation working up the production to four complete 2800 h.p.



2800 H.P. TRIPLE EXPANSION MARINE ENGINE

engines a week. Send for booklet, "Building Marine Engines on a Quantity Basis."

Hamilton Sugar Mills.

Cane crushing and grinding mills built complete with power equipment. Many large "Centrals" in Cuba have Hamilton mills. One produced 55,000,000 lbs. of sugar from 1918-19 crop. Send for Sugar Mill Catalogue containing complete mechanical details with illustrations.

Hamilton Service.

This company maintains a large staff of engineers who are authorities in their respective lines. Use them as consulting engineers. Ask them to solve any power problems—to answer any question. This service is free.

SWEET'S CATALOGUE

THE HOUSTON, STANWOOD & GAMBLE CO.

Manufacturers of Engines, Boilers and Boiler Settings
CINCINNATI, OHIO

Products.

STEAM ENGINES: Throttling Governor and Shaft Governor, Open, also Enclosed Self-oiling.

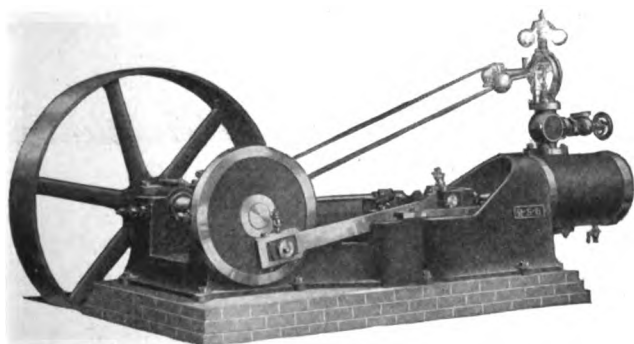
BOILERS: Horizontal Tubular, Locomotive Firebox and Internally Fired.

Also manufacturers of Feed Water Heaters, Stacks, Sheet and Plate Work.

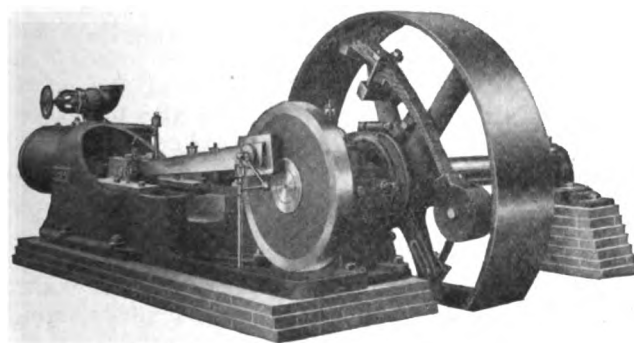
Steam Engines.

This company builds single valve steam engines in sizes from 20 h. p. to 350 h. p.; in the case of engines with throttling governor twin engines with capacity up to 700 h. p. are built.

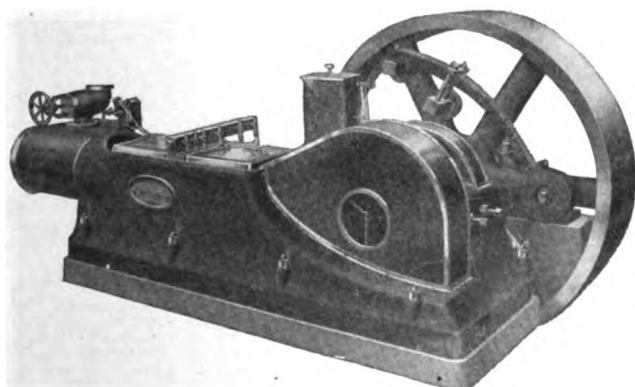
The larger sizes are all side crank, but it also builds center crank engines in sizes up to 75 h. p. Most of these engines are for medium speed, so that this company does not specialize on direct connected dynamo driving. These engines can be used for many kinds of direct connected service, such as fans, blowers, rotary pumps, etc.



THROTTLING ENGINE



SHAFT GOVERNOR ENGINE, OPEN STYLE



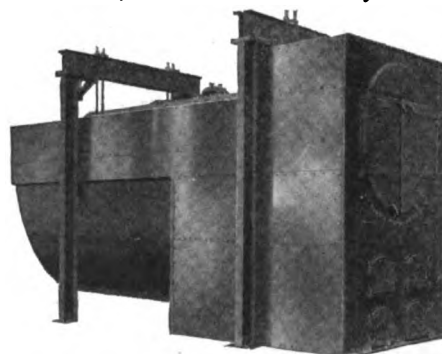
ENCLOSED SELF-OILING ENGINE WITH SHAFT GOVERNOR

Horizontal Tubular Boiler with Steel Casing Setting.

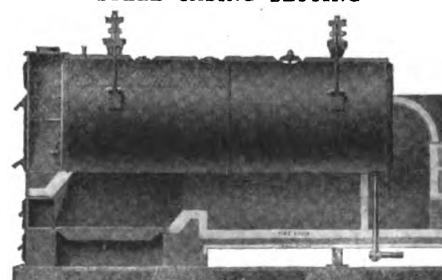
The steel casing setting is a steel jacket which surrounds and supports a heat resisting wall, consisting of a layer of non-conducting material (such as asbestos) and courses of fire brick. A few common brick are used where not exposed to the heat.

This steel jacket reduces the expense of operating horizontal tubular boilers very substantially by almost eliminating leakage of air through the walls into the furnace, thus reducing the fuel consumption; and by holding fire brick together and in place. The repairs are very much reduced, as the cracking of the walls is the cause of most of the repairs required by the ordinary all brick setting. There are other advantages, such as the elimination of most of the common brick; a reduction in space because of thinner walls; cleanliness and neatness in appearance.

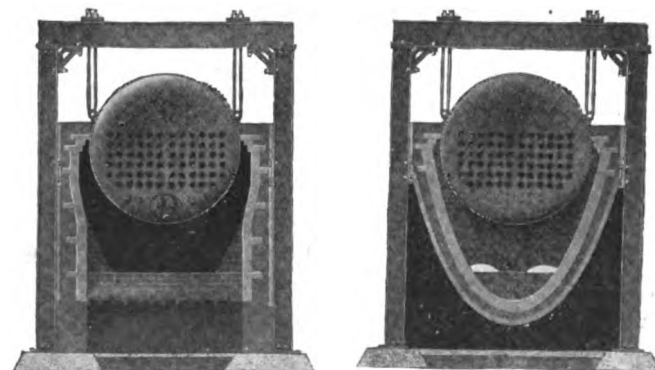
The steel casing is very easy to install. The casing is riveted up at the factory into a small number of sections, which have only to be bolted together, not riveted, at destination. The casing is assembled complete at the factory, fitted and carefully marked.



HORIZONTAL TUBULAR BOILER WITH STEEL CASING SETTING



APPLICATION OF STEEL CASING SETTING



CROSS SECTION VIEWS OF HORIZONTAL TUBULAR BOILER SUSPENDED WITH STEEL CASING SETTING

SKINNER ENGINE COMPANY

ERIE, PA.

BRANCH OFFICES IN ALL PRINCIPAL CITIES

Products.

"UNIVERSAL UNAFLOW" STEAM ENGINES and SKINNER STEAM-TIGHT-VALVE COUNTERFLOW ENGINES.

"Universal Unaflow" Engines.

The "Universal Unaflow" engine is the most economical steam prime mover built to-day. Proof of its superior economy has been substantiated by over 600 tests. This engine is built in capacities of from 100 to 1500 h.p. in side crank type and 100 to 400 h.p. in center crank type.

The "Universal Unaflow" engine is built only by this company and is arranged for noncondensing and condensing operation without any change. It automatically adjusts itself to the different exhaust pressure conditions.

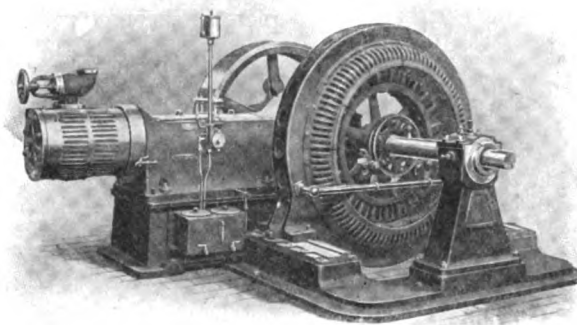
One of the characteristics of the "Universal

South America, Europe, Cuba, Canada, the Philippines and in practically every section of the United States. The economy and dependability of the "Universal Unaflow" engine are shown by the fact that in the year 1919 over 47% of the SKINNER ENGINE COMPANY'S business was "repeat orders."

Steam-Tight-Valve Counterflow Engines.

The Skinner Steam-Tight-Valve Counterflow engine is in operation in 10,000 plants in the United States. It shows superior economy, after years of use, to multi-valve counterflow engines, on account of the fact that the original economy of the Skinner engine is maintained because valve leakage has been entirely eliminated.

This engine is built in single cylinder type only, and in capacities of 100 to 600 h.p. in side crank engines, and 30 to 450 h.p. in center crank engines.



STEAM-TIGHT-VALVE COUNTERFLOW ENGINE

Unaflow" engine is that it gives an almost flat steam consumption curve from 25% to 125% of rated capacity, showing complete absence of valve leakage and initial condensation.

The "Universal Unaflow" engine has steam-tight poppet valves. The entire valve gear has only fourteen joints and is under the control of an automatic shaft governor, giving extremely close regulation. The smaller sizes operate at speeds as high as 277 r.p.m. and the larger engines operate at 150 r.p.m. The heavy duty construction and close regulation make the engine especially adapted to electric generator service.

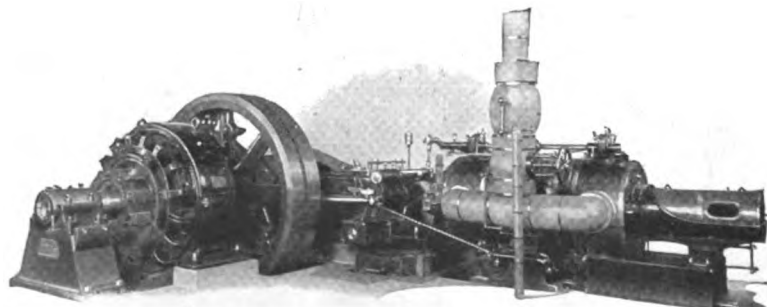
These engines are in operation in India, China,

Heavy-Duty, Variable-Speed Engines.

The SKINNER ENGINE COMPANY also builds several types of heavy-duty variable-speed engines, in both the "Universal Unaflow" and Steam-Tight-Valve Counterflow design, for various classes of service.

Skinner System of Automatic Lubrication.

All Skinner engines are equipped with the Skinner System of Automatic Lubrication (patented), which filters and cools the oil, separates it from the water and returns it to the bearings of the engine in a pure, clean condition.



"UNIVERSAL UNAFLOW" ENGINE

TROY ENGINE & MACHINE CO.

Manufacturers of Steam Engines Exclusively

TROY, PA.

Products.

TROY VERTICAL and HORIZONTAL STEAM ENGINES for every service, within capacities of 2 to 120 h. p.

Troy Vertical Automatic Engine.

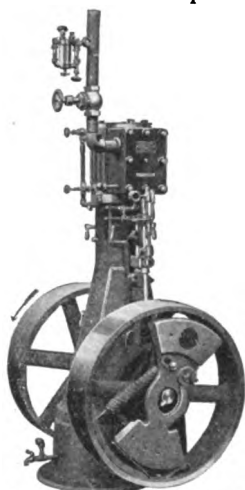
Self-oiling with enclosed frame, or cup lubrication; with 2 wheels for belted service or extended base for direct connection to generator. Equipped with Rites inertia governor, giving perfect balance. Regulation and stability obtained by weighting arm at one or both ends and by adjustment of coil spring. Variation between no load and full load seldom exceeds 2%.

Speed adjusted at standard revolutions as per table unless otherwise ordered. Standard driving pulley has same diameter and face as governor wheel. Equipment includes lubricator, drain cocks, throttle valve, wrenches, etc.

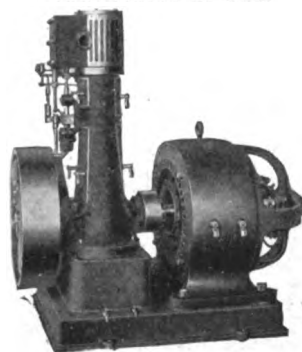
Several hundred vertical direct connected engine sets similar to illustration have lately been supplied to the United States Government.

Troy Horizontal Automatic Engine.

Two methods of lubrication—self-oiling or tank gravity system. Steam pressures, 60 to 160 lbs.; special cylinders for higher pressures. Subbase used with self-oiling engines contains oil reservoir and fittings. Full equipment. Speed and direction of rotation should be specified.



VERTICAL AUTOMATIC SELF-OILING ENGINE



VERTICAL DIRECT CONNECTED ENGINE

DATA, VERTICAL AND HORIZONTAL AUTOMATIC ENGINES

Cyl. in- der, in.	Revolutions		Brake h. p. ¾ cut-off.		Gov. wheel driving pulley		Shaft, in.	Pipes, in.	Floor, space, in.	Approx. shipping wt., lbs.			
Diam.	Stroke	Lowest	Standard	High	100 lbs. press., 300 revs.	1 lb. press., 1 rev.	Diam.	Length	Supply	Exhaust	Belted, 2 wheels	Belted, 2 wheels	D. C. extended base
3 ¼	4	4400	400600	12	96	000074	20	3 ½	130 1 ¼	22 ½	1 ¼	20x 23	750 950
4 ¼	5	5400	400600	16	44	000161	24	4 ½	175 1 ½	27	1 ½	24x 27	950 1150
5	7	7300	300500	9	36	000312	30	5 ½	415 2 ½	32 ½	1 ½	31x 33	1850 2100
6	7	7300	300500	13	35	000449	30	6 ½	415 2 ½	32 ½	1 ½	31x 33	1900 2200
7	7	7300	300500	18	36	000612	30	7 ½	415 2 ½	32 ½	1 ½	31x 33	1980 2250
8	8	8300	300475	20	97	000699	36	8 ½	610 3	39 ½	2	36x 41	2900 3200
8	8	8300	300450	27	39	000913	36	8 ½	610 3	39 ½	2	36x 41	2960 3250
9	9	9275	300400	33	03	001301	40	9 ½	930 3 ½	46 ½	2 ½	40x 48	4300 5600
9	9	9275	300453	20	01	001440	44	10	1050 4	53	3	44x 53	5200 6600
10	10	10275	300400	53	52	001784	44	10	1050 4	53	3	44x 53	5400 6800
10	10	10275	300400	64	74	002158	44	10	1050 4	53	3	44x 53	5600 7000
10	10	12275	300350	64	26	002142	54	12	1500 5	57 ½	4	54x 62	8200 9700
12	12	12275	300350	92	52	003084	60	12 ½	1700 5	57 ½	4	60x 62	8700 10200

† Power rating as 100 r.p.m.

HORIZONTAL AUTOMATIC ENGINES

Diam.	Stroke	Lowest	Standard	High	100 lbs. press., 300 revs.	1 lb. press., 1 rev.	Diam., in.	Face, in.	Wt. of Gov. wheel, lbs.	Diam.	Length	Supply	Exhaust	Belted, 2 wheels	D. C. extended base
7	8	300	475	20	97	000699	36	8 1/2	610	3	39 1/2	2	7 1/2	41x 72	3750 3900
8	8	300	450	27	39	000913	36	8 1/2	610	3	39 1/2	2	7 1/2	41x 72	3800 3950
9	9	275	300	40	33	001301	40	9 1/2	930	3 1/2	46 1/2	2 1/2	8 1/2	47x 82	5600 6800
9	9	275	300	40	43	001440	44	10 1/2	1050	4	53	3	9 1/2	53x 89	6400 8100
10	10	275	300	40	53	001784	44	10 1/2	1050	4	53	3	10 1/2	53x 89	6600 8300
10	10	275	300	40	64	002158	44	10 1/2	1050	4	53	3	10 1/2	53x 89	6800 8500
10	10	275	300	50	64	002142	54	12 1/2	1500	5	57 1/2	4	5	62x 105	9600 11000
12	12	275	300	50	92	003084	60	12 1/2	1700	5	57 1/2	4	5	62x 105	10000 11200

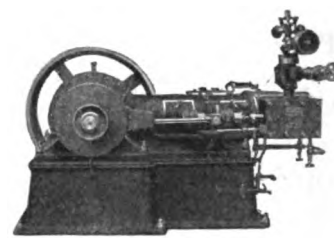
voir and fittings. Full equipment. Speed and direction of rotation should be specified.

Troy Vertical Throttling Engines.

The Troy special balanced slide valve is standard equipment in all sizes. Special cylinders are made for extra high steam pressures, or for superheat. Engine self-oiling, or cup lubrication. Full equipment supplied. Also built duplex or in pairs to suit customers.

Troy Horizontal High Pressure Throttling Engines.

Sizes from 15 h. p. up. Massive frame and base. Self-oiling system or tank gravity lubrication. Left-hand engines, as illustrated, are standard. Special equipment for direct connection to fans, blowers, pumps, etc.



HORIZONTAL THROTTLING ENGINE

Experience.

Troy engines are the result of 30 years' experience in the design and construction of steam engines. The benefit of this experience is offered to our patrons.

DATA, VERTICAL AND HORIZONTAL THROTTLING ENGINES

Cylinder, in.		R. p. m.	Brake h. p. $\frac{3}{4}$ cut-off		Flywheel in.		Shaft. in.		Pipes, in.		Floor space, in.		Approx- ship, wt., lbs.	
Diam.	Stroke		90 lbs. steam press.	1 lb. press. 1 rev.	Diam.	Face	Diam.	Length	Supply	Exhaust	Engine, with stand. pulley	Engine, with stand. pulley		
VERTICAL THROTTLING ENGINES														
HIGH PRESSURE TYPE														
3 $\frac{1}{4}$	4	300	2.21	000082	16	3 $\frac{1}{2}$	1 $\frac{1}{4}$	23 $\frac{1}{2}$	1 $\frac{1}{4}$	1	20x 23	500		
4 $\frac{1}{4}$	5	300	4.81	000178	20	4 $\frac{1}{2}$	1 $\frac{1}{2}$	29 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{4}$	24x 30	750		
5	7	250	7.80	000346	26	6 $\frac{1}{2}$	2 $\frac{1}{2}$	36	2 $\frac{1}{2}$	1 $\frac{1}{2}$	31x 36	1380		
6	7	250	11.20	000499	26	6 $\frac{1}{2}$	2 $\frac{1}{2}$	36	2 $\frac{1}{2}$	1 $\frac{1}{2}$	31x 36	1460		
7	7	250	15.34	000682	26	6 $\frac{1}{2}$	2 $\frac{1}{2}$	36	2 $\frac{1}{2}$	1 $\frac{1}{2}$	31x 36	1550		
7	8	250	17.32	000770	36	8 $\frac{1}{2}$	3	42 $\frac{1}{2}$	2	2	36x 43	2300		
8	8	250	22.80	001014	36	8 $\frac{1}{2}$	3	42 $\frac{1}{2}$	2	2 $\frac{1}{2}$	36x 43	2500		
9	9	250	32.40	001440	40	9 $\frac{1}{2}$	3 $\frac{1}{2}$	53	2 $\frac{1}{2}$	3	40x 49	3800		
9	10	250	36.00	001600	44	10 $\frac{1}{2}$	4	57	3	4	44x 56	4400		
10	10	250	44.55	001980	44	10 $\frac{1}{2}$	4	57	3	4	44x 56	4600		
11	10	250	54.00	002400	44	10 $\frac{1}{2}$	4	57	3	4	44x 56	4800		
10	12	250	53.55	002380	54	12 $\frac{1}{2}$	5	64 $\frac{1}{2}$	3 $\frac{1}{2}$	5	54x 68	6800		
12	12	250	77.10	003427	54	12 $\frac{1}{2}$	5	64 $\frac{1}{2}$	3 $\frac{1}{2}$	5	54x 68	7000		
14	12	250	102.44	004664	54	12 $\frac{1}{2}$	5	64 $\frac{1}{2}$	4	5	54x 68	7300		

VERTICAL THROTTLING ENGINES
HIGH PRESSURE TYPE

3 3/4	4	300	2.21	000082	16	3 1/2	1 3/4	23 3/4	3/4	1 1/4	20x	23	500
4 1/4	5	300	4.81	000178	20	4 1/2	1 3/4	29 1/2	1 1/4	1 1/2	24x	30	750
5	7	250	7.80	000346	26	6 1/2	2 1/2	36	1 1/4	1 1/2	31x	36	1800
6	7	250	10.70	000495	26	6 1/2	2 1/2	36	1 1/4	2 1/2	31x	36	1460
7	7	250	15.35	000682	26	6 1/2	2 1/2	36	2	2 1/2	31x	36	1550
7	8	250	17.32	000770	36	8 1/2	3	42 1/2	2	2	36x	43	2300
8	8	250	22.80	001014	36	8 1/2	3	42 1/2	2	2 1/2	36x	43	2500
9	9	250	32.40	001440	40	9 1/2	3 1/2	53	2 1/2	3	40x	49	3800
9	10	250	36.00	001600	44	10 1/2	4	57	3	4	44x	56	4400
10	10	250	44.55	001980	44	10 1/2	4	57	3	4	44x	56	4600
11,	10	250	54.00	002400	44	10 1/2	4	57	3	4	44x	56	4800
12,	12	250	53.55	002380	54	12 1/2	5	64 1/2	3	5	54x	68	6800
12	12	250	77.10	003427	54	12 1/2	5	64 1/2	3 1/2	5	54x	68	7000
14	12	250	102.44	004664	54	12 1/2	5	64 1/2	4	5	54x	68	7300

LOW PRESSURE TYPE

8	5	250	3.15	.00063	20	4 1/2	1 1/4	29 1/2	1 1/2	2	23x 30	950
10	7	250	6.50	.00130	26	6 1/2	2 1/2	36	2	2 1/2	31x 36	1800
12	7	250	9.50	.00190	26	6 1/2	2 1/2	36	2 1/2	3	31x 36	2000
14	7	250	13.50	.00272	26	6 1/2	2 1/2	36	3	3 1/2	31x 36	2400
12	8	250	11.40	.00228	36	8 1/2	3	42 1/2	3	3 1/2	36x 43	3000
15	8	250	17.65	.00353	36	8 1/2	3	42 1/2	3	3 1/2	36x 43	3200
12	9	250	12.85	.00257	40	9 1/2	3 1/2	53	3	4	40x 53	4000
15	9	250	28.90	.00578	40	9 1/2	3 1/2	53	4 1/2	6	40x 53	4600
18	10	250	22.30	.00446	44	10 1/2	4	57	3 1/2	4	44x 57	5000
16	12	250	30.45	.00609	54	12 1/2	5	64 1/2	4	5	54x 68	7600
18	12	250	38.50	.00770	54	12 1/2	5	64 1/2	5	7	54x 68	7800

HORIZONTAL THROTTLING ENGINES
HIGH PRESSURE TYPE

HIGH PRESSURE TYPE														
7	8	250	17.32	000770	36	8 1/2	3	42 1/2	2	2	43x 72	3300		
8	8	250	22.80	001014	36	8 1/2	3	42 1/2	2	2 1/2	43x 72	3400		
9	9	250	32.40	001440	40	9 1/2	3 1/2	53	2 1/2	3	53x 82	4700		
9	10	250	36.00	001600	44	10 1/2	4	57	3	4	57x 89	5600		
10	10	250	44.55	001980	44	10 1/2	4	57	3	4	57x 89	5800		
10	10	250	54.00	002400	44	10 1/2	4	57	3	4	57x 89	6000		
10	12	250	53.55	002380	54	12 1/2	5	64 1/2	3 1/2	5	65x 105	7800		
12	12	250	77.10	003427	54	12 1/2	5	64 1/2	3 1/2	5	65x 105	8000		
14	12	250	102.44	004664	54	12 1/2	5	64 1/2	4	5	65x 105	8200		

LOW PRESSURE TYPE

12	8	250	11.40	00228	36	8 1/2	3	42 1/2	3	3 1/2	43x 73	3800
15	8	250	17.65	00353	36	8 1/2	3	42 1/2	3	3 1/2	45x 73	4000
12	9	250	12.85	00257	40	9 1/2	3 1/2	53	3	4	54x 82	5000
18	9	250	28.92	00578	40	9 1/2	3 1/2	53	4 1/2	6	56x 82	5200
15	10	250	22.30	00446	44	10 1/2	4	57	3 1/2	4	57x 90	6200
16	12	250	30.45	00609	54	12 1/2	5	64 1/2	4	5	65x 106	8600
18	12	250	38.50	00770	54	12 1/2	5	64 1/2	5	7	65x 106	8800

CHICAGO PNEUMATIC TOOL COMPANY

Semi-Diesel Oil and Gas Engines

1002 Chicago Pneumatic Building
NEW YORK, N. Y.

SALES AND SERVICE BRANCHES

BIRMINGHAM CHICAGO DETROIT JOPLIN NEW ORLEANS PITTSBURGH SAN FRANCISCO
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BERLIN CHRISTIANIA JOHANNESBURGH MONTREAL SHANGHAI VANCOUVER MANILA
BOMBAY BRUSSELS LONDON OSAKA TOKYO WINNIPEG PARIS

Products.

SEMI-DIESEL OIL, GAS, and GASOLINE ENGINES.

Also Steam Engines.

For Pneumatic Tools, Electric Tools, Rock Drills, Hammers and Geared Hoists, see pages 42-43; for Air Compressors, see pages 48-49.

Giant Oil Engines.

Maximum Power at Minimum Cost—Giant Semi-Diesel oil engines are the most economical form of isolated power plants, having the over all operating economy of the full Diesel type without its complexity, the dependability of the steam engine without its costly auxiliaries, and the ability to operate successfully and economically on low-grade fuels.

Principal Features of Giant Semi-Diesel Oil Engines—Horizontal, crosshead type of construction. Hot plate ignition instead of hot ball, hot bulb or electric ignition. Valveless 2-cycle power cylinders.

Positive self-oiling system of lubrication.

Governed fuel injection. Close speed regulation. Perfect scavenging of cylinder. Rugged horizontal enclosed frame. Removable covers and accessible bearings. Economy of fuel.

Giant engines are guaranteed to run on any petroleum distillate, containing not more than 1% sulphur or 25% asphaltum, and ranging from 28° Baumé scale up to and including kerosene. They will operate satisfactorily on many oils below 28° Baumé, depending on the character of the oil.



TRADE-MARK

Parts relatively few in number, and engine well suited to rough, heavy duty under conditions that prevent the employment of highly trained attendants.

Economy of Operation—The economy of Giant engines is not only due to their ability to use low-priced liquid fuels, which are easily transportable. They occupy less floor space and require a minimum of operating supervision. Being more compact they can be placed nearer the machinery driven, giving a reduction in transmission losses. The close speed regulation particularly adapts them to electric generator service.

Successful Installations—Giant engines are operating successfully in oil pumping service, for driving refrigerating machinery, pumping for rice and other agricultural irrigation, driving line shafts, cotton gins, electric generators, grain mills and municipal pumping plants, as well as for such heavy duty variable load work as driving drop forging machinery.

A Complete Line—

Giant oil engines are built in capacities from 12 to 200 h.p. as listed in the accompanying table. Ask for Bulletin 389.

DATA, GIANT SEMI-DIESEL OIL ENGINES, FOR GENERAL SERVICE*

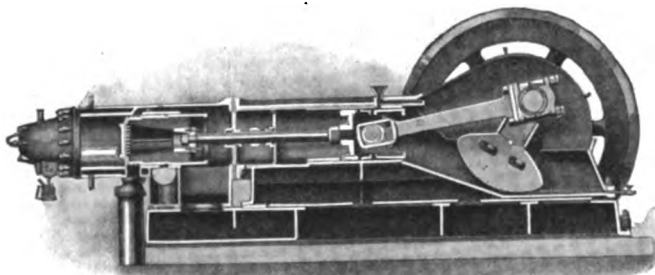
Brake h. p.	R. p. m.	Diam. flywheel, in.	Floor space, ft.-in.	Code
CLASS A-02—SINGLE TYPE				
12	400	42	7-2 x 3-0	Axiopolis
20	300	54	9-6 x 5-3	Axial
30	300	62	11-3 x 5-6	Axially
40	275	60	12-0 x 6-9	Axicorne
50	275	63	13-0 x 7-6	Axiculo
60	250	63	14-3 x 7-9	Axieros
80	230	72	16-8 x 8-4	Axifere
100	230	72	17-0 x 9-4	Ayrampo
CLASS A-D02—DUPLEX TYPE				
100	275	60	13-0 x 8-2	Axifugo
126	250	72	14-6 x 10-3	Axigrapha
160	230	72	16-8 x 12-6	Axiladas
200	230	72	18-0 x 15-6	Azafamado

*These engines, when supplied for electric generator drive are equipped with extra heavy flywheels. When this type is desired add words, "Electric Service" to code word.

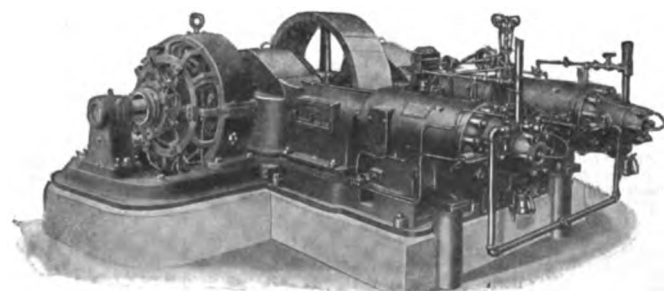
†On duplex type machine this dimension is that of the belt wheel, which serves also as the flywheel.

Giant Gas Engines.

Giant engines are built also for operation on gas, in capacities from 16 to 220 h.p. Ask for bulletin 492, containing complete information.



GIANT SEMI-DIESEL OIL ENGINE, CLASS A-02
Sectional view, showing construction



GIANT DUPLEX SEMI-DIESEL OIL ENGINE, CLASS A-D02
100 h.p. direct connected to electric generator

THE FAIRBANKS COMPANY

Super-Diesel Oil Engines

ADMINISTRATIVE OFFICES

416 Broome Street
NEW YORK, N. Y.

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Products.

SUPER-DIESEL OIL ENGINES.

For Trucks, Wheelbarrows, Cars and Dragscrapers, see page 1220; for Steel Factory Equipment, see page 1237.



TRADE-MARK

Just turn on the fuel oil and turn over the engine.

It needs no water or steam to keep the cylinder free from carbon.

Made in sizes of 20, 25, 30, 40, 50 and 60 h.p.

The "Fairbanks O. K."

The "Fairbanks O. K." tag, a mark of merit, is attached to every Fairbanks product.

It protects the purchaser against faulty equipment and assures him of standard quality, fair prices and dependable after-service.

Fairbanks Super-Diesel Oil Engines.

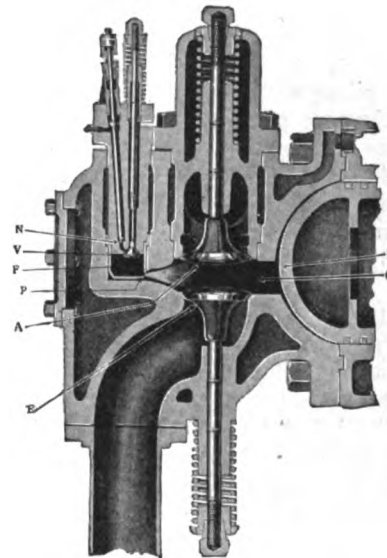
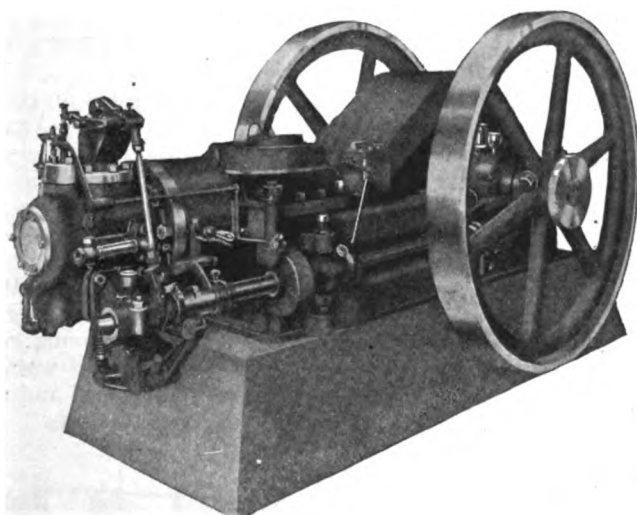
The Fairbanks super-Diesel oil engine requires no high pressure pump to inject the fuel because the fuel oil is admitted before the compression stroke.

To start this engine, no blow torches, hot balls, hot tubes or hot plates are needed to help ignition.

How It Operates.

The lighter parts of the fuel oil in the fuel cup "F" are released when the air in the cylinder is compressed. The heat generated by compression ignites them, raising the pressure in the cup and forcing the rest of the fuel oil out through the holes in the cup (one of them is shown at "P"). Immediately the combustion chamber "C" is filled with burning mixture, the expansion of which creates pressure on the piston and drives it out.

On the return stroke, the exhaust valve "A" and the fuel valve "V" admit the air and fuel for the next cycle; on the compression stroke, all valves are closed.



FAIRBANKS SUPER-DIESEL OIL ENGINE

ECONOMY TABLE

Comparison of cost on basis of 300 days of 10 hours each

Horsepower	FAIRBANKS SUPER-DIESEL ENGINE				GASOLINE ENGINES			GASOLINE—KEROSENE			ELECTRIC POWER			STEAM POWER		
	Based on fuel consumption of 6 lbs. per h.p. hour, oils weighing approximately 7.5 lbs. per gal.				Based on fuel consumption of 1.0 lb. per h.p. hour, gasoline weighing 6.6 lbs. per gal.			Based on 1 gal. in 15; gasoline for starting and maneuvering. Consumption per h.p. hour, gasoline 1.0 lb.; kerosene 1.0 lb.			\$0.02 per kw.	\$0.04 per kw.	\$0.06 per kw.	Coal per ton (part time engineer included)		
	\$0.03	\$0.05	\$0.07	\$0.09	\$0.20	\$0.25	\$0.33	G. \$0.20 K. 0.08	G. \$0.25 K. 0.10	G. \$0.33 K. 0.14				\$4.00	\$6.00	\$8.00
20	\$144.00	\$240.00	\$366.00	\$432.00	\$1818.00	\$2272.50	\$2999.70	\$799.92	\$999.90	\$1387.74	\$994.67	\$1989.34	\$2984.01	\$2496.00	\$3360.00	\$4224.00
30	216.00	360.00	504.00	648.00	2727.00	3408.75	4499.55	1199.88	1499.85	2081.61	1492.00	2984.01	4476.01	3744.00	5040.00	6336.00
40	288.00	480.00	672.00	864.00	3636.00	4545.00	5999.40	1599.84	1999.80	2775.48	1989.34	3978.68	5968.02	4992.00	6720.00	8448.00
60	432.00	720.00	1008.00	1296.00	5454.00	6817.50	8999.10	2399.76	2990.70	4163.22	2983.91	5968.02	8952.03	7488.00	10080.00	12672.00

FAIRBANKS, MORSE & CO.

Manufacturers of Oil Engines

CHICAGO, ILL.

Products.

OIL ENGINES, 10 h.p. to 200 h.p.

Also manufacturers of Kerosene and Gasoline Engines, 1½ h.p. to 20 h.p.; Railway Supplies, including Gasoline Railway Motor Cars; Standpipes; TRADE-MARK Water Tanks and Towers; Coaling Stations.

For Centrifugal, Steam, and Power Pumps, see page 889; for Electric Motors, see page 589.



"Y" Oil Engines.

Exclusive Features—(1) **WIDE VARIETY OF FUEL OILS**—The "Y" oil engine gives unfailing, reliable power from a wide variety of *low priced* fuel oils.

(2) **NO WATER IN CYLINDER**—The "Y" engine does not use water in the cylinder or combustion chamber. It has been fully demonstrated that introduction of water into the cylinders of internal combustion engines causes rapid deterioration and wear of cylinders and pistons. The design of the "Y" engine is such that not only is a cool cylinder head maintained by water jacketing of the walls, but the temperature of the combustion chamber is controlled by water jacketing it. It is in this manner that pre-ignition is avoided in these engines without the use of injection water.

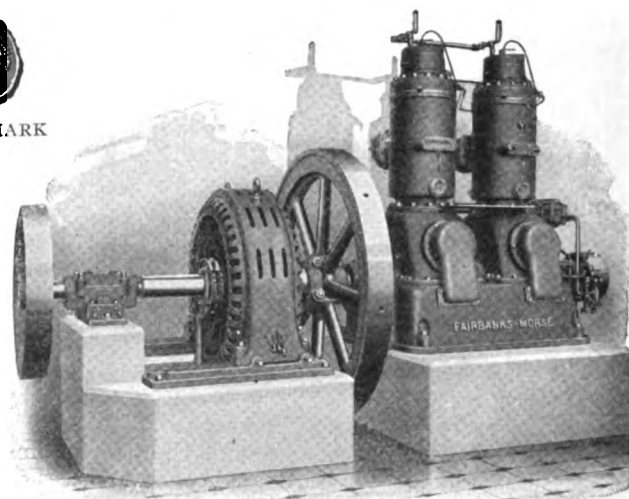
(3) **PERFECT LUBRICATION**—Fuel is injected into the combustion chamber, not into the cylinder where it would impair lubrication. The fuel never comes into contact with the lubricating oil. The main bearings are ring oiling with large oil reservoirs. Piston, piston pin and crank pin are lubricated from a force feed pump.

(4) **NO EXCESSIVE TEMPERATURE**—There is no hot ball or hot bulb to overheat or burn out. The combustion chamber is water jacketed and its temperature is thereby always under control.

(5) **AIRTIGHT CRANK CASE**—Special air seals on the crank shaft are used instead of stuffing boxes which would require repacking. With this construction the main bearings are not inclosed in the crank case; thus lubrication is not interfered with by air pulsations and the bearings may be inspected readily.

(6) **SPECIAL QUICK STARTING ARRANGEMENT.**

(7) **NEW STANDARD OF LOW POWER COSTS**—The "Y" oil engine produces power at a lower cost than any



75 H.P. "Y" OIL ENGINE DIRECT CONNECTED TO FAIRBANKS-MORSE ALTERNATOR

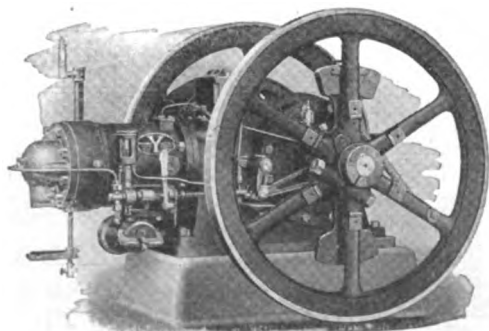
other type of plant figured on a basis of first cost including interest and depreciation, fuel, attendance and all other power plant expenses.

It is simple, without carburetors, mixers, timers, batteries, electric igniters, spark plugs, magnetos, switches or high pressure air compressors, etc. It is practically automatic in operation.

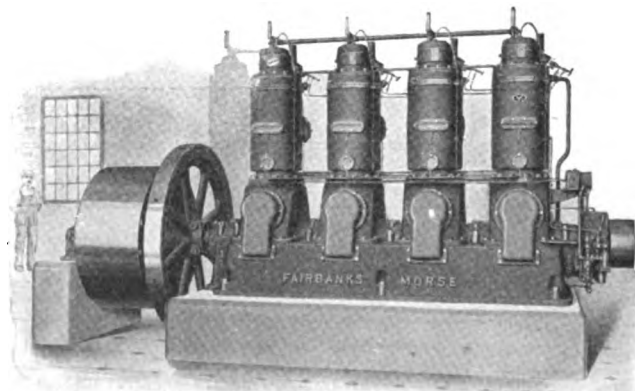
All of the above facts prove economy in maintenance and attendance costs.

Description—This engine operates on the 2-stroke moderately high pressure principle with the fuel injected under pressure in amounts positively governed in proportion to the load. The heat remaining in the combustion chamber, together with that from the compression of the air, ignites the oil, which then burns and creates a pressure which is similar to that in the usual lower pressure internal combustion engines. It operates reliably and continuously on low priced fuel oils.

Thousands of "Y" engines are giving continuous satisfaction in the performance of varied work, proving that its many advantages are appreciated and meet with the approval of discriminating engine users.



25 H.P. HORIZONTAL "Y" OIL ENGINE



200 H.P. "Y" OIL ENGINE

MUNCIE OIL ENGINE COMPANY

MAIN OFFICE AND FACTORY
MUNCIE, IND.

EASTERN OFFICES AND EXPORT DEPARTMENT HEADQUARTERS, 36-40 West 60th Street, NEW YORK, N. Y.

Products.

MUNCIE SEMI-DIESEL CRUDE and FUEL OIL ENGINES.

Also manufacturers of M & G Straight Drive Friction Clutch Pulleys, Roller Bearing Type; Muncie Reversible Friction Clutch.

Muncie Oil Engines.

The Muncie oil engine is a slow speed engine, all sizes developing their rated capacities at or near 750 ft. per minute piston travel. The reduced piston travel as compared with other engines means longer life.

The Muncie is also of the medium compression type, and will give better economy even than many so-called high compression engines.

The design of the Muncie permits better economy and the actual use of low or lower grades of fuel than any other Semi-Diesel engine with higher compression; at the same time it is not encumbered by the attendant wear and tear of working parts bumping and pounding.

Neither is it subject to reduced economy due to lost compression.

Fuels Used.

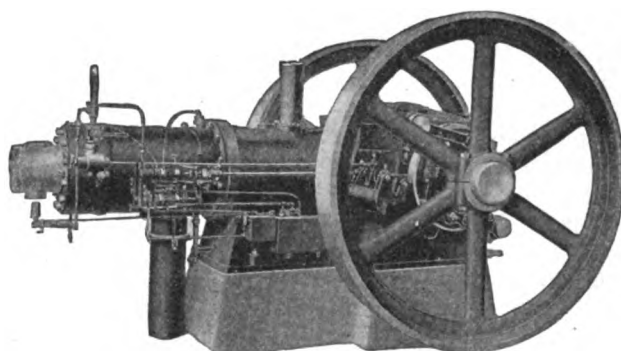
Heavy crude or fuel oils 18° to 28° Beaume gravity or higher, kerosene, distillate, naphtha, solar oil, gas oil, or other distillates of petroleum.

Fuel Consumption.

From .60 to .70 lb. ($\frac{2}{3}$ to $\frac{3}{4}$ pint, average run of fuels) per b.h.p. hour, the higher efficiency obtaining in the larger sizes. Best economy results from oils 24° to 28° Beaume.

General Usage.

For any stationary requirement where the duty is heavy or severe, where constant and reliable service is expected, and the sizes offered will suffice; such as ordinary industrial or municipal plants, lighting or pumping, machine-shops, ginning plants, flour mills, feed mills, gravel pumps and boats, heavy dredges, mine pumping or power plants, pipe line service, pumping stations, or operation in crude oil fields.



RIGHT-HAND VIEW 125-H.P. TYPE C, HEAVY DUTY DESIGN
MUNCIE OIL ENGINE

Equipment.

Friction clutch pulleys are furnished with all standard commercial engines, unless otherwise specified. Friction cut-off couplings are furnished with the standard commercial direct coupled engines unless desired omitted by the customer.

Sizes.

10 to 125 b.h.p. in single cylinder.

160 to 250 b.h.p. in twin cylinder.

GENERAL SPECIFICATIONS STANDARD COMMERCIAL MUNCIE OIL ENGINES

Size, b. h. p.	Speed, r. p. m.	Crank bearings, in.	Crank pin, in.	Piston pin, in.	Length, connecting rod, centers, in.	Length, piston, in.	Length, over all, ft. in.	Width, over all, ft. in.	Approximate shipping weight, lbs.
10	375	3 x 6½	3 x 3	1¾ x 3	30	14½	6 6	5 0	2700
20	250	4 x 8	4 x 4	2½ x 4	36	17½	7 11	8 3	5600
25	250	5 x 10	5¼ x 5	3½ x 5	40	24½	8 11	9 6	8050
30	250	5 x 10	5¼ x 5	3½ x 5	40	24½	9 3	9 6	9000
35	250	5 x 10	5¼ x 5	3½ x 5	40	24½	9 3	9 6	9500
40	265	6¼ x 16	6¼ x 6¼	3¾ x 5	51	26½	10 9	12 0	14000
45	250	6¼ x 16	6¼ x 6¼	3¾ x 5	51	26½	10 10	12 0	15000
50	250	6¼ x 16	6¼ x 6¼	3¾ x 5	51	26½	10 10	12 0	16000
55	250	6½ x 15	6½ x 6½	4¼ x 6½	54	28½	11 4	12 0	17000
60	240	6½ x 15	6½ x 6½	4¼ x 6½	54	28½	11 4	12 0	18000
70	225	7 x 17	7 x 7	5 x 7	60	31½	12 3	12 6	22000
80	200	7¼ x 17	7½ x 7½	5½ x 7½	66	31½	13 3	13 0	26000
85	200	7¼ x 17	7½ x 7½	5½ x 7½	66	31½	13 3	13 0	27500
100	190	8½ x 17	8½ x 8½	6 x 8½	72	34	14 7	15 8	32500
125	190	8½ x 17	8½ x 8½	6 x 8½	72	34	14 7	15 8	36000
160	200	7½ x 17	7½ x 7½	5½ x 7½	73	31½	14 3½	19 0	45000
200	190	8½ x 17	9 x 8½	6 x 8½	72	34	14 7½	19 4	50000
250	190	8½ x 17	9 x 8½	6 x 8½	72	34	14 7½	19 6	55000

NORDBERG MANUFACTURING CO.

Designers and Builders of Engines, Mine Hoists, Air Compressors and Condensers
MILWAUKEE, WIS.

Products.

DIESEL TYPE STATIONARY and MARINE OIL ENGINES.

STEAM, AIR and ELECTRIC MINE HOISTS.

AIR COMPRESSORS; BLOWING ENGINES.

CORLISS POPPET VALVE and UNIFLOW POPPET VALVE STEAM ENGINES.

STEAM STAMPS and CONDENSERS.

Also manufacturers of Gas Compressors.

NORDBERG



MACHINERY
TRADE-MARK

parallel motion prevents the brake blocks from dragging on the brake ring when the hoist is in operation and insures a perfect contact and equal pressure on all parts of the brake blocks. Hence even wear and maximum effective life of the blocks are secured.

The Nordberg axial plate-type clutch as used on Nordberg hoists is the only type of friction clutch that has equal driving power in both directions of rotation. Gripping of clutch is accom-

plished without producing any end thrust on drum shaft or drum. The specially designed features, on the brake and clutch operating cylinders, for controlling oil, combined with the floating lever control between the platform and operating valve, make the operation of the brakes and clutches as perfect as if operated directly by hand. Moreover, the parts may be moved with only a few pounds exerted on the operating levers.

Diesel Type Stationary and Marine Oil Engines.

Nordberg Diesel type stationary and marine oil engines are especially adapted for heavy duty work, and range in sizes from 330 to 3000 b.h.p. For stationary service they are used extensively in electric light and power plants, flour mills, mining industries, machine-shops, textile works, cement industries, water works, shipyards, chemical works, refineries, compressor plants, irrigation plants, ice manufacture, etc. Nordberg Diesel engines are made for either constant or variable speed and when operated at variable speed can be used in connection with compressors, blowing engines, pumps, ice machines, etc. For operation at high elevations and for continuous non-stop service they will be found particularly well adapted. They burn a large variety of fuel oils with exceptional economy. Particular attention is called to the large sizes of Nordberg marine and stationary units.

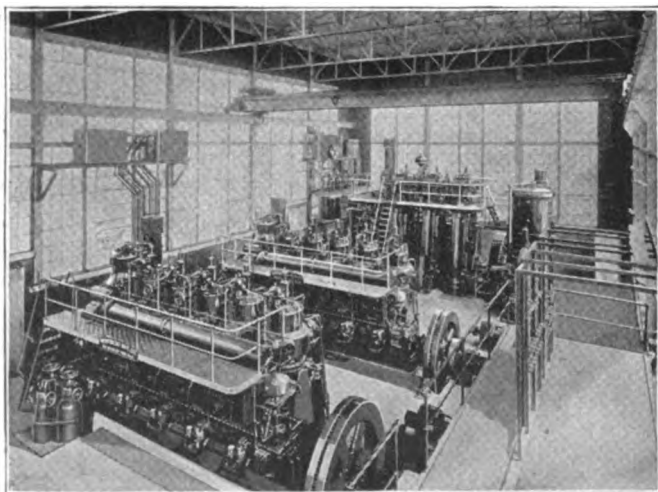
Coal Mine Hoists.

For coal mines where depth is not excessive and rapid hoisting is desired, Nordberg coal mine hoists will be found especially well adapted and economical. They are equipped with oil-operated post brakes and either cylindrical or cylindro-conical drums in accordance with the service demanded. An effective safety stop which will safeguard the hoists under all operating conditions is also furnished. Sizes range from 100 h.p. with drums of 4-ft. diameter up to the largest.

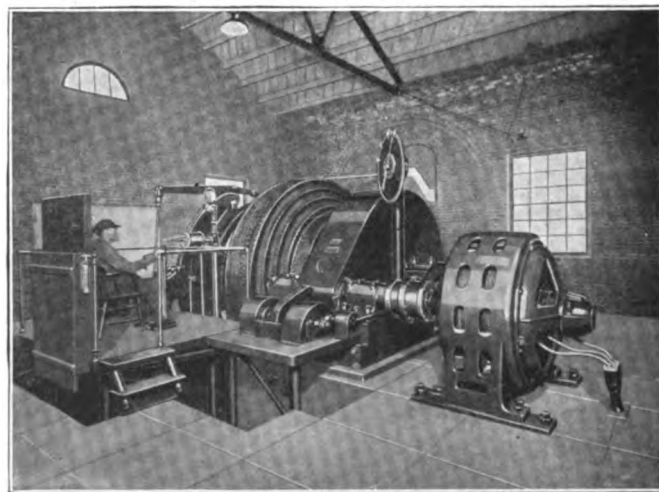
All post brakes are so designed that the posts move with parallel motion when engaging and releasing. The

Air Compressors and Blowing Engines.

Nordberg air compressors and blowing engines are built in the larger sizes only, the air compressor having capacities of 1500 cu. ft. per minute and larger and the blowing engines 6000 cu. ft. per minute or more. They are arranged for motor, steam or oil engine drive. Owing to the demand for higher speeds, Nordberg air compressors are equipped with automatic valves in place of Corliss valves operated by wrist plates and eccentrics. Nordberg automatic valves consist of thin strips of steel seated on cast iron seats. The cast iron seats, carrying the valves, guides and guards, are built in the form of a cylinder which fits into the same set of parts formerly used for the Corliss valves. This form of construction makes it possible to convert any of the older types of Nordberg air compressors into the most modern compressors on the market, simply by dispensing with the valve gear and Corliss valves and substituting Nordberg automatic valves. Air compressors of the two-stage type equipped with Nordberg automatic valves can be operated at no capacity, half capacity or full capacity and these are under control of an air governor which will maintain a constant discharge pressure.

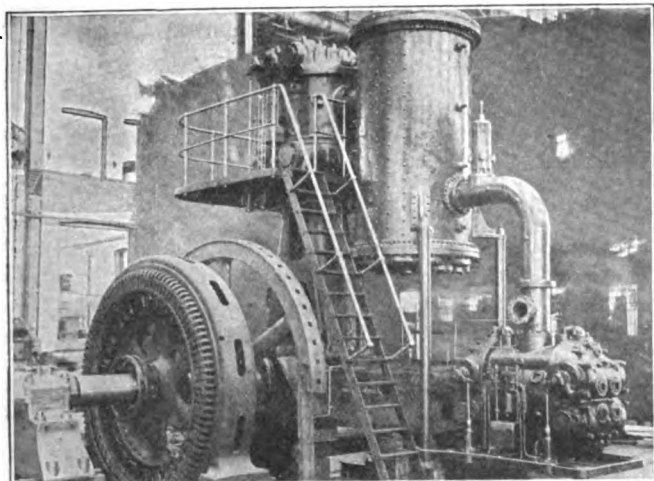


TWO 550 B.H.P. NORDBERG-CARELS DIESEL ENGINES DIRECT CONNECTED TO GENERATORS, AND ONE 750 B.H.P. ENGINE DIRECT CONNECTED TO AIR COMPRESSOR, OKLAHOMA IRON WORKS, TULSA, OKLA.



A NORDBERG COAL HOIST WITH CYLINDRO-CONICAL DRUM, ONTARIO GAS COAL CO.

It lifts 5000 lbs. of coal at a speed of 1920 ft. per minute. Two and a half trips are made each minute



A NORDBERG COMPRESSOR BUILT FOR THE UNITED VERDE EXTENSION MINE
Capacity 4000 cu. ft. at 163½ r.p.m.

Steam Engines.

The Nordberg-Todd uniflow poppet valve engines are the highest type of steam prime movers known. Producing exceptional operating economies when new, they maintain them over a long period of years. The Uniflow engines have poppet valve gears; furnished in sizes of 200 h.p. and up. Suitable for operating condensing, non-condensing or with high back pressure, and with any steam pressure or superheat. When operating under any of these conditions, with wide variations of load, steam consumption is exceptionally low.

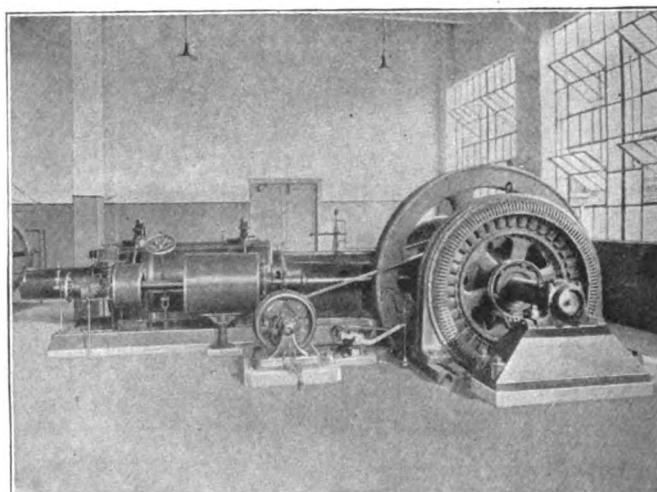
Nordberg compound Corliss and compound poppet engines are used when the power required is constant and the lowest possible steam consumption is desired.

Both simple tandem and cross compound Nordberg Corliss engines may be had in sizes of 100 h.p. and up.

Metal Mine Hoists.

Steam Driven—When the depth is from 1,000 ft. to 14,000 ft., Nordberg mine hoists are specially designed to meet the conditions. The motive power may be simple Corliss or compound condensing Corliss engine. Nordberg post brakes operated hydraulically. Nordberg hydraulically-operated axial plate clutches, and Nordberg safety stops are used. Cyindro-conical drums are specified when their use is advantageous. Safety is the first consideration of Nordberg engineers.

Electrically Driven—Nordberg electrically driven



A NORDBERG-TODD UNIFLOW POPPET VALVE ENGINE IN A LARGE EASTERN CHEMICAL PLANT

metal mine hoists are equipped with drums 4 ft. or larger in diameter and have motors of 100 h.p. capacity or more. They comprise the direct coupled, the single reduction gear, and in special cases the double reduction gear types. Post brakes, axial plate clutches, hydraulically-operated devices and Nordberg safety stops are distinctive features.

Steam Stamps.

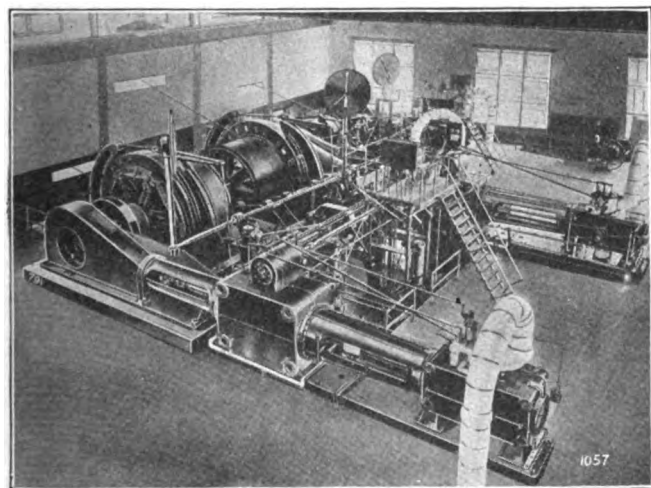
Nordberg steeple compound steam stamps are generally used to crush the ore leaving the jaw crushers to a size that will pass an ⅛-in. mesh screen. A single Nordberg stamp has a capacity of 700 tons of ore per 24 hours. They operate compound condensing and are extremely economical in steam consumption.

Condensers.

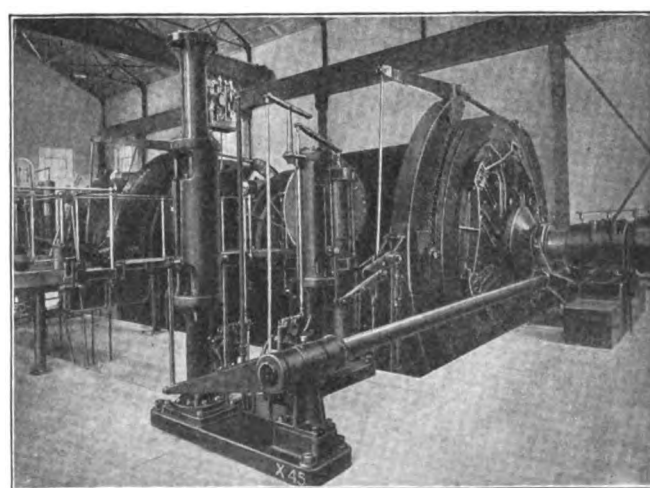
Nordberg condensers comprise jet condensers, either steam or power driven; surface condensers, with either steam or power operated air pumps; and, where the quantity of steam to be condensed is large, counter-current jet condensers with Corliss engine-operated air and circulating pumps are recommended.

Nordberg Service.

Nordberg's corps of highly trained engineers will gladly assist in the solution of engineering problems involving the use of any of the above mentioned apparatus. State the conditions to Nordberg.



NORDBERG TWIN TANDEM COMPOUND CONDENSING HOIST AT ANVIL MINE OF NEWPORT IRON CO., BESSEMER, MICH.



ONE OF THE LARGEST FIRST MOTION ELECTRIC MINE HOISTS IN THIS COUNTRY
It winds 3500 ft. of rope at 2500 ft. per min

DE LAVAL STEAM TURBINE CO. TRENTON, N. J.

Products.

DE LAVAL STEAM TURBINES; CENTRIFUGAL PUMPS; BOILER FEED PUMPS; BLOWERS and COMPRESSORS; STEAM TURBINE GENERATORS and DYNAMOS; SPEED REDUCING GEARS.

Also manufacturers of Special Centrifugal Machinery.

De Laval Steam Turbines.

Single-stage, velocity-stage and pressure-stage types; built for driving machinery at all speeds and for all steam and exhaust conditions, and in all capacities up to 15,000 h.p.

De Laval Centrifugal Pumps.

Built for all capacities and pressures, from boiler feeders to geared turbine driven pumping units of the largest size, and for all methods of driving, including electric motor, and directly connected and geared steam turbines. De Laval steam turbine driven centrifugal pumps hold the highest records for efficiency and duty.

De Laval Centrifugal Compressors.

Built in all capacities and pressures up to 125 lbs. per sq. in. for both motor and steam turbine drive. Close regulation for either constant pressure or constant volume is secured by sensitive, yet simple and rugged, governors.

De Laval Double Helical Speed Reducing Gear.

Originally designed for steam turbine service, and fully tested by extensive use. Over 2,000,000 h.p. of De Laval gears now giving wholly satisfactory service. De Laval centrifugal pumps driven by De Laval geared turbines realize over-all economies greatly superior to those of triple expansion pumping units. Standard speed direct current generators driven by De Laval geared turbines are the most efficient and reliable means for supplying direct current. The De Laval gear is free from noise and vibration in operation, and shows an efficiency above 98%. Speed ratios up to 25 to 1 can be secured in one reduction.

De Laval Method of Manufacture.

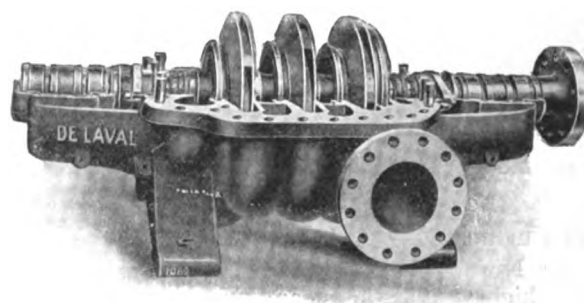
De Laval steam turbines, centrifugal pumps, blowers, compressors and speed reducing gears are built in a shop producing solely high grade turbine and centrifugal machinery. Designs and methods have been developed and perfected by continuous specialization on this class of work for over 25 years. Only high grade materials and skilled men, trained in this class of work, are employed throughout. All parts are made to limit gages upon an interchangeable basis, and repair parts can be placed in machines by ordinary attendants without requiring to be fitted. All De Laval apparatus is made with horizontally split casings, and internal working parts are at once accessible upon lifting the casing covers and can be lifted out after removing bearing caps. Piping connections are to the lower parts of the casing and need not be disturbed. All machines are guaranteed as to capacity and efficiency, and are given

a thorough test before leaving the shops. This policy of thorough-going testing has led to continuous improvements in apparatus.

Service of Turbines.

State the requirements of service, so that our Engineering Department can suggest the best solution of your power, pumping and air-compressing problems.

Ask for special publication No. B 46.



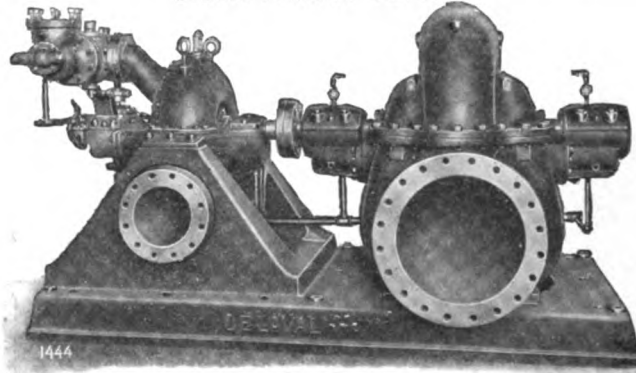
DE LAVAL MULTISTAGE PUMP (CASING COVER REMOVED)



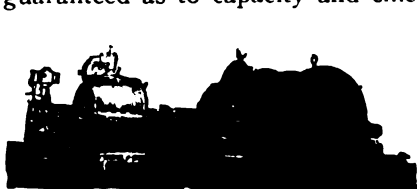
DE LAVAL STEAM TURBINE DRIVEN CENTRIFUGAL PUMP
2000 gals. per min., 1400-ft. head



DIRECT CURRENT GENERATOR DRIVEN BY DE LAVAL GEARED
STEAM TURBINE—1200 KW.



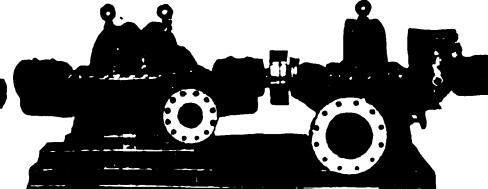
DE LAVAL TURBINE DRIVEN BLOWER
18,000 cu. ft. per min. against 40-in. water column, 3600 r.p.m.



DE LAVAL TURBINE DRIVEN MULTI-STAGE COMPRESSOR
14,650 cu. ft. per min. from 10-in. water column vacuum to 8 lbs. per sq. in. gage



DE LAVAL GEARED TURBINE DRIVEN
CENTRIFUGAL CIRCULATING PUMP



DE LAVAL TURBINE DRIVEN CENTRIFUGAL BOILER FEED PUMP
800 gals. per min. against 520-ft. head

THE TERRY STEAM TURBINE CO.

HARTFORD, CONN.

BRANCH OFFICES

ATLANTA, GA., 1521 Candler Building
BIRMINGHAM, ALA., 3 South 20th Street
BOSTON, MASS., 141 Milk Street
CHICAGO, ILL., 1328 McCormick Building
CLEVELAND, OHIO, 436 Engineers' Building
DENVER, COLO., 1710 Glenarm Street
DETROIT, MICH., 715 Dime Bank Building
FORT WORTH, TEX., 508 Flatiron Building
GRAND RAPIDS, MICH., 636 Michigan Trust Building
HOUSTON, TEX., 423 Southern Pacific Building
KANSAS CITY, MO., 410 Mutual Building

LOS ANGELES, CAL., 625 Washington Building
NEW YORK, N. Y., 95 Liberty Street and 90 West Street
MEMPHIS, TENN., 338 Piomingo Street
MINNEAPOLIS, MINN., 423 Fifth Street, South
NEW ORLEANS, LA., 525 Baronne Street
PHILADELPHIA, PA., 302 Maxwell Building
PITTSBURGH, PA., 816 Oliver Building
RICHMOND, VA., 301 American National Bank Building
SAN FRANCISCO, CAL., 1070 Folsom Street
SEATTLE, WASH., 220 Railway Exchange Building
ST. LOUIS, MO., 1105 Chemical Building

Products.

STEAM TURBINES.

CENTRIFUGAL TURBO-PUMP SETS for all classes of service.

TURBO-GENERATOR SETS, D. C. or A. C., direct connected or through Terry Reduction Gears.

DUPLEX EXCITERS.

TURBO-BLOWERS for forced or induced draft.

REDUCTION GEARS; combined TURBO-GEAR UNITS.

Capacities of Terry Turbines.

Horizontal Terry turbines are built in sizes up to 1500 h.p., combined gear units in sizes up to 125 h.p., while the vertical types cover a range from 1 to 600 h.p.

Terry Non-condensing Turbines.

Principle of Operation—The outstanding feature which makes the Terry turbine so simple and reliable is its principle of operation.

It is of the compound velocity stage impulse type, i. e., the steam is expanded to desired point in a correctly formed jet or nozzle, wherein its pressure energy is converted into kinetic or velocity energy.

Steam is distributed by a steam chest or steam ring to a series of nozzles. In these nozzles the steam is expanded from approximately boiler pressure to exhaust pressure.

Issuing from the nozzle at high velocity, the steam enters the side of the wheel bucket in which its direction is reversed 180°.

As the initial impact absorbs only a part of the total energy, the jet of steam passes into a reversing chamber which returns it to the wheel bucket.

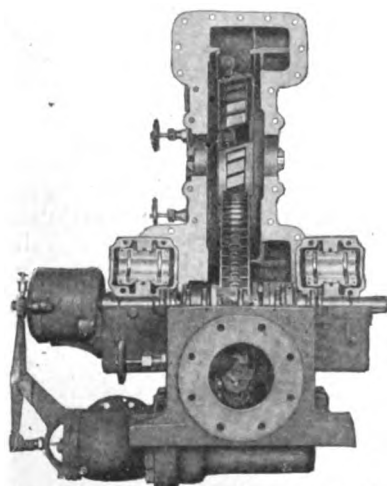


FIG. 1. NON-CONDENSING TERRY TURBINE WITH COVERS LIFTED
Split case, short shaft span, large interchangeable bearings and maximum accessibility. Low temperature and constant alignment. Indestructible wheel

This action is repeated several times until all of the available energy is exhausted.

A distinct advantage of the Terry principle of operation is that the highest economies are obtained at lower speeds.

Features of Design—ACCESSIBILITY—The Terry turbine may be completely dismantled, including removal of rotor without disturbing the alignment or the steam and exhaust piping.

This is accomplished by splitting the casing on the shaft center line, including bearings and glands, and locating steam and exhaust connections in the lower half.

SIMPLICITY, SAFETY AND RELIABILITY—The Terry turbine is built with a totally enclosed one-piece wheel with uniform rotary motion.

This indestructible wheel is made of special composition steel with semicircular buckets milled from the solid metal (Fig. 4).

The bladelike portion between these buckets receives no power-producing action from the steam, but merely serves to split the jet.

The power-producing action of the steam takes place entirely on the curved surface at the back of the bucket (Fig. 2), therefore erosion does not alter the angle at which the steam enters or leaves the bucket.

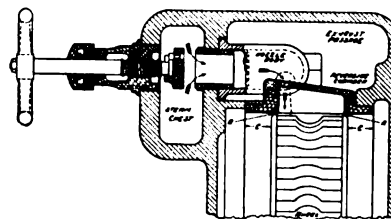


FIG. 3. DIAGRAM SHOWING WHEEL CLEARANCES

AA—rim clearance. B—large blade clearance. CC—side clearance (about 1 in.). Blades can not foul, as they are protected by rims. Rubbing at AA will do no damage. Side clearance is so large that end play from excessive external thrust can not damage wheel

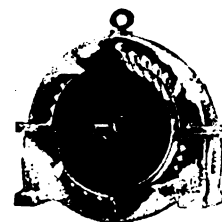


FIG. 2. ACTION OF STEAM IN TERRY TURBINE

Action is such that steam is returned to the wheel again and again until all available energy is utilized. Power producing action of steam takes place on back of buckets, so that erosion of blade edges has little effect on economy or power



FIG. 4. INDESTRUCTIBLE WHEEL OF TERRY TURBINE

Buckets cut from the solid and protected from rubbing by raised wheel rim. Notch at center of blade reduces blade weight and stresses. Wheel can not burst and injure operators

This construction enables the Terry turbine to maintain its original efficiency after a great many years of service.

The fact that steam impinges against the wheel in a direction perpendicular to the axis makes it unnecessary to provide for end thrust.

The large wheel clearances are shown in Fig. 3. It is impossible for wheel buckets and reversing chamber buckets to foul. The blades of the wheel are protected by projecting rims (Figs. 3 and 4), which will take care of any rubbing that might occur if for any reason the radial clearance should become reduced.

Its rugged, simple construction makes it a fool-proof piece of apparatus that can be operated by engineers not familiar with turbine operation.

Critical Speed Well Above any Operating Speed—The short span permitted by the single wheels in Terry turbines, combined with the stocky shafts used, bring the critical speed well above any operating speed. This eliminates all shaft whipping and excessive vibration.

High Efficiency at Partial Loads and Overloads—Each nozzle of the Terry turbine acts independently of the others and produces its own proportion of the total power. Partial loads may, therefore, be procured at practically full load economy by closing the desired number of nozzles by means of hand valves furnished for the purpose.

See Fig. 5, showing variation in steam consumption from full load to lower loads.

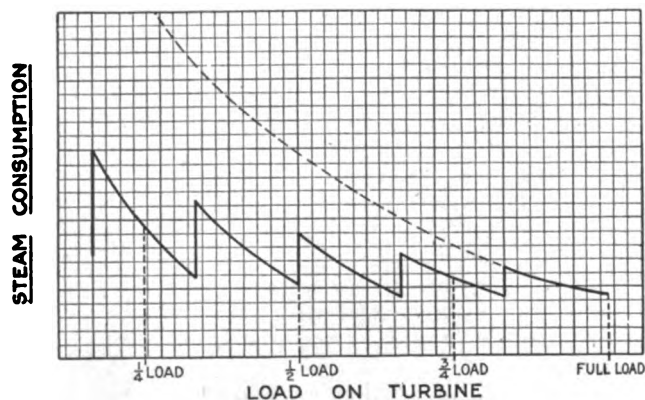


FIG. 5. CURVE SHOWING VARIATION IN STEAM CONSUMPTION OF TERRY TURBINES AT VARIOUS LOADS

Vertical lines show where a nozzle has been closed. High points show steam consumption with nozzle open, low points with nozzle closed. This high efficiency at low loads is due to fact that shutting of nozzles as load decreases prevents throttling in governor valve so that steam reaches remaining nozzles with full energy. This hand control does not in any way interfere with automatic speed governor

Readily Adaptable to Changes in Plant Conditions—The design of the Terry turbine makes it readily adaptable to the development or changes in plant conditions.

The feature of the independent nozzle control previously described makes it possible to install a turbine which will operate at high efficiency under present load conditions and have reserve power in the form of a nozzle continually kept closed.

Should it become necessary to operate at a lower steam pressure or should the pressure be increased for higher plant efficiency, the nozzles can easily be changed to meet new conditions with minimum shutdown and slight expense.

High Pressures and Superheats—The Terry turbine is particularly adapted to the special cast steel

construction so vital to long life under high steam pressures and superheats where cast iron will not stand up.

Terry Condensing Turbines.

Furnished as straight high pressure, low pressure, mixed pressure or bleeder type turbine.

A very important feature incorporated in the design of the Terry condensing turbine is known as "composite design." The combination of a single velocity wheel for the high pressure end, with multipressure elements in the low pressure end, secures maximum efficiency.

This "composite design" reduces the over-all length to a minimum, or with a given over all length, makes it possible to use a greater number of multipressure stages in the low pressure end with consequent higher efficiency.

Terry condensing turbines possess the same features of accessibility, high efficiencies at partial loads, etc., as do the non-condensing turbines. The bearings, glands, interstage diaphragms, casing and bearing pedestals are all horizontally split and the steam and exhaust connections are on the lower half.

Short shaft span with operating speed well below critical speed and low temperature in the casing, insure reliable operation and long life.

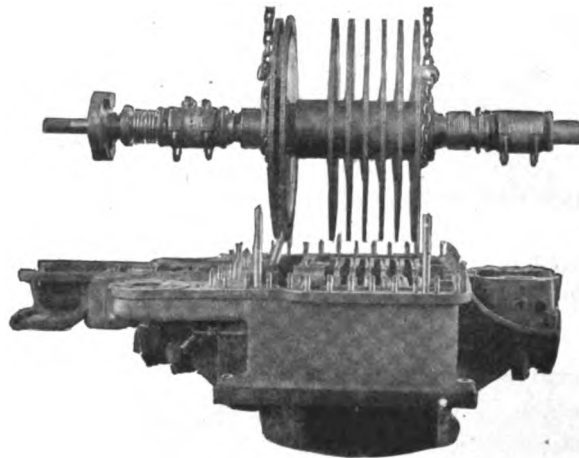


FIG. 6. TERRY "COMPOSITE DESIGN" CONDENSING TURBINE SHOWING SPLIT CONSTRUCTION

Centrifugal Turbo-pump Sets.

Terry centrifugal turbo-pump sets are adapted for all classes of service, including boiler feed, condenser circulation, hot well, dredging, fire service, vacuum, water works and general service.

The advantages embodied in these pump sets are reliable operation, high efficiency, low maintenance charges and absence of waterhammer, valves and rubbing reciprocating parts.

They may be automatically governed by pressure regulators. In this way the speed of the unit is automatically varied so as to maintain constant pressure in the discharge line regardless of the amount of water used.

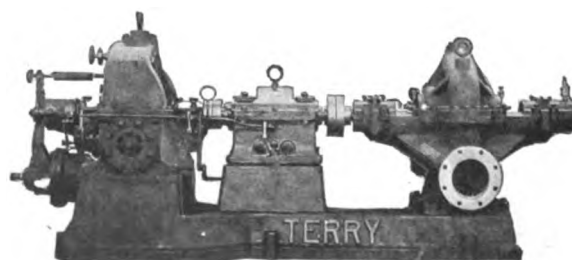


FIG. 7. TERRY CONDENSER CIRCULATING SET

Note the rugged appearance, compactness and simplicity. Where high efficiency is required, a Terry geared unit is used

Turbo-generator Sets.

Turbo-generator sets furnished in sizes from 1 kw. to 1000 kw., geared or direct connected, condensing or non-condensing. Used extensively for main units in small plants or auxiliary sets for night lighting, week-end service, marine work, lifting magnet sets, etc. In non-condensing work, the turbine may be designed to exhaust against most any back pressure desired for heating, manufacturing or other purposes.

The nozzles may be so arranged that efficient operation may be obtained with varying back pressures. In condensing work, the turbine may be designed to operate on exhaust steam entirely or may be equipped with the well-known Rateau control where the supply of exhaust steam is intermittent. Bleeder turbines are also furnished, permitting the extraction of exhaust steam for heating or other purposes at desirable pressures.

Terry turbo-generator units have many individual advantages, such as small space, light foundations, absence of vibration, low cost of upkeep, long life and clean exhaust steam.

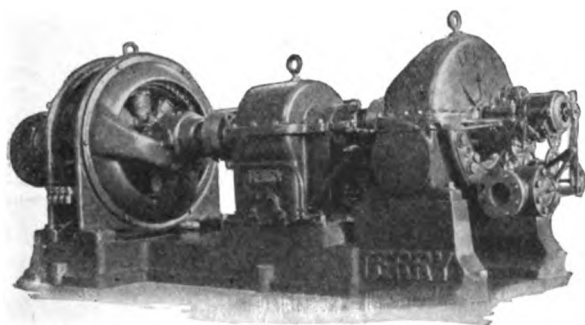


FIG. 8. TERRY TURBO-GENERATOR SET
D. C. units geared to permit high turbine speed and efficiency and low generator speed for good operating characteristics

Duplex Exciters.

These sets consist of an exciter-generator driven from one end by a motor and from the other end by a specially governed Terry turbine. Exciter ordinarily is driven by the motor. Should the motor fail, the turbine will automatically take hold without causing appreciable fluctuation in the exciter voltage.

A governor on the unit not only controls its speed but may be adjusted while running to take the load off the motor and throw it on the turbine when more steam is needed by the feed water heater. The control from motor to turbine and vice versa may be handled entirely from the switchboard.

These sets have met with marked success because of their inherent reliability.

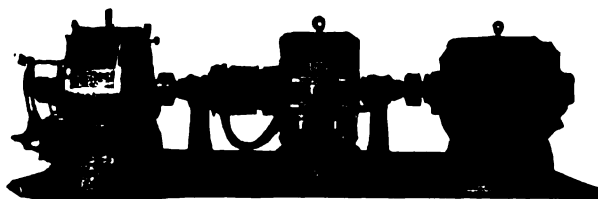


FIG. 9. TERRY DUPLEX EXCITER UNIT
Insures continuous excitation, and is used extensively because of reliability and adaptability to automatic heat balance

Turbo-blower Sets for Forced and Induced Draft.

Fan units are usually installed in objectionable locations, often requiring very light foundations in places

where they are subject to excessive heat and dirt. The Terry turbine, with its freedom from vibration, its ability to operate over long periods under adverse conditions without attention, is particularly adaptable to this service. Turbine drive also obviates the objectionable large fans necessary with engine drive, because of the low speed required by the engine for reliable service.

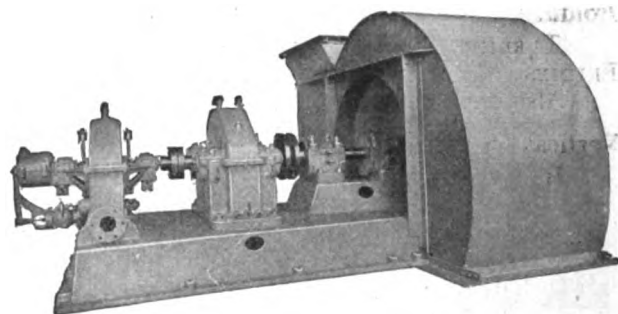


FIG. 10. TERRY INDUCED DRAFT FAN
Small space and light foundations make it readily adaptable to plant conditions. Its high speed avoids the necessity of large bulky fans

Reduction Gears.

Terry gears and pinions are of the stub-tooth double helical type, cut by the most accurate method and are interchangeable. The lubricating system is unusual in the ample supply of cool oil under pressure to the bearings.

All Terry gears have forced feed lubrication, ring oiling not having been found satisfactory.

Cooling is effected by large water chambers, cored in the walls of the gear case, eliminating risk of leakage where pipe cooling coils are used.

Bearings are split horizontally to permit their replacement without removing the couplings.

Gears furnished for either direction of rotation, the only change being the location of the oil spray piping above or below the contact point.



FIG. 11. TERRY REDUCTION GEAR
Note horizontally split casings, giving complete accessibility

Combined Turbo-gear Units.

In sizes up to 125 h.p., geared turbine units may be obtained in one common rigid frame casing.

Each part of the unit possesses the same features of design contained in the separate turbine and gear.

The advantages embodied in this type of unit are: decreased cost, light weight, compactness, maintained correct alignment and no flexible coupling. Both turbine and gear are horizontally split to permit easy access to interior for inspection or repairs.

ESTABLISHED 1874

L. B. DOW, INC.

SUCCESSORS TO HUMPHREY MACHINE COMPANY

Manufacturers of Turbine Water Wheels and Gearing

KEENE, N. H.

Products.

TURBINE WATER WHEELS; GOVERNORS; STEEL FLUMES; WOOD PENSTOCKS; HEAD GATE IRONS.

Also manufacturers of Special Machinery.

Vertical Turbine Water Wheels.

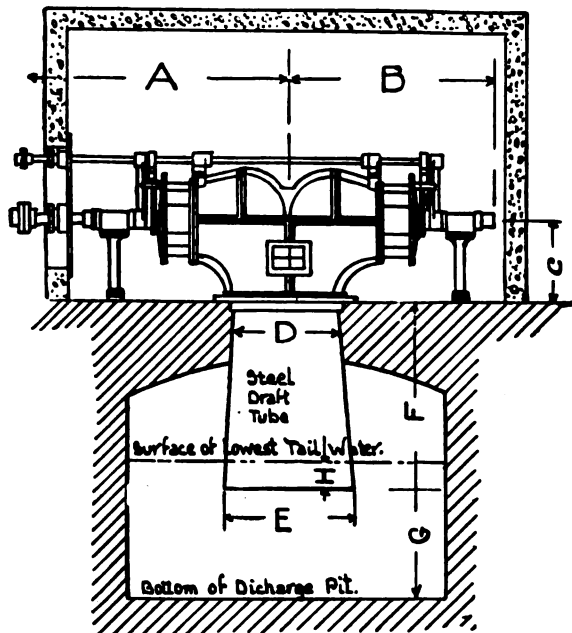
Built with the latest type of single bucket mounted on a vertical shaft. Revolving parts are carried on lignum vitae steps; the top one supported on the housing of the turbine; the bottom one resting on a heavy cast iron bridge tree.

These turbines can be set in wood, concrete or steel flumes.

Horizontal Turbines.

Built of single and double discharge, to suit all conditions; with several runners on one shaft to develop high power and high speed, for direct connection to generators or other fast revolving machinery.

We also build vertical turbines for direct connection to electric generators, pumps and all other high speed machines.



HORIZONTAL TURBINE, TYPE 15

Governors.

Governors of the very latest design to regulate the speed of all types of turbines are furnished.

Steel Flumes.

Steel flumes are built for high and low heads; in all sizes up to 12 ft. in diameter.

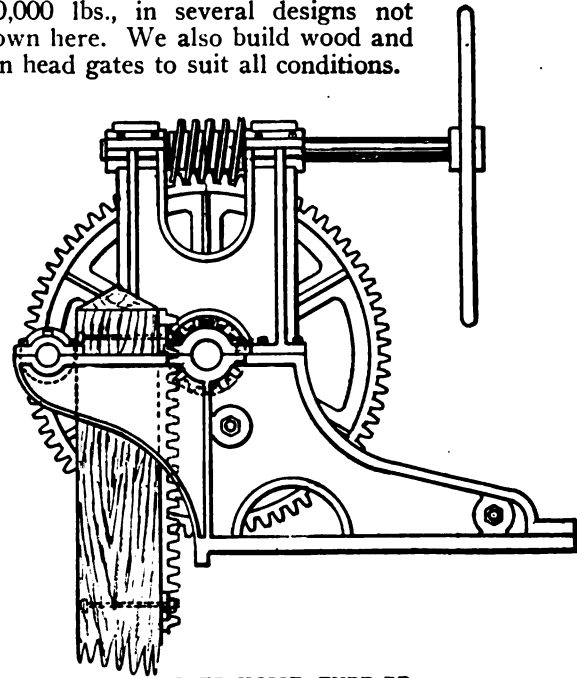
Wood Penstocks.

Wood penstocks built for heads up to 200 ft., and in all sizes from 18 in. to 15 ft. in diameter.

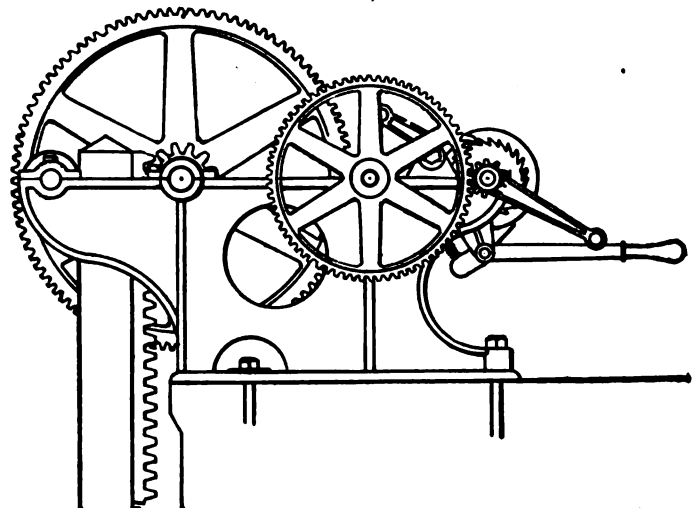
Head Gate Irons.

Head gate irons are built in capacities from 1,000 to

100,000 lbs., in several designs not shown here. We also build wood and iron head gates to suit all conditions.



GATE HOIST, TYPE BB



GATE HOIST, TYPE AA

Service.

This company is prepared to inspect and furnish drawings for the most modern and up-to-date equipment to develop the maximum power for the least possible cost.

Guarantee.

Our products are guaranteed to be first class, of the latest designs, and of high grade workmanship and materials; and if properly installed to do as represented. If any of our goods prove defective from flaws within one year, we will replace them free of charge, f. o. b., our factory.

Catalogues.

We shall be glad to send catalogue or to have one of our engineers call.

RODNEY HUNT MACHINE CO.

Turbine Water Wheels and Water Controlling Apparatus

90 Mill Street
ORANGE, MASS.

Products.

TURBINE WATER WHEELS; WOOD and METAL GATES; GATE HOISTS of all types; GATE STEM RACKS; RIM LEVERAGE WHEELS.

Also, Flumes; Steel and Wood Penstocks; Screens and Strainers; Wood Rolls and Textile Wet Finishing Machinery.

Hunt-McCormick and Hunt-Francis Water Wheels.

Fifty years of experience in the manufacture of water wheels have developed the best designs to return the most power from streams of all sizes.

The power and efficiency results of 3,000 creditable installations have demonstrated that Rodney Hunt equipment is exclusive in practical operation.

"New England Service from the center of New England."

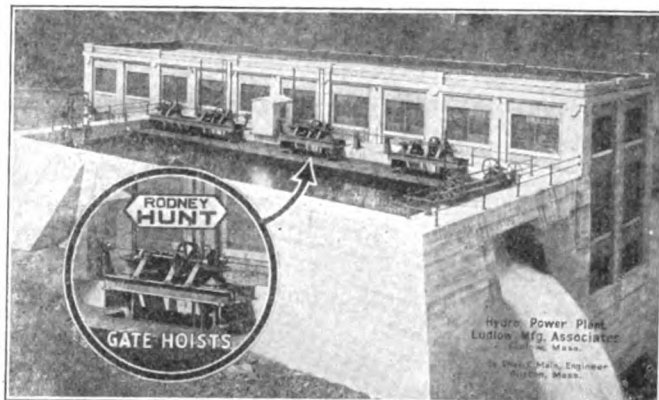
The building of new equipments and the refitting of old plants are our specialties.

Standard and Special Turbine Water Wheels.

The RODNEY HUNT MACHINE CO. manufactures standard designs of turbines for both high and low speed requirements. A complete line is offered to meet a wide range of conditions.

Rim Leverage Wheels.

This company manufactures special designs of rim



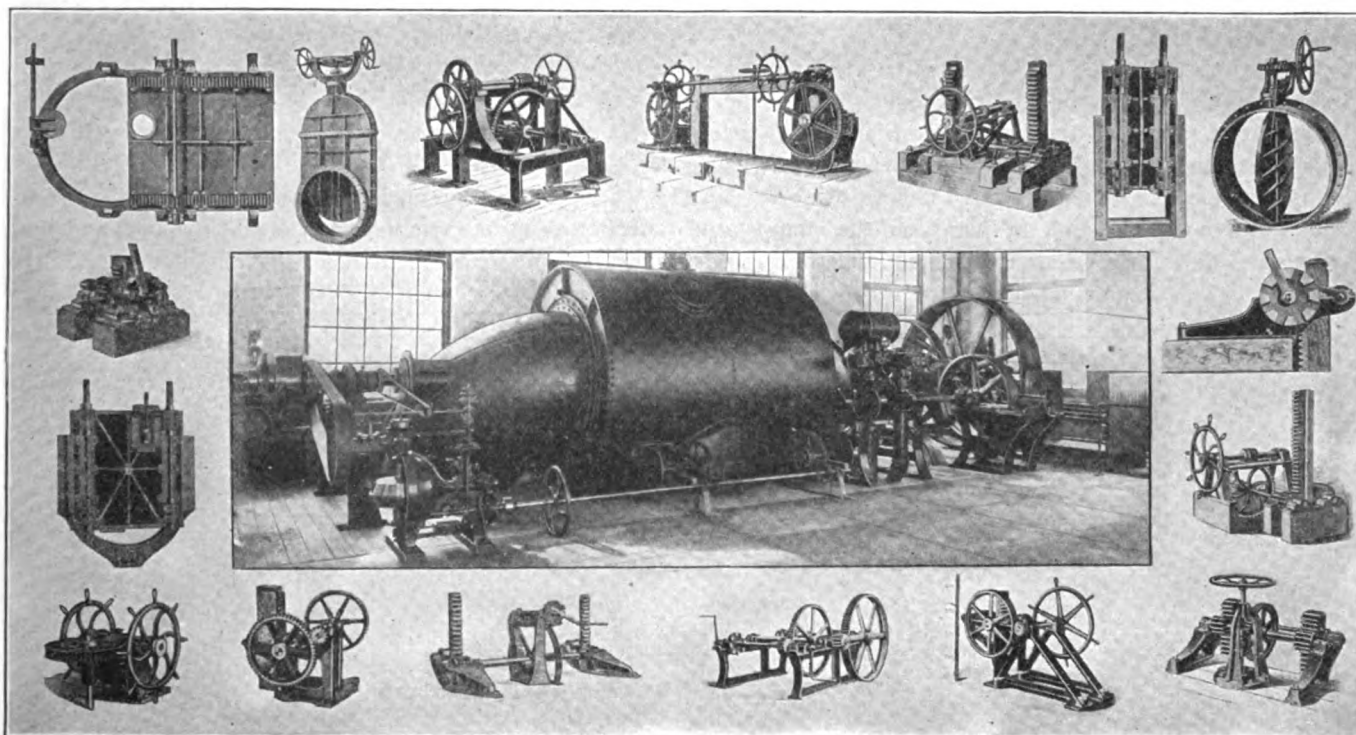
"RODNEY HUNT" TIMBER GATES, 14 FT. BY 14 FT. AND 11 FT. BY 18 FT., COMPLETE WITH SCREW TYPE HOISTS FOR LUDLOW MFG. ASSOCIATES, LUDLOW, MASS.

CHAS. T. MAIN, Engineer, Boston, Mass.

leverage wheels for power development of very small streams. They also publish an illustrated 178-page book of complete information, entitled "Power Development of Small Streams." Price of the book, \$3.50.

Characteristics of Rodney Hunt Apparatus.

Established durability, efficiency, reliability, ease of operation and low cost of maintenance characterize all Rodney Hunt apparatus.



WATER POWER EQUIPMENT—"FROM DAM TO TAILRACE"

ALLIS-CHALMERS MANUFACTURING COMPANY

Complete Centrifugal Pumping Units

MILWAUKEE, WIS.

For District Offices see page 590

Products.

Specialists in the selection, design and manufacture of the following:

CENTRIFUGAL PUMPS and CENTRIFUGAL PUMPING UNITS for every service: Mill and Factory Water Supply Pumps, City Service Pumps, High Pressure Fire Pumps, Underwriters' Fire Pumps, Drainage Pumps, Sewage Pumps, Boiler Feed Pumps, Condenser Pumps, Hot Well Pumps, Heating System Pumps, Filter Pumps, Sugarhouse Pumps, Paper Mill Pumps, Mine Pumps, Irrigation Pumps and Pumps for Special Service.

For Power and Electrical Equipment, see pages 590-591.

Service.

Co-operative service begins with a careful consideration of the customers' pumping conditions by our engineering organization, after which a suitable pump and drive will be selected from our complete lines so as to give the best economy and service when operated in the customer's plant. Before shipment, the majority of the standard pumps are given a careful shop test in the centrifugal pump testing laboratory without extra charge, under contract conditions or approximate contract conditions, so that the customer is assured that the unit when carefully installed in place will perform in accordance with the guarantees.

Combined Units.

The ALLIS-CHALMERS MANUFACTURING COMPANY recommend their combined units, consisting of pump and motive power of their own manufacture as insurance that each part of the complete machine will be properly selected for its share of the work.

With complete data at hand on the pumps and whatever drive has been determined, whether motor, turbine, steam engine or oil engine, all of which this

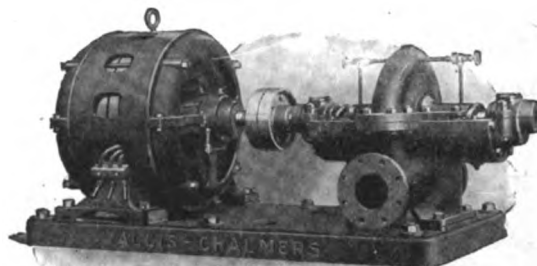
company manufactures, there is no danger of the drive being too large or too small for the pump, or similar difficulties which are possibilities when the pump and drive are furnished by different makers.

The economical and satisfactory service which these complete units are giving in service has impressed us with the value to the purchaser of our "*complete units of undivided responsibility*."

Types of Pumps.

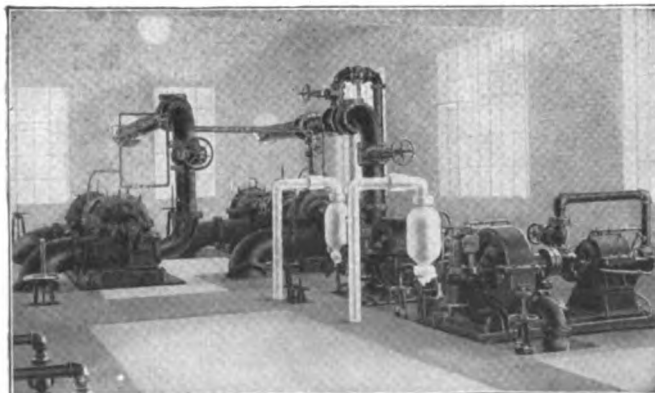
The types of pumps manufactured as standards are the single stage type "S" and the multistage, both horizontal; also horizontal and vertical types for special services.

TYPE "S"—This type, which is a horizontal split casing, single stage, double suction, enclosed runner, bronze fitted pump, has the most general application to all classes of pumping service. It is built as a standard and carried in stock in sizes from 2 to 20 ins. These pumps will operate against heads up to 200 ft. and are simple, reliable and economical in operation.

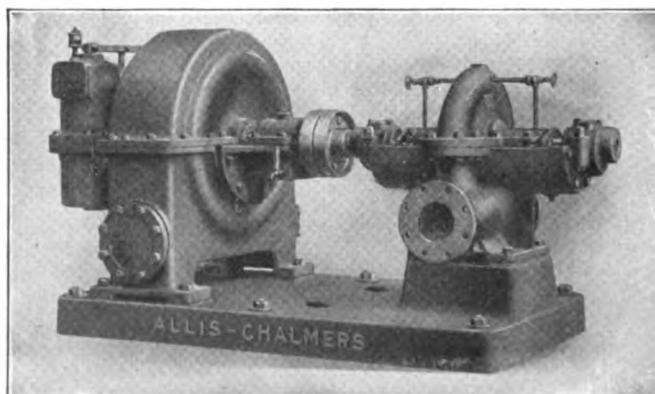


MOTOR DRIVEN TYPE "S" PUMP

Type "S" pump lends itself readily to direct connection to an electric motor or steam turbine; and these are the commonest methods of drive, although belt drive is often used when it is desirable to retain the advan-



ALLIS-CHALMERS COMBINED UNITS IN POWERHOUSE OF UNITED VERDE COPPER COMPANY



TURBINE DRIVEN TYPE "S" PUMP

tages of the type "S" pump operated at a relatively high speed but driven by a slower running driving agent.

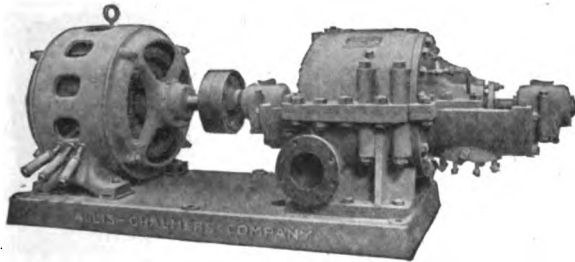
The design of the Allis-Chalmers type "S" pump was carefully worked out after an exhaustive series of tests and has been proved under all conditions of operation in a great many different services.

DATA, STANDARD TYPE "S"
Approximate Capacities of Standard Sizes

Size	Capacity in g. p. m.		Total head in feet		Speed, r. p. m.
	Norm.	Max.	Norm.	Max.	
2	125	225	85	95	1730
3	300	500	85	110	1740
4	450	750	130	145	1750
6	800	1400	120	160	1750
8	1500	2400	170	190	1750
10	2500	3750	175	200	1750
12	4500	6500	165	200	1450
14	5500	7500	170	200	1450
16	6500	9000	135	170	1160
18	9500	12000	90	100	860
20	12000	14500	80	90	690
24	15000	20000	110	140	690

Table is only approximate and for more detailed information the company's centrifugal pump catalogue will be sent on request.

MULTISTAGE PUMPS—For heads higher than can be developed in a single stage, this company recommends their standard horizontal split casing, bronze fitted, hydraulically balanced, multistage pumps. These pumps are built in sizes from 2½ to 14 ins. and for normal heads up to 500 ft. Special multistage pumps are also built for heads up to 1000 ft.

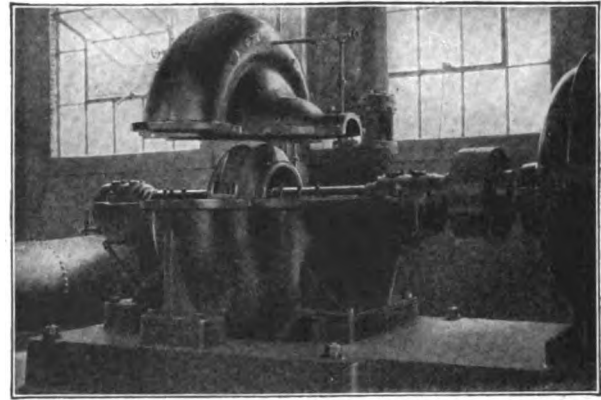


MOTOR DRIVEN MULTISTAGE PUMP

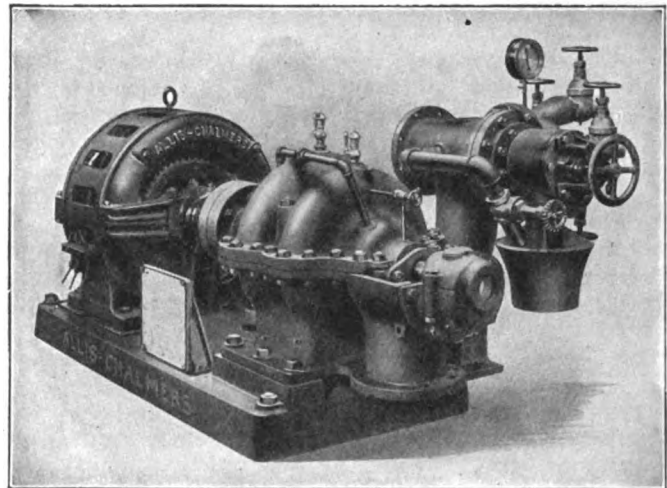
Multistage pumps have their widest application as boiler feed pumps, mine drainage pumps, fire pumps, etc., and in all of these services the features of the Allis-Chalmers multistage pumps are proving their practical usefulness in many installations.

Horizontally Divided Casings.

Allis-Chalmers type "S" and standard multistage pumps are all made with horizontally divided casings with the suction and discharge nozzles located in the lower half casing. This makes it possible to easily remove the top half casing without disturbing the piping connections.



18-INCH TYPE "S" PUMP IN IRRIGATION PUMPING STATION
Cover raised showing split casing feature



1000-GALLON UNDERWRITERS' FIRE PUMP

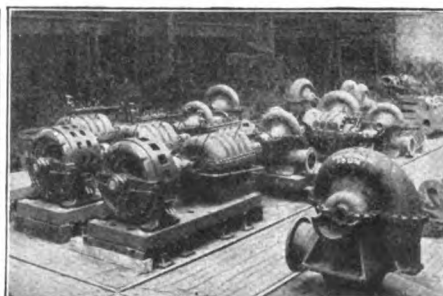
Built in four sizes: 500, 750, 1,000, 1,500 g. p. m.

750 AND 1,000 G. P. M. SIZES MOST COMMON

Size, g. p. m.	Total hd., lbs.	R. p. m.	H. p. motor required	Size of suction and disch., ins.	No. of 1½-in. streams	Weight with fittings, lbs.
750	100	1750	85	8	3	3800
1000	100	1750	100	8	4	4000

Catalogue.

There are a number of points to consider in selecting centrifugal pumps for industrial uses, and to assist those who contemplate installing centrifugal pumps the company will send without charge catalogue No. 1632-DX, which describes the standard pumps more in detail and gives other valuable information.



VIEWS SHOWING PUMPS UNDER CONSTRUCTION IN ALLIS-CHALMERS SHOPS

AMERICAN STEAM PUMP COMPANY

BATTLE CREEK, MICH.

NEW YORK OFFICE, 17 Battery Place

CHICAGO OFFICE, 1220 Monadnock Block

Products.

AMERICAN-MARSH VACUUM PUMPS; AMERICAN POWER PUMPS; AMERICAN-MARSH BOILER FEED PUMPS; AMERICAN-MARSH CENTRIFUGAL PUMPS; MARSH DEEP WELL ENGINES.

Also manufacturers of American Compound Pumps, Water Works Pumps, Elevator Pumps, Belt or Steam Driven Air Compressors; American-Marsh Steam Pumps, Automatic Boiler Feed Pumps and Receivers, Hydraulic Pressure Pumps, Tank Pumps, Magma Pumps, Oil Pumps, Brine Pumps, Sinking Pumps, Jet Condensers.

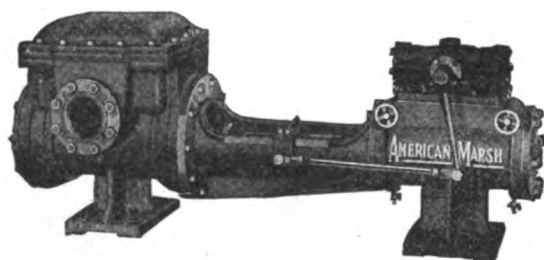
American-Marsh Pump.

Of the improved Marsh design. Consists of all the advantages and governing element of the well-known Marsh pump combined with the American simple, positive and reliable auxiliary valve which is mechanically actuated by a lever arm connected to the crosshead attached to piston rod. With this combination the inside trip tube and packing box formerly used in the Marsh design are eliminated. The American-Marsh is the very best pump ever produced; it is positive in action, possessing a perfect governing element and will not hang up under all the varying conditions.

Made of the best material and rugged and substantial in design. Steam and water cylinders joined by heavy cast iron yokes with ring and plug fit to insure perfect alignment of wearing parts. Special bronze fittings (not common brass) furnished regularly without extra charge, consisting of removable bronze liners, bronze piston rods, valve seats, valve bolts, springs; also either good grade hard or soft rubber valves or bronze valves, as the service may require, are furnished.

Pumps for Heating Service.

Due to the positive full stroke, self-governing element and special fitting, these pumps are particularly adapted for use in connection with heating systems of all descriptions. The American-Marsh is the very best pump made for extreme hot water service.

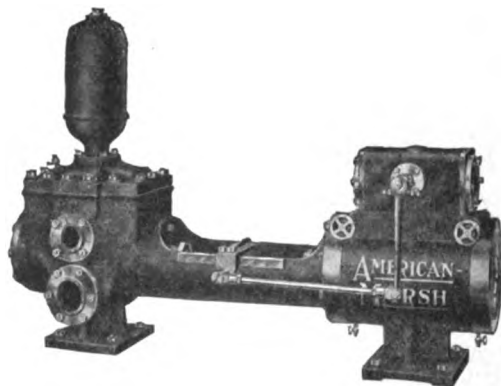


STYLE "S" AMERICAN-MARSH VACUUM PUMP
Side suction; double base; delivery opposite

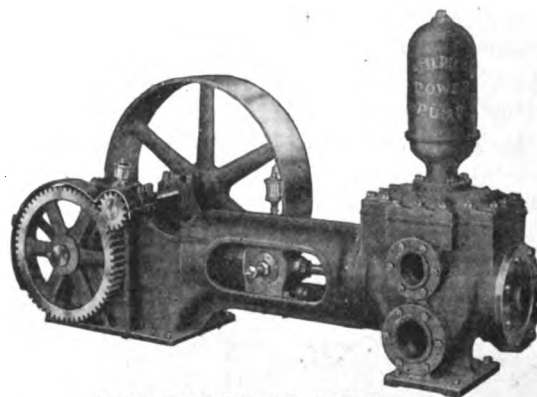
American-Marsh Boiler Feed Pump.

Heavily constructed and bronze fitted; equipped with solid bronze piston rods, bronze valve seats, bolts and springs and heavy cast bronze removable water cylinder bushings, with the exception of the three smallest sizes, in which the bushing is pressed into place. Waterways large and direct, with ample valve area. Ample handhole plates, giving immediate access to all water valves, furnished in the larger size piston pumps and in all outside center packed plunger pumps.

In cases where the boiler pressure exceeds 150 lbs., the outside center packed plunger type is recommended. Description and other data on application.



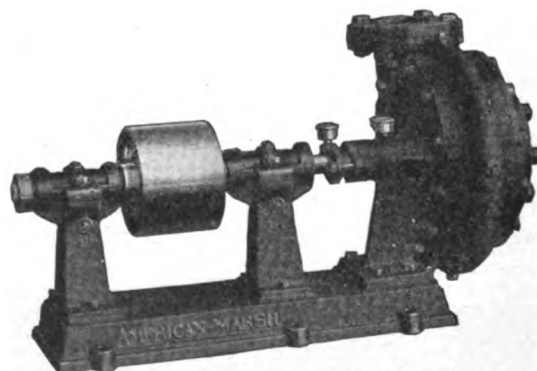
AMERICAN-MARSH BOILER FEED PUMP



AMERICAN GEARED POWER PUMP

American-Marsh Centrifugal Pump.

Very simply constructed; hence first cost is much less than any other style of pump. No valves used in construction and practically noiseless in operation. Occupies but little space; cost of foundation is small.



TYPE "B" AMERICAN-MARSH CENTRIFUGAL PUMP

Marsh Deep Well Engine.

Designed for pumping wells in which the water drops below suction reach of the regular horizontal pump. Steam head or steam cylinder is located at the surface of the ground, while the water cylinder is lowered to the water and operated by means of a well rod connecting the steam and water pistons.

THE AMERICAN WELL WORKS

Manufacturers of Centrifugal and Deep Well Plunger Pumps

GENERAL OFFICES AND WORKS
AURORA, ILL.

First National Bank Building
CHICAGO, ILL.

DISTRICT AND SALES AGENCIES

NEW YORK, N. Y.
(Domestic and Export)
PHILADELPHIA, PA.
PITTSBURGH, PA.
ST. PAUL, MINN.

SAN FRANCISCO, CAL.
LOS ANGELES, CAL.
ARTESIA, N. M.
SALT LAKE CITY, UTAH
DENVER, COLO.

KANSAS CITY, MO.
JOPLIN, MO.
ST. LOUIS, MO.
BIRMINGHAM, ALA.
DALLAS, TEX.

MONTREAL, QUE., CAN.
CHATHAM, ONT., CAN.
CALGARY, ALTA., CAN.
EDMONTON, ALTA., CAN.

Products.

CENTRIFUGAL PUMPS, for water works, irrigation, drainage, mine, fire protection, quarry, dredge, hydraulic, giant, caisson, foundation, sump, trench, bilge, boiler feed, condensing and general purpose pumping.

DEEP WELL TURBINE CENTRIFUGAL PUMPS for pumping wells 12 in. and larger in diameter.

DEEP WELL PLUNGER PUMPS, Single Acting, Double Acting, and 2-stroke.

"American" Centrifugal Pumps.

These pumps are built in about 50 standard types, each designated by a letter of the alphabet; and, in addition, a large number of special pumps are designed and built.

Centrifugal pumps are made with either open type or enclosed type impellers, with or without diffusers and with either single suction or double suction in single stage pumps.

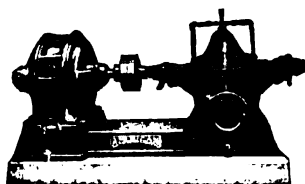
Most of our double suction pumps and some single suction pumps are made with split casing, so

designed that the upper half of the casing can be removed to expose the internal working parts without disturbing the pipe connections.

Important Features—The important features of "American" centrifugals are: Skillful designing so that they attain high efficiencies with flat efficiency curves, thus being economical in use through a wide range of delivery. Use of good material in their construction, careful machining and accurate adjustments. Bearings are ring or chain oiled. Impellers are given both rotative and end thrust balance. In single suction, open impeller type pumps, the sides and edges of impeller and interior of casing are carefully machined and closely adjusted at sides to prevent leakage. The split casing types are fitted with labyrinth rings around suction openings to reduce leakage to minimum. Multistage, enclosed impeller types are designed to have fewest points of leakage back to suction opening.

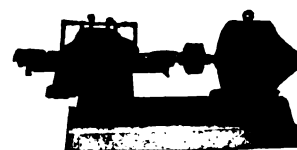
Water for water seal on high pressure side packing box is taken from first stage of the pump, thus reducing friction on shaft.

Multistage opposed im-



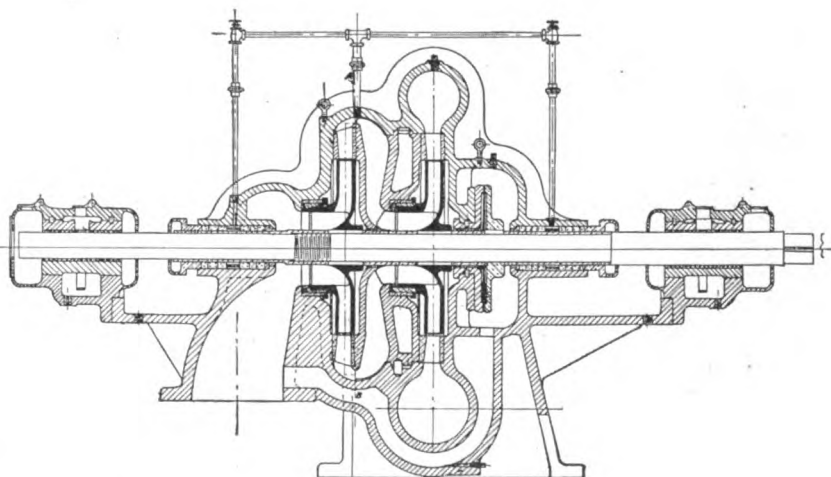
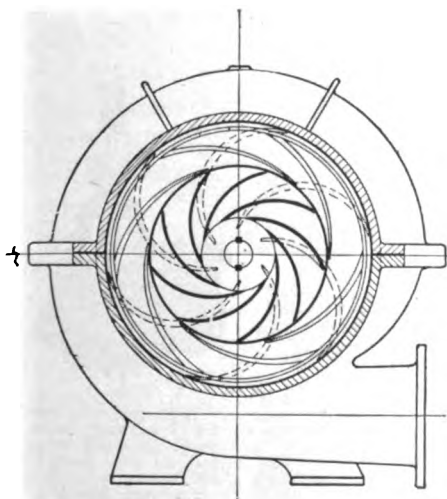
TYPE DSMD

High pressure, double suction, single stage, split volute, for total heads to 200 ft.



TYPE KTMD

High pressure, multistage, horizontally split casing, motor driven, for total heads up to 1000 ft.



CROSS SECTION OF TYPE KTMD "AMERICAN" CENTRIFUGAL PUMP
Illustrating hydraulic balancing device and also the diffuser vanes

pellor types have long radius pipe bends connecting stages in pairs, so that end thrust in one stage is equalized by end thrust in opposite direction in the other stage.

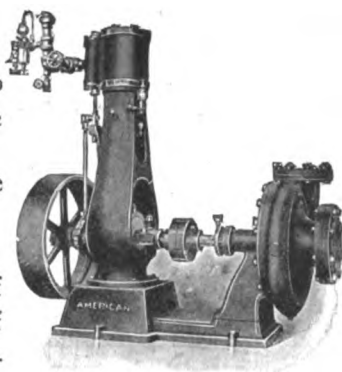
Testing—Pumps made from each separate set of patterns in all sizes of stock pumps, and all specially designed pumps are carefully tested under working conditions and their characteristics plotted.

No pump is allowed to leave the works that does not show the efficiency guaranteed.

Thrust Balance—“American” multistage, single suction, split casing, centrifugal pumps, with enclosed impellers, are provided with hydraulic thrust bearings in which a rotating disk within pump casing is separated from a stationary disk by a film of water, the water within the enclosed space acting as a hydraulic cushion. This hydraulic balance has advantages over the mechanical thrust bearing, although both types can be furnished, depending on conditions.

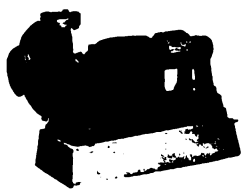
For pumping gritty water, we make a pump with very wide bearings entirely removed from the volute chamber. This pump is known as Type P. Between the bearings in this pump is placed a ball-bearing for taking care of end thrust. This ball bearing is held in place by a threaded collar which is locked in position.

Many types of “American” vertical



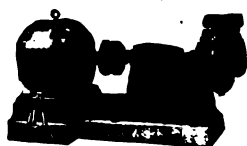
TYPE AED

Low pressure, single stage, horizontal centrifugal pump, direct connected to steam engine, for total heads up to 30 ft.



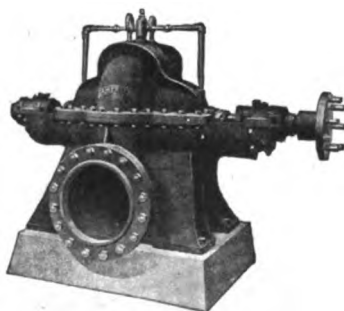
TYPE P

High pressure, horizontal, single stage centrifugal, with gritproof bearing, for total heads to 125 ft.



TYPE PMD

High pressure, single stage, horizontal centrifugal, with gritproof bearing. Motor driven, for total heads to 125 ft.



TYPE DS

Double suction, horizontal, split volute, single stage centrifugal, for total heads to 200 ft.



TYPE RMD

High pressure, single stage, double suction, vertical split volute, for total heads to 200 ft.

centrifugals and all “American” deep well turbine centrifugals are provided with roller or ball thrust bearings placed at top of the shaft and so designed that the entire weight of shaft and attached impeller, or impellers, is carried at the surface.

Efficiency—Skillful designing and careful workmanship enable “American” centrifugal pumps to compete in point of efficiency with pumps of their kind made by any other manufacturer. The larger the pump and the higher the head, within certain limitations, the higher the efficiency.

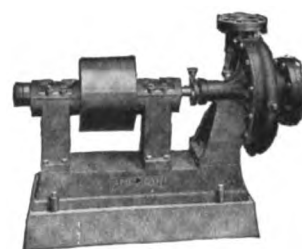
Several standard types of these pumps are designed in larger sizes to maintain their highest efficiencies on total heads up to 200 ft. for each stage. Specially designed pumps that maintain highest efficiencies on total heads of over 400 ft. for each stage have been built by this company, and these pumps attain up to 80% efficiencies.

Equipment—“American” centrifugal pumps are equipped with plain pulley for belt drive, with grooved sheave for rope drive, steam engine, gasoline engine, electric motor, steam turbine, or with hydraulic turbine.

The pumps are also supplied unmounted, with flexible shaft coupling for any power, or mounted on a base, but without attached power.

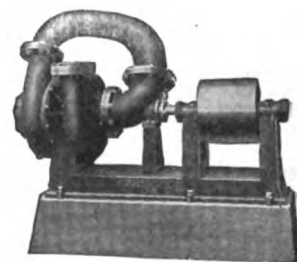
Material—“American” centrifugal

pumps are made of all-iron, of iron with bronze fittings



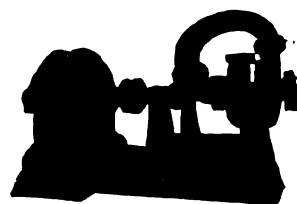
TYPE EE

Single stage, belt driven, high pressure, for heads to 125 ft.



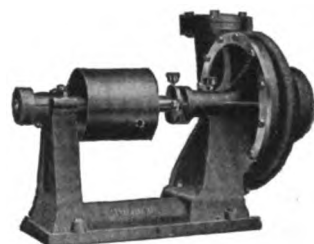
TYPE I

High pressure, 2-stage, belt driven, for total heads to 250 ft.



TYPE IMD

High pressure, 2-stage, motor driven, for total heads to 250 ft.



TYPE A OR TYPE E

Single stage, belt driven Type A, low pressure. Type E, high pressure, for heads to 125 ft.



TYPE C OR TYPE G

Type C, low pressure, single stage, vertical shaft, for total heads to 50 ft.

Type G, high pressure, single stage, vertical shaft, for total heads to 100 ft.



TYPE Q

High pressure, vertical type, single stage, with submerged water seal, for total heads to 100 ft.

Patented March 7 1916

or of all-bronze. For some conditions, special acid-resisting metals are used.

Sizes and Capacities—
“American” centrifugal pumps are made in any size, from $\frac{3}{4}$ in. to the largest built. They are made in both horizontal and vertical types, and in any number of stages. For approximate capacities, see table on following page.

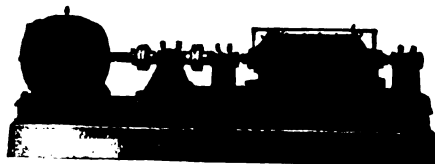
Mine Pumping.

“American” electrically driven centrifugals for mine pumping have the advantages of occupying small space; are so designed that they are least affected by water containing grit, or acid solutions; have all internal parts easily accessible in case repairs are needed; require little attention; and they obviate the use of steam pipes in shafts and underground chambers. The sinker pumps are designed to operate under variable heads, and are so constructed that they will not overload motors if total head is less than that for which pump is designed.

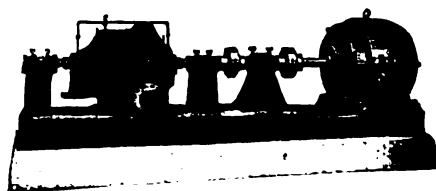
Type KTMD, Special—Illustration below shows a 6-stage high pressure, horizontally split shell, enclosed impeller, diffuser type, centrifugal pump, direct connected to electric motor.

This is a special type for mine service with marine type motor-thrust bearing and with flange coupling between bearing and motor, and flexible shaft coupling between thrust bearing and pump to provide for installing in an inclined shaft.

The 3-stage high pressure, horizontally split shell, enclosed impeller, diffuser type, centrifugal pump, direct connected to electric motor, is especially designed for mine service and equipped to operate in an inclined shaft.



TYPE KTMD, SPECIAL



TYPE KTMD, 3-STAGE



TYPE H
High pressure, 2-stage, vertical shaft, for total heads to 150 ft.



TYPE OKMD
Vertical plain centrifugal type mine-sinking pump, direct connected to vertical type motor



TYPE GMD
High pressure, single stage, vertical shaft, motor driven, for total heads to 100 ft.

Deep Well Turbine Centrifugal Pumps.

The “American” deep well turbine centrifugal pump is designed to meet conditions which will not permit the use of plain centrifugals when mounted either horizontally or vertically. Made in sizes to operate in wells 12 ins. and larger in diameter, inside of casing. Special designs of this pump provide a combination of a deep well turbine, located in the well for elevating water to surface, and a single stage or multistage centrifugal mounted on same shaft at surface and driven by same power, to act as a booster pump for forcing water through mains or into an elevated tank or standpipe.

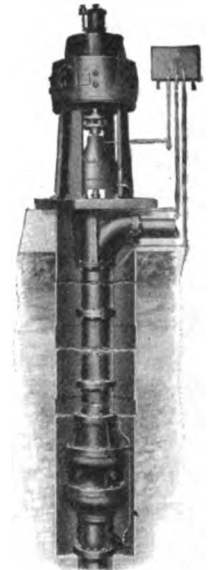
This pump has the shaft enclosed in an inner casing, so that water passage to surface is between inner and outer water casing. The pump is so constructed that any water passing up through packing gland above top impeller is drained out through an orifice into the well, preventing gritty water from getting into bearings. The entire weight of main shaft and attached impellers is carried on roller or ball bearings at surface, operating between large disks.

These pumps are designed to deliver from 200 to 3000 gals. of water per minute.

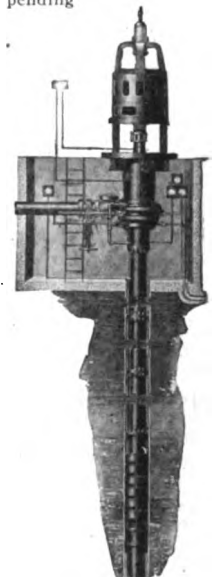
The turbine may be belt driven from any convenient power; but, where electric power is obtainable, electric motor can be mounted vertically on pump head and thus secure the most compact and economical drive. When electric motor is used, it is attached to turbine shaft by means of a flexible coupling. This equalizes any unequal alignment between motor and pump shaft, removes from pump all weight of motor and allows motor and pump to rotate together, the inequalities in either being balanced, saving friction common to other designs.

“American” Deep Well Plunger Pumps.

The latest practice in deep well plunger pumps is represented in



TYPE NMD
High pressure, 2-stage, motor driven, vertical turbine for operating in drill holes 12 to 30 ins. in diameter. Patented, and other patents pending



TYPE KNMD
Combination deep well turbine and booster pump. Patented and patents pending



TYPE CMD
Low pressure, single stage, vertical pump, direct connected to vertical type motor; for use in pits to 15 ft. in depth

the "American" line of this type. These pumps are built in types of power heads for operating single acting, double acting or 2-stroke cylinders. Each of these types of power heads can be adapted to be driven by belt, electric motor, gas or gasoline engine, or by steam engine. Power frame heads are substantially built to meet requirements of high lifts and large volumes of water from deep wells. The bearing boxes on frame, the wrist pin boxes, crank boxes, and the guide through which plunger travels are of large proportions. Bearing boxes are lined with babbitt metal, and run cool under maximum load. Crank shafts are made of steel, while gears and pinions are machine cut.

Compound steam heads are used when steam is delivered to pump at from 80 to 125 lbs. pressure. Special designs of large size deep well plunger pumps, not illustrated, are made with 36-in. stroke. Deep well plunger pumps are made in sizes to operate in wells 3 ins. and larger in diameter.

All water cylinders are made of bronze. The double acting cylinder delivers water on both down-stroke and up-stroke, and has about 60% greater capacity than a single acting cylinder of equal diameter and length of stroke. The 2-stroke cylinders are perfectly balanced and have practically double the displacement capacity of a single acting cylinder of equal diameter and length of stroke.

SIZES AND CAPACITIES OF "AMERICAN" CENTRIFUGAL PUMPS
TYPES A, AA, B, E, EE, L, P, C, G AND Q

Economical capacity per minute in U. S. gallons			Diam. of discharge, in ins.	Diam. of suction, in ins.	Weight iron*	
Low head	Medium head	High head			Domestic	Export
10	30	35	1	1 1/4	45	60
30	55	80	1 1/4	1 1/2	115	140
40	75	150	1 1/2	2	125	150
60	125	195	2	2 1/4	145	170
110	200	385	2 1/4	3	215	260
135	265	470	3	4	230	275
225	410	720	3 1/4	5	360	420
250	500	845	4	6	380	440
350	750	1200	5	7	680	790
400	900	1350	6	8	725	1440
600	1350	2200	7	9	950	1490
800	1600	2600	8	10	1280	1520
1100	2600	3950	10	12	2045	2400
1500	4000	5800	12	15	2420	2810
2900	6000	8800	15	15	3040	3500
4500	10000	14000	18	18	5320	6150
6100	13500	18500	20	20	7200	8280
7500	16500	22000	24	24	11400	13200

* Weights given apply only to Type A Pumps

TYPES DS, DSB AND DSMB				TYPES K, KMB, KT AND KTMB			
Diam. of discharge in ins.	Most economic capacities per minute in U. S. gallons, depending on total heads			Diam. of discharge in ins.	Most economic capacities per minute in U. S. gallons, depending on total heads		
1 1/4	65	75	85	1 1/4	65	75	85
2	105	125	145	2	105	125	145
2 1/4	160	185	210	2 1/4	160	185	210
3	225	265	305	3	225	265	305
3 1/4	315	370	425	3 1/4	315	370	425
4	410	480	550	4	410	480	550
5	640	750	860	5	640	750	860
6	935	1100	1265	6	935	1100	1265
7	1275	1500	1725	7	1275	1500	1725
8	1620	1900	2180	8	1620	1900	2180
10	2550	3000	3450	10	2550	3000	3450
12	3655	4300	4945	12	3655	4300	4945
15	5525	6500	7475	15	5525	6500	7475
18	8160	9600	11000	18	8160	9600	11000
20	10200	12000	13800	20	10200	12000	13800
24	14450	17000	19550	24	14450	17000	19550
30	22500	26500	30500				
36	32300	38000	43700				
42	44200	52000	59800				
48	57000	67000	77000				
60	85000	100000	115000				

SWEET'S CATALOGUE



"AMERICAN" HEAVY DEEP
WELL STEAM PUMP HEAD
For operating with either single
or double acting cylinders

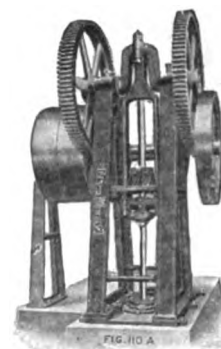


Fig. 110-A No. 316
"AMERICAN" HEAVY CON-
STRUCTION, DEEP WELL,
BELT DRIVEN PUMP HEAD
For operating double acting
cylinders

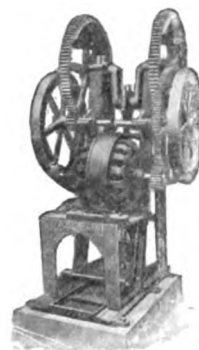


Fig. 110-AMS
"AMERICAN" MOTOR
DRIVEN DEEP WELL POWER
HEAD
For operating single or double
acting cylinders



Fig. 483
"AMERICAN" MOTOR
DRIVEN 2-STROKE DEEP
WELL POWER HEAD

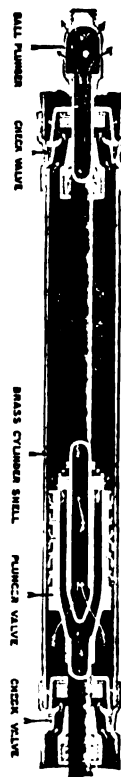


Fig. 382-A.
"AMERICAN" ALL-BRONZE
BALL VALVE
SINGLE ACT-
ING WATER
CYLINDER

Fig. 380-A. "AMERICAN" ALL-BRONZE
DOUBLE ACTING
WATER CYLINDER

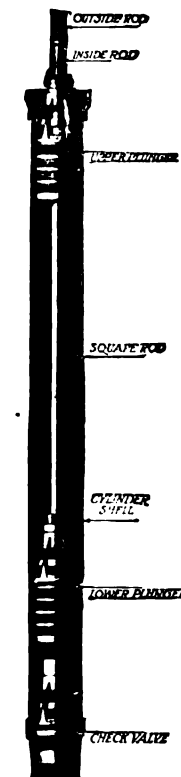


Fig. 195. "AMERICAN" ALL-BRONZE
2-STROKE WATER
CYLINDER

Continued on next page

Complete line of "American" deep well plunger pumps is illustrated and described in Catalogue No. 130.

Irrigation Pumping.

"American" centrifugal pumps have gained merited prominence in the irrigation field, because they are made in a large number of special designs for this purpose; to meet nearly every condition of service.

Bulletin 150 describing types of pumps adapted for irrigation work mailed on request.

Water Works Pumps.

"American" centrifugal pumps for water works installations have the advantage of being low in first cost, low in foundation cost, low in housing cost; require small expense for attendance and repairs; are not likely to get out of order or to rupture the mains by sudden changes of pressure; and are so designed that they produce a more flexible installation than plunger pumps.

By installing a water works system of "American" centrifugals of comparatively small units, and piping the pumps so that they can be operated separately, in parallel or in series, only a sufficient number of pumps need be operated at any time to supply desired quantity of water at required head, and these pumps can be operated at their maximum efficiency.

By manipulating a few valves, other pumps can be coupled-in to increase the quantity of delivery, or by coupling the pumps in series, to raise the pressure for fire service.

Catalogue 149 showing a number of water works designs will be sent on request to any one interested.

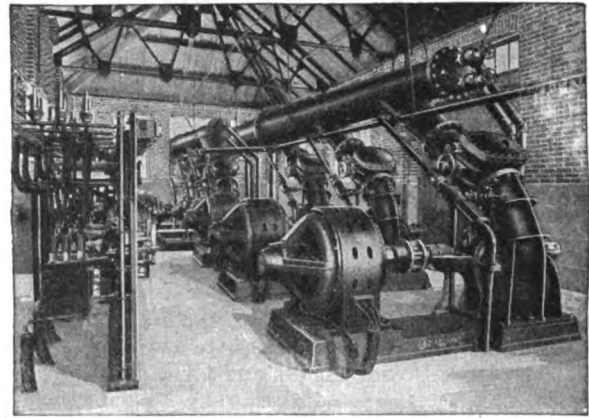
Fire Protection Pumping.

"American" centrifugal fire pumps conform to underwriters' specifications. They combine simplicity with reliability. A special feature of these pumps is that they are so designed that, in case of hose rupture, they will not overload motor, but will consume less power than when operating under standard fire pressure. Capacity, 500 to 1500 gals. per minute, or larger, as ordered. Discharge pressure, 100 lbs. or more per sq. in.

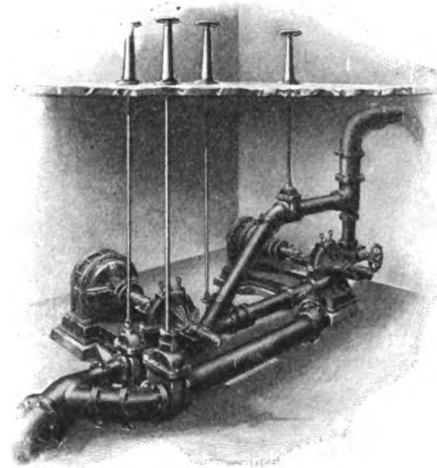
Information Required When Installing "American" Centrifugal Pumps.

- State: (1) Quantity of water required.
 (2) Kind of pump suggested for economical results.
 (3) Static head, or total distance from fluid at rest to center of mouth of discharge pipe.
 (4) Velocity head, or energy required to set fluid in motion and raise it to velocity attained when passing through discharge opening of pump.
 (5) Friction head, or friction throughout piping, bends, valves, etc.

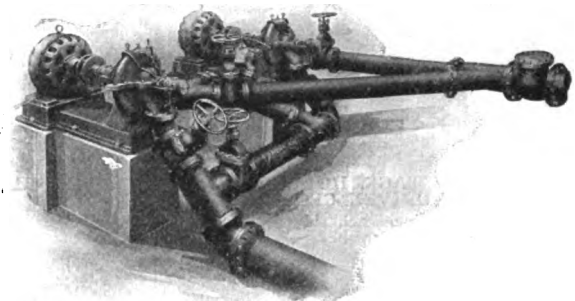
SWEET'S CATALOGUE



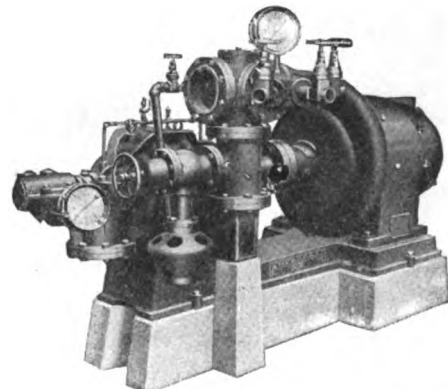
SIX 14-INCH "AMERICAN" CENTRIFUGALS INSTALLED FOR IRRIGATING 6,000 ACRES AND DELIVERING OVER 50,000,000 GALS. OF WATER PER DAY, ON LIFTS OF 84 TO 110 FT.



INSTALLATION OF "AMERICAN" CENTRIFUGALS, CITY WATER WORKS, HOLLAND, MICH.



INSTALLATION OF "AMERICAN" CENTRIFUGALS, CITY WATER WORKS, LINCOLN, NEBR.



TYPE KMD, UNDERWRITERS' FIRE PUMP
 High pressure, 2-stage, horizontal split shell; direct connected by flexible shaft coupling to high speed enclosed ventilated motor

AURORA PUMP & MANUFACTURING COMPANY

Manufacturers of Centrifugal Pumps and Deep Well Power Heads and Cylinders

AURORA, ILL.

Products.

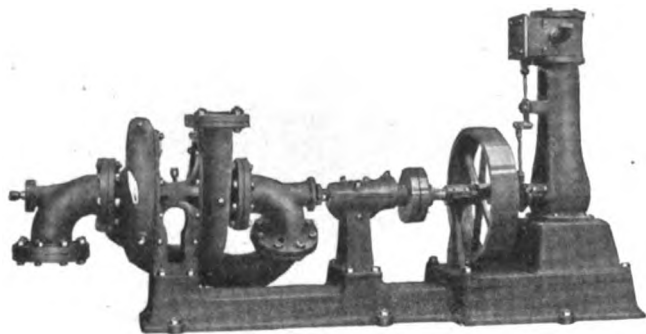
CENTRIFUGAL PUMPS for all purposes including: Horizontal Centrifugal Pumps, both Single- and Multiple-stage; Vertical Centrifugal Pumps, both Single- and Multiple-stage.

Deep Well Power Heads and Cylinders for all conditions.

A Better Pump for Every Purpose.

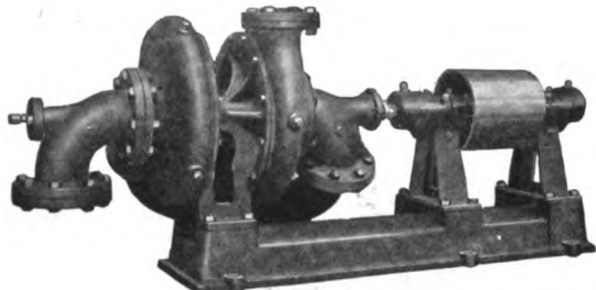
All that has been learned by exacting engineering

science, supplemented by more than 25 years' actual experience in the designing of Centrifugal and Deep Well Pumps, combined with the use of the best materials obtainable and the employment of conscientious skilled workmanship, has made AURORA Pumps the most advanced and efficient of their kind.



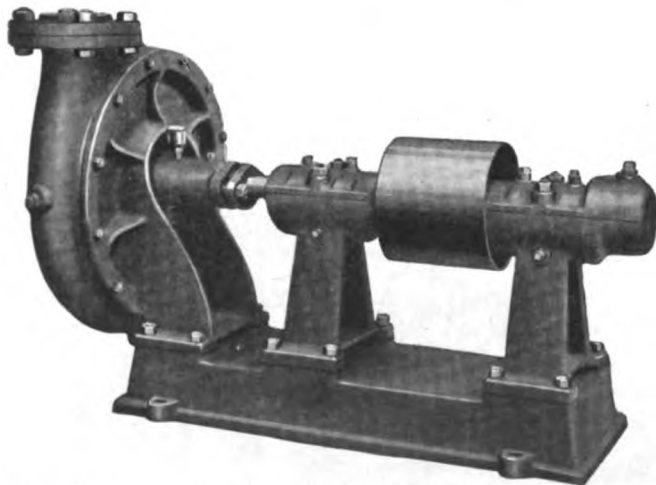
TYPE HHED, TWO-STAGE, HORIZONTAL CENTRIFUGAL PUMP

Direct connected to engine, with flexible coupling, ring oiling bearings, and suction elbow with grease lubricated tail bearing. Designed for total heads up to 60 ft., depending on size of pump



TYPE HH, TWO-STAGE, HORIZONTAL, HIGH PRESSURE, BELT DRIVEN CENTRIFUGAL PUMP

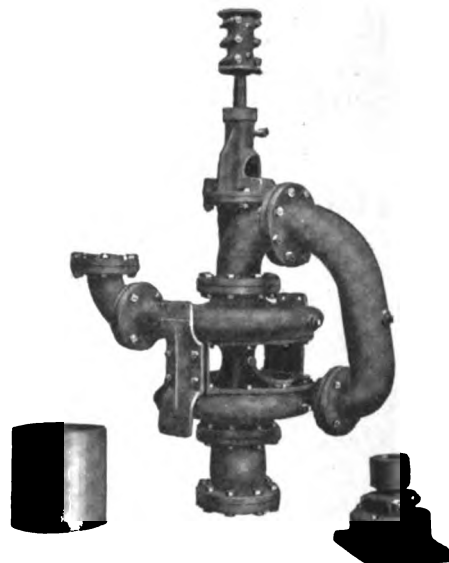
Ring oiling bearings each side of pulley. Suction elbow with grease lubricated tail bearing furnished. Total heads up to 250 ft.



TYPE GG, SINGLE-STAGE, HORIZONTAL, HIGH PRESSURE BELT DRIVEN CENTRIFUGAL PUMP

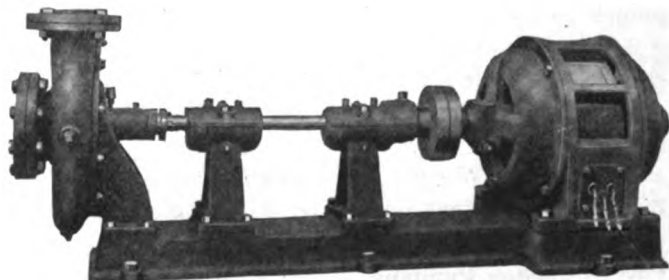
Ring oiling bearings each side of pulley. Designed for total heads up to 130 ft.

SWEET'S CATALOGUE



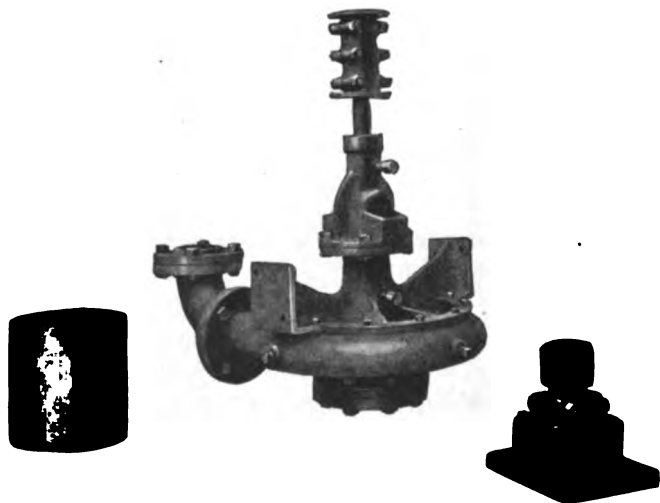
TYPE LL, TWO-STAGE, VERTICAL CENTRIFUGAL PUMP

Designed for total heads up to 250 ft., depending on size. Furnished with pulley and thrust bearing



TYPE GGMD, SINGLE-STAGE, HORIZONTAL, HIGH PRESSURE, MOTOR DRIVEN CENTRIFUGAL PUMP

Two ring oiling bearings and flexible couplings. Total heads up to 130 ft.



TYPE K, SINGLE-STAGE, VERTICAL CENTRIFUGAL PUMP

Designed for total heads up to 125 ft. Furnished with thrust bearing and pulley

BUFFALO STEAM PUMP COMPANY

BUFFALO, N. Y.

BRANCHES IN ALL PRINCIPAL CITIES

Products.

SINGLE-STAGE and MULTISTAGE, DOUBLE SUCTION, CENTRIFUGAL PUMPS.

Specifications, Class "S" Single-stage, Double Suction, Centrifugal Pumps.

Shell—Heavy gray cast iron, divided on horizontal center line, machined to gauge, drilling to template. Close clearances with runner preventing leakage.

Wearing Rings—Brass. Furnished in shell.

Runner—Enclosed type, double suction, hard cast iron to withstand abrasion, finished to template.

Shaft—Open hearth machine steel, accurately finished all over. Large size shafts are hammer forged. All rotating parts assembled on shaft and balanced before putting in pump.

Bearings—Ring oiling. Solid bearing bushings on 4-in. sizes and smaller. Split bearing bushings on 5-in. sizes and larger.

Thrust Bearing—Bearing surfaces water cooled on 5-in. sizes and larger, insuring perfect condition of lubricant. (Factory reserves discretion as to best type bearing to suit customer's requirements of head and running speed.)

Stuffing Boxes—Extra deep. Glands of cast iron, allowing ample packing space. Water seals and necessary connections furnished.

Companion Flanges—Furnished on pumps 6-in. size and smaller, having flanged openings.

Coupling—Flanged or flexible, as desired.

Subbase—Cast iron, ribbed and stiffened.

Finish—All pumps painted, filled and rubbed down. Bright parts exposed to weather protected by slushing compound.

Fittings—Drain and air cocks, piping for water seal and water jacket on thrust bearing.

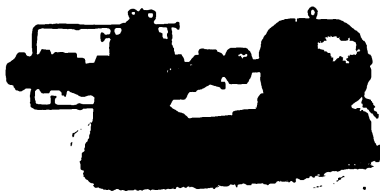


Fig. 1065. CLASS "S" SINGLE-STAGE, DOUBLE SUCTION, CENTRIFUGAL PUMP
180 ft. maximum working head

Fig. No.	Size pump, in.	Pipe sizes, in.		Cap., gals. per min.		Diam. and face pulley, in.	Approx. floor space, pulley pump, in.	Code word, pulley pump
		Suc-tion	Dis-charge	Nor-mal	Maxi-mum			
1059	1	1½	1	25	35	4 x 4	31 x 18	PABAG
1059	1½	2	1½	55	75	5 x 5	31 x 18	PABEH
1059	1½A	2	1½	55	75	5 x 5	31 x 18	PABEX
1059	2	2½	2	100	140	6 x 6	31 x 18	PABFU
1059	2A	2½	2	100	140	6 x 6	31 x 18	PABFZ
1062-3	2½	3	2½	155	225	6 x 6	39 x 22	PABIJ
1062-3	2½A	3	2½	155	225	6 x 6	39 x 22	PABIR
1062-3	3	4	3	225	325	7 x 6	39 x 22	PABJY
1062-3	3A	4	3	225	325	7 x 6	39 x 22	PABLD
1062-3	4	5	4	400	550	8 x 8	45 x 25	PABNA
1065	5	6	5	620	850	10 x 8	69 x 28	PABOK
1065	6	8	6	900	1,300	10 x 10	70 x 30	PABSE
1065	8	10	8	1,600	2,000	12 x 12	83 x 35	PABUL
1065	10	12	10	2,500	3,100	15 x 12	92 x 42	PABWI
1065	12	14	12	3,600	4,500	18 x 12	100 x 44	PABYM
1065	15	18	15	5,500	7,000	30 x 20	108 x 51	PABZS
1065	18	20	18	8,000	10,500	40 x 24	128 x 69	PABZX

Add code words:
JCSP for brass runner.
JCHBY for brass glands.
JCFXD for brass covered shaft.
JGMP for monel metal shaft.
JCWAR for motor base and flanged coupling.
JXCXS for motor base and flexible coupling.

Specifications, Class "RDS", Multistage, Double Suction, Centrifugal Pumps.

Casing—Cast iron, divided on horizontal center line.

Impellers—Cast iron. Double suction, enclosed type. Hydraulically balanced. Mounted on shaft by feather keys and lock nuts.

Clearance Rings—Bronze, "L" section, floating type.

Shaft Bearings—Ring oiling, removal shells, babbitt lined.

Thrust Bearing—Multiple collar, marine type. Housing split horizontally, babbitted and water jacketed. Oil circulates continuously over thrust collars.

Glands—Cast iron, brass bushed.

Water Seals—Brass cage rings with suitable circulating holes. Provided at each stuffing box. Seal on suction end has water supply connection.

Shaft—Steel, brass covered in pump and through glands.

Subbase—Cast iron, ribbed and stiffened.

Pulley—Cast iron, one piece. Pedestal bearings cast iron, bearings similar to main pump bearings.

Coupling—Flexible type.

Finish—Painted, filled and rubbed down outside with final finishing coat. Bright parts exposed to weather protected by a slushing compound.

Fittings—Drain and air cocks. Piping for water jacket on thrust bearing and for water seal.

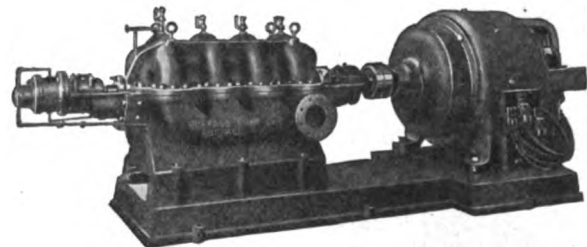


Fig. 1240. SECTIONAL VIEW, CLASS "RDS" MULTISTAGE, DOUBLE SUCTION, CENTRIFUGAL PUMP
300 lbs. maximum working pressure

Fig. No.	Size pump, in.	Pipe sizes, in.		Cap., gals. per min.		Diam. and face pulley, in.	Approx. floor space, pulley pump, in.	Code word, pulley pump
		Suc- tion	Dis- charge	Nor- mal	Maxi- mum			
TWO-STAGE								
1248	2	2½	2	100	140	6 x 5	87 x 25	RSADM
1248	2½	3	2½	150	225	7 x 6	87 x 25	RSBER
1248	3	4	3	225	325	8 x 8	92 x 27	RSCUB
1248	4	5	4	400	550	10 x 10	111 x 31	ESDIL
1248	5A	6	5	620	750	10 x 12	111 x 31	RSEFX
1248	5B	6	5	620	850	10 x 12	116 x 38	RSPAD
1248	6	8	6	900	1300	12 x 16	120 x 38	RSPYK
1248	8	10	8	1600	2000	13 x 16	130 x 43	RSPZP
THREE-STAGE								
1249	2	2½	2	100	140	On Application	94 x 25	RSGND
1249	2½	3	2½	150	225		94 x 25	RSHFZ
1249	3	4	3	225	325		99 x 27	RSTEQ
1249	4	5	4	400	550		120 x 31	RSKAP
1249	5A	6	5	620	750	On Application	120 x 31	RSLOX
1249	5B	6	5	620	850		127 x 38	RSLVQ
1249	6	8	6	900	1300		131 x 38	RSMIT
1249	8	10	8	1600	2000		143 x 43	RSMUX
FOUR-STAGE								
1250	2	2½	2	100	140	On Application	100 x 25	RSNUC
1250	2½	3	2½	150	225		100 x 25	RSOBY
1250	3	4	3	225	325		106 x 27	RSPAL
1250	4	5	4	400	550		129 x 31	RSQEP
1250	5A	6	5	620	750	On Application	129 x 31	RSTIZ
1250	5B	6	5	620	850		138 x 38	RSTWD
1250	6	8	6	900	1300		142 x 38	RSWOL
1250	8	10	8	1600	2000		155 x 43	RSWRV

Add code words:
JCSP for brass runners.
JCHBY for brass glands.
JCFXD for brass covered shaft.
JGMP for monel metal shaft.
JCWAR for motor base and flanged coupling.
JXCXS for motor base and flexible coupling.

NOTE: Brass runners are recommended for 2-in. and 2½-in. pumps, and are necessary on these sizes when speed is 2200 r.p.m. or over.

BLACKMER ROTARY PUMP CO.

FACTORY
PETOSKEY, MICH.

SALES OFFICES

DETROIT, MICH.
HOUSTON, TEX.

NEW YORK, N. Y.
KANSAS CITY, MO.

CHICAGO, ILL.
MINNEAPOLIS, MINN.
PITTSBURGH, PA.

PHILADELPHIA, PA.
SAN FRANCISCO, CAL.

Product.

Sole manufacturers of the BLACKMER ROTARY PUMP.

Blackmer Rotary Pump (Patented).

The Blackmer rotary pump is a different and exclusive application of the rotary or centrifugal principle.

There is no other pump on the market like it. It has proved its greater efficiency and economy by its varied uses over a number of years.

Wide Variety of Uses.

Blackmer pumps are giving satisfactory service in beverage plants, tanneries, chemical works, oil stations, cotton oil mills, soap factories, packing houses and refineries.

They act as bilge pumps on boats, large and small, in salt or fresh water.

They are used in water works, irrigation plants, quarries, sugar refineries, creameries, dairies and canning factories.

It is thus evident that they are adapted to the widest variety of usages.

Improvements.

Gradual improvements have raised the early high standing of Blackmer efficiency to a point where it is generally accepted as one of the most efficient pumps now on the market.

The improved Blackmer rotary pump handles a surprisingly large volume of fluid.

Its action is continuous and dependable; it starts easily without priming.

Blackmer pumps are standardized throughout. The interchangeability of all its parts, whether of iron or bronze, is a highly important feature, as pumps cost at piece-meal no more than as a unit.

Construction.

The illustration shows the interior construction of the Blackmer rotary pump, which consists of cylinder, revolving piston and 4 buckets.

As the piston revolves with the shaft, the buckets are held out against the cylinder by centrifugal force and gravity. The air is thus exhausted from the extension or water chamber, and the fluid which is under atmospheric pressure flows into the pumps and fills the extension chamber.



TRADE-MARK
Reg. U. S. Pat. Off.

The buckets drop into this extension chamber at the left and pass to the right, drawing liquid in at suction and pushing it out at discharge. The only fluid that will carry by the discharge port is that which fills the recesses in the piston. Here, it acts as a fluid packing, and keeps the pump at all times suctiontight.

The ports of the Blackmer pump run diagonally across the cylinder, which gives the bucket an even wear. Friction everywhere is reduced to the lowest point.

Suction Lift.

The large extension chamber, found in the Blackmer pump, enables these pumps with centrifugal force to make a good suction lift.

When properly installed with suction lift that is given for them in specification table, each pump will pick the liquid from the bottom without priming.

Slippage.

The Blackmer pump is protected against slippage losses by the fact that the buckets are hinged; this device allows freedom for the buckets to drop out against the wall of the cylinder by their own weight, as well as by centrifugal force.

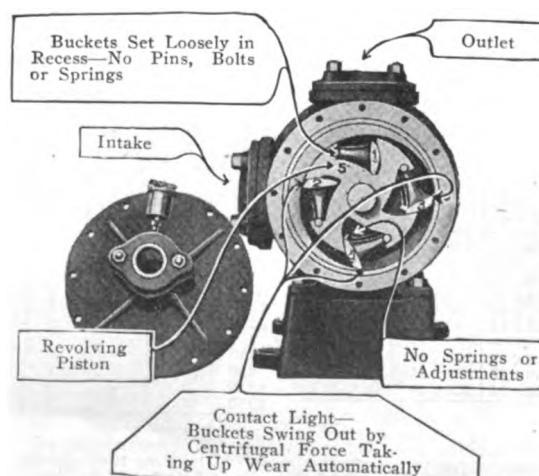
All wear is automatically taken up and the pump is kept at full efficiency until the buckets are used up. New buckets can be installed at small expense, so that the same pump is always ready for another long term of usefulness.

Renewable Linings.

Another remarkable and distinctive feature of the Blackmer pumps, as applied to rotary pumps, is the renewable linings. These can be taken out and replaced without special tools or experience, and without disturbing the connections, in 30 minutes' time. This is an important consideration—the independence from the machine-shop's aid.

Nos. 2, 4, 6, 8, 10 and 12 are made with these replaceable linings. They prolong the life of the pump indefinitely.

For liquids containing acid, a special acid resisting bronze is furnished at the extra cost of the metal.



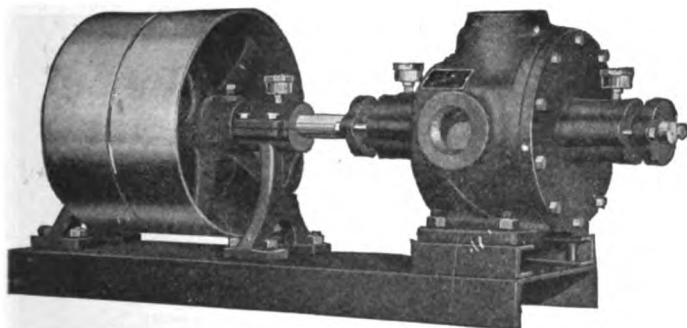
BLACKMER ROTARY PUMP (PATENTED)

Belt Driven Regular Pumps.

Are made in the solid as well as lined type. The lined types have two heads. Specifications for the lined and solid are the same. The solid types are Nos. 0 to 8, inclusive. Nos. 2, 4, 6 and 8 are solid or lined. Nos. 10 and 12 are lined only.

All belted pumps are furnished with tight and loose pulley.

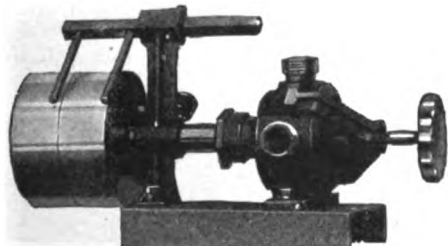
All solid or lined iron pumps are fitted with bronze buckets and bronze glands, up to the No. 8. On the Nos. 8, 10 and 12 they are fitted with iron buckets and iron, bronze-bushed glands.



BELT DRIVEN PUMP

Sanitary Creamery and Food Pumps.

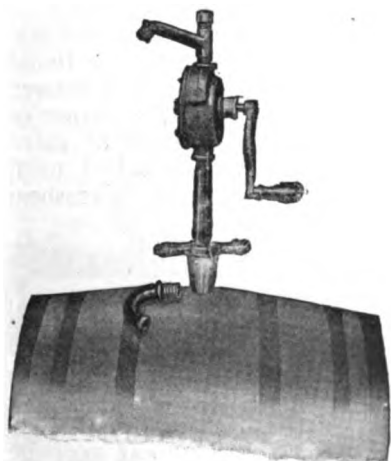
Nos. 11, 01, 02, 03 made in either iron or bronze, with tight and loose pulley. Similar to others except that shaft is in 2 pieces. Head is fastened to cylinder by clamp and hand wheel, which enables one to take it apart, clean and put it together in a few minutes.



SANITARY CREAMERY AND FOOD PUMP

No. 9 Transfer Pump.

Used for transferring from barrels and tanks. Also made with gears, which doubles its capacity and doubles the suction life.



NO. 9 TRANSFER PUMP

Single, Double, Triple, Four and Six Pump Units.

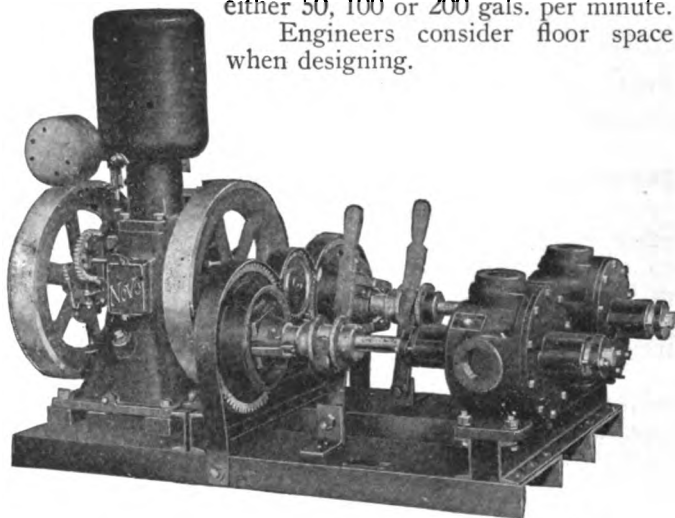
Extensively used by large oil companies, tanneries, chemical plants, heat treating plants, or any company who wishes to conserve space.

Connections are by gear and pinion to either engines or motors.

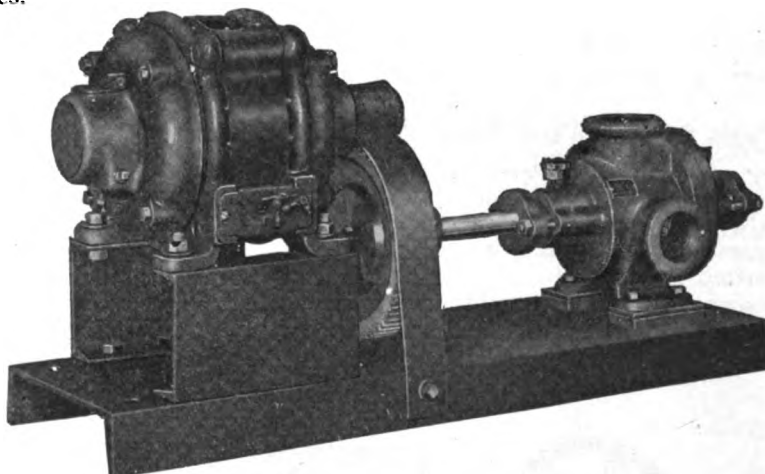
Each pump is provided with a friction clutch or slide gear, in the double, triple, four and six pump units, and can be used together or separately.

Furnish units with pumps of either 50, 100 or 200 gals. per minute.

Engineers consider floor space when designing.



DOUBLE UNIT PUMP CONNECTED BY GEAR TO GASOLINE ENGINE



SINGLE UNIT ROTARY PUMP CONNECTED TO MOTOR

DATA, BLACKMER ROTARY PUMPS

Number of pump	Pipe connections, in.	Size of pulley, in.	R.p.m.	G.p.m.	Suction lift, ft.	Max. pressure, lbs.	Shipping weight, lbs.	Floor space, in.
0	1½	4 x 1	600	6½	2	75	20	4 x 12
1	¾	6 x 2	500	12	10	75	45	10 x 21
2	1	6 x 2	500	20	10	75	55	10 x 21
3	1½	10 x 3	400	35	12	75	120	12 x 31
4	2	10 x 3	430	50	12	75	130	12 x 31
6	2½	16 x 4	250	100	15	75	350	16 x 40
8	3½	18 x 6	220	200	18	75	500	18 x 52
10	5	30 x 7	175	350	20	75	1350	30 x 80
12	6	36 x 10	150	500	20	75	2500	36 x 90
6 Spec.	2	12 x 4	250	100	15	40	260	14 x 36
11	1	4 x 1	700	4½	1½	40	20	4 x 12
01	1	6 x 2	500	16	8	40	45	8 x 16
02	1½	10 x 2	350	30	10	40	75	10 x 23
03	2	12 x 4	200	80	12	40	240	12 x 33
9	1	Hand		12	5		40	
5	1½	Hand		15	5		65	
7	2	Hand		25	8		125	
9	1			Geared 25	Hand 12		45	
5	1½			30'			60	

BLAKE PUMP & CONDENSER CO.

FITCHBURG, MASS.

BRANCH OFFICES

NEW YORK, N. Y.
PHILADELPHIA, PA.
BALTIMORE, MD.
BOSTON, MASS.

MONTREAL, QUE.

RICHMOND, VA.
BIRMINGHAM, ALA.
CLEVELAND, OHIO
CHICAGO, ILL.

KANSAS CITY, MO.
SAN FRANCISCO, CAL.
LOS ANGELES, CAL.
HOUSTON, TEX.

MINNEAPOLIS, MINN.
DULUTH, MINN.
TULSA, OKLA.
VANCOUVER, B. C.
TORONTO, ONT.

Product.

DUPLEX and TRIPLEX POWER PUMPS.

Predominating Features of Blake Pumps.

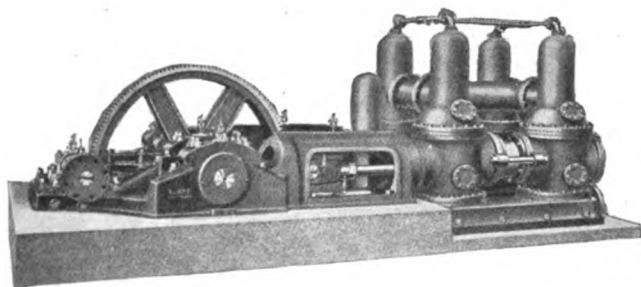
The predominating feature of Blake pumping apparatus is the application of the Blake-Fitchburg high efficiency, four-bearing type, power end, to certain types of fluid ends which have been developed to the highest point of efficiency for the particular service to which they are applicable.

The power end consists of two one-piece frames, each containing two main crank shaft bearing jaws cast integral. The frames are assembled and tied rigidly together, making them as immovable as if cast in one piece.

Adjustment of each bearing is so made by one wedge on front side that excessive strain merely increases friction load and in no way affects alignment. Both top and bottom shells of each bearing are of the full floating type and follow the shaft to a perfect bearing at all times. Crossheads are provided with adjustable shoes, top and bottom, which ride in smooth bored guides, cast integral in frames.

Types DCS for Water Works Service.

Type DCS is primarily adapted for water works service but is equally suited for other forms of duty where moderate or large volume is necessary, under pressures up to 250 lbs. per sq. in. Fluid end is characterized by unusually large water passages, absence of sharp angles, and valves of sufficient size and number to reduce fluid velocities to a minimum.



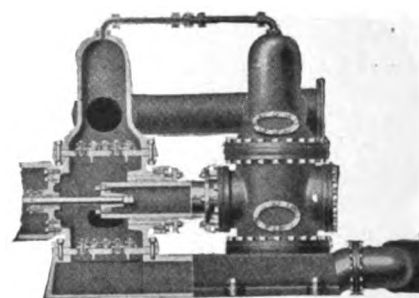
TYPE DCS DUPLEX OUTSIDE CENTER PACKED PLUNGER PUMP, DOME TYPE

Four separate cylinders are mounted in tandem on suction boxes which are placed front and rear and provide for constant water surge. This type is equipped with removable suction and discharge valve decks of iron, steel or bronze, set between main fluid castings (see sectional view). Each plunger stuffing box is removable. Plungers are ground to size and operate through externally packed stuffing boxes of unusual depth to guard against leakage.

Plunger rods are taper-fitted to plunger heads which

are removable. Valves are of rubber with bronze seats, guards and spring.

Large hand-holes provide access to all interior parts. Air domes on each cylinder of ample capacity to cushion all shocks.

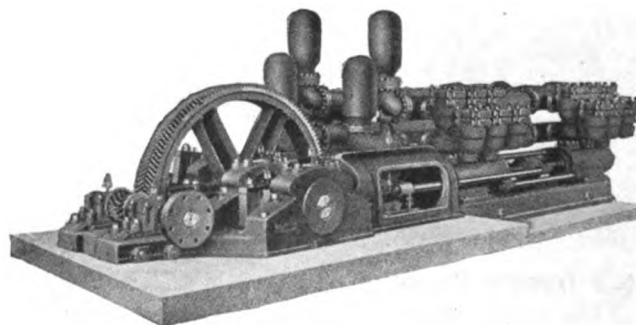


SECTIONAL VIEW, TYPE DCS

Type PC for Great Variety of Service.

The predominating feature of this type is its flexibility. Built in a large number of sizes for pressures up to 1500 lbs. per sq. in., it is adapted to an endless variety of services, such as mines, steel mills, oil lines, or any duty where moderate or large quantity is required and the pot type preferred.

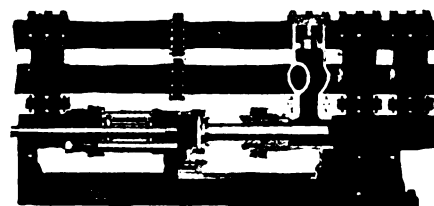
Fluid end has four separate cylinders, two on each side, mounted in tandem on a heavy cast iron base.



TYPE PC DUPLEX OUTSIDE PACKED PLUNGER PUMP
Pot valve type

Sufficient number of valve pots to reduce fluid velocities to a minimum. All passages free and open.

A special feature of this type is found in the fact that the plunger stuffing boxes and master pot flanges are easily removed and smaller or larger ones as easily installed to meet new conditions of increased or decreased loads. Plungers are bolted to flange which in turn is held to crosshead. Crossheads equipped with babbitted shoe as in type previously described. Valves of wing, ball or disk type with suitable facings. All parts are easily accessible and each may be removed without disturbing others.

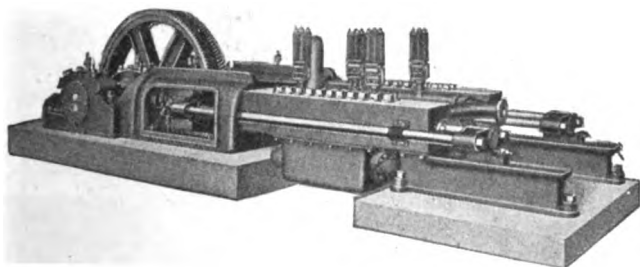


LONGITUDINAL SECTION, TYPE PC

Type FO for Pumping Viscous Oils and Fluids.

This type is offered for difficult service, and pumping oils or other fluids of heavy viscosity. Fluid end consists of two forged steel blocks into which cylinder barrels and all valve chambers are machined. This construction eliminates leakage of combustible vapors common to cast fluid ends. All passages are free from air pockets and are easy flowing.

Two cast steel manifolds, bolted to cylinders, are connected to a common cast steel Y forming the main



**TYPE FO DUPLEX OUTSIDE END PACKED PLUNGER PUMP
BILLET END**

discharge. Special attention given to valve areas to reduce fluid velocities to a minimum.

Valves of ball or disk type, the latter provided with leather inserts and a cushion (while lifting), by means of dashpot in which disk stem operates.

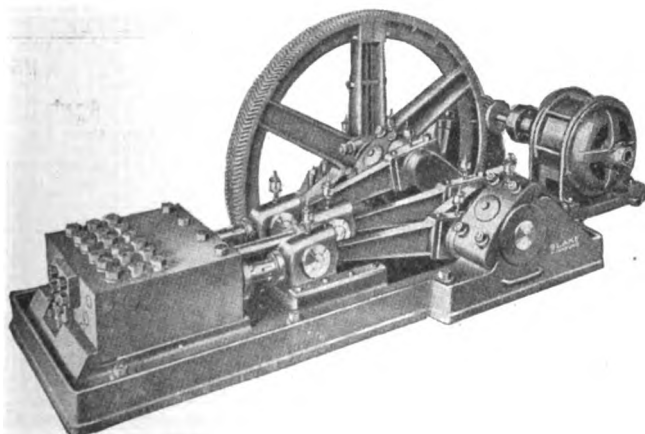
Each cylinder is equipped underneath with individual suction boxes, placed in conjunction, by means of heavy standard piping connected to a common suction opening.

Plungers are of high grade solid steel carefully turned and ground to size. They operate in stuffing boxes of extra depth. Perfect alignment of each plunger is maintained by adjustable babbitted shoes fitted to crossheads. All parts quickly and easily accessible.

Type T for High Pressure Industrial Service.

This type is designed exclusively for high pressure service, and is applicable to such duties as are found in the industrial field, such as in steel, brass, rubber and aluminum works, shipbuilding, cotton compressing, cotton gins, etc., and for relatively small volume capacities. It contains all the latest and accepted features of high pressure engineering and is extremely compact and rugged. With the exception of driving pinion, entire pump is mounted on a heavy one-piece frame or foundation.

Main bearing jaws are cast integral with frame and



**TYPE T HORIZONTAL TRIPLEX OUTSIDE END PACKED
HYDRAULIC PUMP**

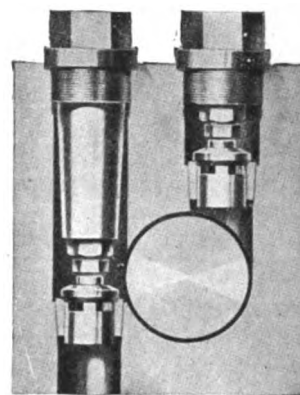
are lined with babbitt or bronze as the duty requires. Bearings are the split type with usual adjustments.

Connecting rods are the forked type equipped with adjustable babbitt lined boxes on crank ends of bronze boxes in crossheads. Each crosshead is fitted with babbitted shoes, operating on independent smoothly finished ways integral with main frame.

Fluid end consists of one solid steel forging in which are machined the cylinder barrels, valve chambers, and suction and discharge chambers as well. This construction results in an unusually compact and practically leakproof fluid end.

Valve construction (see accompanying illustration) consists of special bronze cylindrical valves operating on hardened nickel steel seats, with valve adjustment provided by means of bolts and lock nuts in each valve plug.

The drive is through single reduction herringbone gears adaptable to any form of motive power by flexible coupling on the pinion shaft.



**HIGH PRESSURE VALVE
CONSTRUCTION, TYPE T**

Other Types of Pumps.

The Type DCI duplex outside center packed plunger pump, integral type, is adaptable to a variety of services such as low head mines, water works and general service where pressure does not exceed 250 lbs.

Type PE duplex outside end packed plunger pump, pot valve type, adaptable to many duties for moderate or large quantities, and for pressures up to 1500 lbs.

Type F duplex outside end packed plunger hydraulic pump for indefinitely high pressures and of larger capacities. Also Type B by-pass valve, and Type O high pressure operating valve, both characterized by their dependability, quietness and strength.

Blake Pumps are Offered Upon an Efficiency Basis.

Blake pumps are offered exclusively upon an efficiency basis, no effort whatever having been made to save in cost, from a competitive standpoint. They combine the best and most modern engineering refinements, with superior workmanship and construction.

Details in photographic form and comprehensive descriptions are contained in specifications forming a part of all proposals.

Directions for Ordering—General service to be performed; amount of fluid to be pumped; temperature and viscosity of fluid; character of fluid as to grit, acid, etc.; head in feet; length, height and arrangement of suction line and character of power used.

Partial List of Installations.

Baldwin Locomotive Works, Philadelphia, Pa.
American Locomotive Works, Richmond, Va.
McMyler Interstate Co., Bedford, Ohio
Ford Motor Co., Detroit, Mich.
American Steel Foundries, Chicago, Ill.
Studebaker Co., South Bend, Ind.
U. S. Navy, Arsenal, Washington, D. C.
Steel Co. of Canada, Hamilton, Ont.
City of Los Angeles, Los Angeles, Cal.
Newport News Shipbuilding & Drydock Co., Newport News, Va.
American Car & Foundry Co., Depew, N. Y.
Aluminum Co. of America, Pittsburgh, Pa.

CHICAGO PUMP CO.

Electric Pumping Machinery

2332 Wolfram Street
CHICAGO, ILL.

Products.

Manufacturers of HORIZONTAL MULTISTAGE PUMPS; HIGH and LOW PRESSURE AUTOMATIC CONDENSATION PUMPS and RECEIVERS; AUTOMATIC ELECTRIC BILGE PUMPS; SEWAGE EJECTORS; TURBINE AIR LINE PUMPS for heating systems.

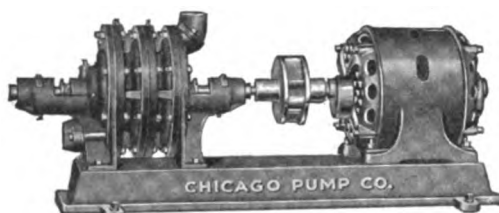
Also manufacturers of Pneumatic Water Supply Systems.

Pumping Machinery.

Pumping machinery is made a specialty and this company caters principally to the building industry. The entire time is devoted to improving this class of equipment, thereby promoting the best interests of customers. The CHICAGO PUMP CO. is proud to be able to state that it has the finest line of pumps manufactured for this service. A full description, including illustrations of the various styles of pumps will be furnished on request.

Horizontal Multistage Pumps.

Multistage pumps are fitted with enclosed type balanced impellers and outer board ring oiled bearings.



TYPE M HORIZONTAL MULTISTAGE PUMP

CAPACITIES, SIZES AND HORSEPOWER, TYPES M AND HS HORIZONTAL MULTISTAGE PUMPS

Unit No.	Type of pump and frame No.	Suction and discharge, in.	No. of stages	Capacity, g.p.m.	Will pump against a head, ft.	H.p. motor	Unit No.	Type of pump and frame No.	Suction and discharge, in.	No. of stages	Capacity, g.p.m.	Will pump against a head, ft.	H.p. motor
S.H. 2	M1	1	1	10	27	1/2	S.H. 116	M3	2 1/2	1	125	37	3
S.H. 3	M1	1	1	10	41	3/4	S.H. 118	M3	2 1/2	1	125	62	5
S.H. 4	M1	1	1	10	53	1	S.H. 119	M3	2 1/2	1	125	94	7 1/2
S.H. 5	M1	1	2	10	81	1 1/2	S.H. 121	M3	2 1/2	2	125	125	10
S.H. 10	M1	1	1	15	26	1 1/2	S.H. 122	M3	2 1/2	2	125	188	15
S.H. 11	M1	1	1	15	40	3/4	S.H. 123	M3	2 1/2	3	125	251	20
S.H. 12	M1	1	1	15	51	1							
S.H. 13	M1	1	2	15	80	1 1/2	S.H. 134	M3	3	1	150	53	5
S.H. 18	M1	1 1/4	1	25	19	1 1/4	S.H. 135	M3	3	1	150	80	7 1/2
S.H. 19	M1	1 1/4	1	25	28	3/4	S.H. 137	M3	3	2	150	106	10
S.H. 20	M1	1 1/4	1	25	38	1	S.H. 138	M3	3	2	150	160	15
S.H. 22	M1	1 1/4	2	25	57	1 1/2	S.H. 140	M3	3	3	150	213	20
S.H. 23	M1	1 1/4	2	25	77	2	S.H. 141	M3	3	3	150	264	25
S.H. 25	M1	1 1/4	3	25	115	3							
S.H. 30	M1	1 1/4	1	35	27	3/4	S.H. 844	H.S.	3	1	200	75	10
S.H. 31	M1	1 1/4	1	35	36	1	S.H. 845	H.S.	3	1	200	112	15
S.H. 34	M1	1 1/4	2	35	55	1 1/2	S.H. 846	H.S.	3	2	200	150	20
S.H. 36	M1	1 1/4	2	35	73	2	S.H. 847	H.S.	3	2	200	187	25
S.H. 39	M2	1 1/4	2	35	104	3	S.H. 848	H.S.	3	2	200	225	30
S.H. 43	M2	1 1/4	3	35	173	5	S.H. 849	H.S.	3	2	200	262	35
S.H. 54	M2	1 1/2	1	50	41	1 1/2	S.H. 853	H.S.	3	1	250	64	10
S.H. 56	M2	1 1/2	1	50	55	2	S.H. 854	H.S.	3	1	250	96	15
S.H. 57	M2	1 1/2	1	50	80	3	S.H. 855	H.S.	3	1	250	128	20
S.H. 58	M2	1 1/2	2	50	136	5	S.H. 856	H.S.	3	2	250	160	25
S.H. 60	M2	1 1/2	3	50	205	7 1/2	S.H. 857	H.S.	3	2	250	192	30
							S.H. 858	H.S.	3	2	250	225	35
S.H. 72	M2	2	1	75	59	3	S.H. 863	H.S.	4	1	300	54	10
S.H. 75	M2	2	2	75	98	5	S.H. 864	H.S.	4	1	300	82	15
S.H. 78	M2	2	3	75	149	7 1/2	S.H. 865	H.S.	4	1	300	107	20
S.H. 80	M2	2	3	75	198	10	S.H. 866	H.S.	4	1	300	130	25
S.H. 85	M2	2	5	75	298	15	S.H. 867	H.S.	4	2	300	160	30
S.H. 88	M2	2	5	75	350	20	S.H. 868	H.S.	4	2	300	188	35
							S.H. 869	H.S.	4	2	300	215	40
S.H. 95	M3	2 1/2	1	100	46	3	S.H. 871	H.S.	4	2	350	118	25
S.H. 97	M3	2 1/2	1	100	77	5	S.H. 872	H.S.	4	2	350	142	30
S.H. 100	M3	2 1/2	2	100	116	7 1/2	S.H. 873	H.S.	4	2	350	166	35
S.H. 103	M3	2 1/2	2	100	154	10	S.H. 874	H.S.	4	2	350	190	40
S.H. 106	M3	2 1/2	3	100	232	15	S.H. 875	H.S.	4	2	350	220	50

Send for catalogue giving information on pumps of larger capacities and higher heads

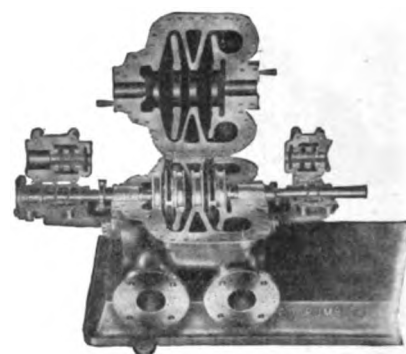
SWEET'S CATALOGUE

They are best adapted for roof tank filling, hot and cold water circulating, pneumatic water systems, brine circulating, in fact, wherever a quiet running pump is essential.

Condensation Pumps and Receivers.

Pump the heating returns into boiler from radiation, heating coils, cooking kettles, etc., that may be located below boiler level.

Condensation pumps and receivers are simple in construction, have very few moving parts, and are quiet in operation. Come all mounted on one base, connected up ready for piping and wiring connections.

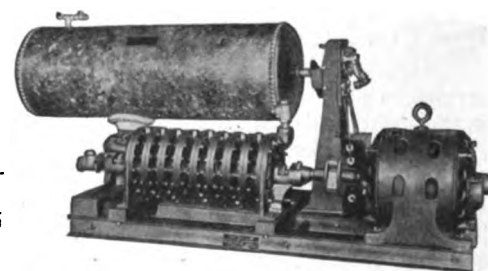


TYPE HS HORIZONTAL MULTISTAGE PUMP



LOW PRESSURE AUTOMATIC CONDENSATION PUMP AND RECEIVER

For returning condensation water from heating systems into boilers. Controlled by tilting receiver—more positive than float control



HIGH PRESSURE AUTOMATIC CONDENSATION PUMP AND RECEIVER, "CHICAGO" OR TILTING TANK TYPE

CAPACITIES, SIZES AND HORSEPOWER, LOW PRESSURE AUTOMATIC CONDENSATION PUMP AND RECEIVER

Unit No.	Max. sq. ft. direct rad.	H.p. motor	Approx. ship. wt., lbs.	Boiler pres. pumps will discharge against at 1750 r.p.m.	Dis. in.	Approx. floor space required, in.	High-est water-level in receiver from floor line, in.
Sc. 2	3000	1 1/2	400	10	1	30x53	21
Sc. 3	6000	1 1/2	600	10	1	32x53	30
Sc. 3A	10000	1 1/2	650	10	1	32x53	30
Sc. 4	10000	3/4	700	15	1	32x64	30
Sc. 4A	15000	3/4	700	10	1	32x70	34
Sc. 5	15000	1	800	20	1 1/4	32x70	34
Sc. 5A	20000	1	800	10	1 1/4	32x70	34
Sc. 6	25000	2	900	20	1 1/4	36x76	37
Sc. 6A	35000	2	900	10	1 1/2	36x76	37

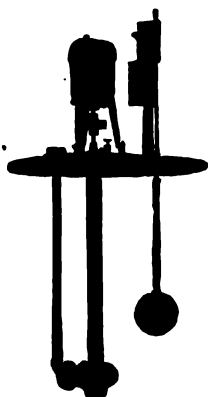
Units listed include pump, motor, receiver and automatic control, all mounted on one iron base connected up and ready for piping and wiring connections.

Continued on next page

Automatic Electric Bilge Pumps.

For pumping water out of basements that are located below the sewer level.

They are the best that modern equipment and skill can produce; are fitted with a grease lubricated bronze bearing every 4 ft., self-aligning ball thrust bearing, flexible coupling and a double carbon contact type float switch.



TYPE L.G.
AUTOMATIC ELEC-
TRIC BILGE PUMP

Duplex Electric Sewage Ejector.

For pumping sewage from basements into sewer. Simplicity of design and construction are predominating features. All working parts are visible and of easy access. No climbing down into the pit to open or close valves or do any adjusting, oiling or repairing.

CAPACITIES, SIZES AND HORSEPOWER,
DUPLEX ELECTRIC SEWAGE EJECTOR

Unit No.	Type of pump and frame No.	Capacity, g.p.m.	Dis-charge, in.	H.p. motor	Will pump against a total head, ft.
S.H. 300	NLG	75	2½	¾	8
S.H. 301	NLG	75	2½	1	11
S.H. 302	NLG	75	2½	1½	16
S.H. 303	NLG	75	2½	2	22
S.H. 304	NLG	75	2½	3	32
S.H. 305	NLG	75	2½	5	40
S.H. 306	L-3	100	2½	¾	7
S.H. 307	L-3	100	2½	1	10
S.H. 308	L-3	100	2½	1½	15
S.H. 309	L-3	100	2½	2	21
S.H. 310	L-4	100	2½	3	30
S.H. 311	L-4	100	2½	5	38
S.H. 312	L-3	125	3	1	8
S.H. 313	L-3	125	3	1½	13
S.H. 314	L-3	125	3	2	17
S.H. 315	L-3	125	3	3	26
S.H. 316	L-4	125	3	5	37
S.H. 317	L-3	150	3	1½	11
S.H. 318	L-3	150	3	2	15
S.H. 319	L-3	150	3	3	23
S.H. 320	L-4	150	3	5	36
S.H. 321	L-3	200	3	2	12
S.H. 322	L-3	200	3	3	19
S.H. 323	L-4	200	3	5	32
S.H. 324	L-4	200	3	7½	34
S.H. 325	L-3	250	4	2	10
S.H. 326	L-3	250	4	3	16
S.H. 327	L-4	250	4	5	27
S.H. 328	L-4	250	4	7½	33
S.H. 329	L-4	300	4	3	14
S.H. 330	L-4	300	4	5	23
S.H. 331	L-5	300	4	7½	35
S.H. 332	L-5	300	4	10	45
S.H. 333	L-4	350	4	3	12
S.H. 334	L-4	350	4	5	21
S.H. 335	L-5	350	4	7½	31
S.H. 336	L-5	350	4	10	42

Duplex units include two pumps, two motors, duplex automatic control strainer and cast iron cover but do not include basin.

Dimensions: Basins for single pumps 75-gal. capacity, should be 36-in. diameter; 100- to 200-gal. capacity, 42-in. diameter; 250- to 350-gal. capacity, 48-in. diameter.

For duplex pumps 75- to 200-gal. capacity, 48-in. diameter; 250- to 350-gal. capacity, 60-in. diameter.

All basins should be 48 in. deeper than lowest inlet.

Ejectors up to 1500 g.p.m. are also manufactured; write for complete catalogue.

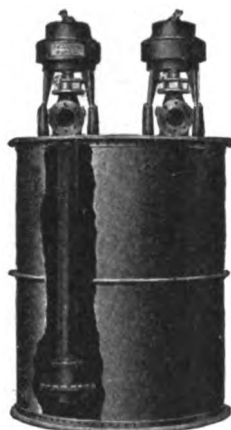
CAPACITIES, SIZES AND HORSEPOWER, AUTOMATIC ELECTRIC BILGE PUMPS

Unit No.	Type of pump and frame No.	Capacity, g.p.m.	Dis-charge, in.	H.p. motor	Will pump against a total head, ft.	Unit No.	Type of pump and frame No.	Capacity, g.p.m.	Dis-charge, in.	H.p. motor	Will pump against a total head, ft.
S.H. 175	LG	15	1	¼	10	S.H. 215	L-3	200	3	2	14
S.H. 176	LG	15	1	¾	19	S.H. 216	L-3	200	3	3	22
S.H. 177	LG	15	1	¾	28	S.H. 217	L-3	200	3	5	37
S.H. 179	LG	30	1½	¼	7	S.H. 218	L-3	200	3	7½	55
S.H. 180	LG	30	1½	¾	14	S.H. 219	L-4	200	3	10	70
S.H. 181	LG	30	1½	¾	21	S.H. 220	L-4	250	4	2	12
S.H. 182	LG	30	1½	1	26	S.H. 221	L-4	250	4	3	20
S.H. 183	LG	30	1½	1½	27	S.H. 222	L-4	250	4	5	34
S.H. 184	LG	30	1½	2	36	S.H. 223	L-4	250	4	7½	50
S.H. 185	LG	50	1½	½	12	S.H. 224	L-4	250	4	10	65
S.H. 186	LG	50	1½	¾	18	S.H. 225	L-4	300	4	3	17
S.H. 187	LG	50	1½	1	22	S.H. 226	L-4	300	4	5	28
S.H. 188	L-2	50	1½	1½	28	S.H. 227	L-4	300	4	7½	44
S.H. 189	L-2	50	1½	2	38	S.H. 228	L-4	300	4	10	55
S.H. 190	L-3	50	1½	3	53	S.H. 229	L-4	350	4	3	14
S.H. 191	LG	75	2	½	8	S.H. 230	L-4	350	4	5	25
S.H. 192	LG	75	2	¾	14	S.H. 231	L-4	350	4	7½	38
S.H. 193	LG	75	2	1	16	S.H. 232	L-4	350	4	10	50
S.H. 194	L-3	75	2	1½	22	S.H. 233	L-4	350	4	15	65
S.H. 195	L-3	75	2	2	30	S.H. 234	L-4	400	4	3	12
S.H. 196	L-3	75	2	3	48	S.H. 235	L-4	400	4	5	22
S.H. 197	L-3	75	2	5	65	S.H. 236	L-4	400	4	7½	35
S.H. 198	LG	100	2½	¾	8	S.H. 237	L-4	400	4	10	45
S.H. 199	L-3	100	2½	1	14	S.H. 238	L-4	400	4	15	60
S.H. 200	L-3	100	2½	1½	18	S.H. 239	L-5	500	5	3	12
S.H. 201	L-3	100	2½	2	25	S.H. 240	L-5	500	5	5	19
S.H. 202	L-3	100	2½	3	38	S.H. 241	L-5	500	5	7½	28
S.H. 203	L-3	100	2½	5	60	S.H. 242	L-5	500	5	10	38
S.H. 204	L-3	125	2½	1	10	S.H. 243	L-5	500	5	15	42
S.H. 205	L-3	125	2½	1½	15	S.H. 244	L-5	750	5	5	13
S.H. 206	L-3	125	2½	2	21	S.H. 245	L-5	750	5	7½	20
S.H. 207	L-3	125	2½	3	33	S.H. 246	L-5	750	5	10	26
S.H. 208	L-3	125	2½	5	55	S.H. 247	L-5	750	5	15	40
S.H. 209	L-3	125	2½	7½	65	S.H. 248	L-5	1000	6	5	10
S.H. 210	L-3	150	3	1½	14	S.H. 249	L-5	1000	6	7½	15
S.H. 211	L-3	150	3	2	19	S.H. 250	L-5	1000	6	10	20
S.H. 212	L-3	150	3	3	28	S.H. 251	L-5	1000	6	15	31
S.H. 213	L-3	150	3	5	48						
S.H. 214	L-3	150	3	7½	60						

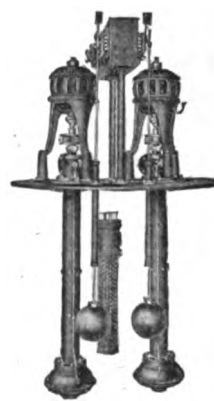
Units include pump, motor, complete automatic apparatus, cast iron basin cover, but do not include basin.

Dimensions: Basins for single pumps, 15- to 30-gal. capacity, should be 30-in. diameter; 50- to 100-gal. capacity, 36-in. diameter; 125- to 250-gal. capacity, 42-in. diameter; 300-gal. capacity, 48-in. diameter.

All basins should be 36 in. deeper than lowest inlet. Bilge pumps up to 1500 g.p.m. are also manufactured; write for complete catalogue.



DUPLEX ELECTRIC
SEWAGE EJECTOR IN
BASIN



DUPLEX
ELECTRIC
SEWAGE EJECTOR

CAPACITIES TURBINE AIR LINE PUMPS

Size	Sq. ft. direct rad.	H.p. motor, 1750 r.p.m.	Air return inlet, in.	Air exhaust and overflow, in.	Approx. ship. wgt., lbs.
1	5000	¼	½	1	320
2	10000	½	¾	1	350
3	15000	¾	1	1	380
4	20000	1	1½	1	420
5	30000	1½	1	1½	830
6	40000	2	1	1½	900

Dimensions, Nos. 1 to 4: Receiver is 15-in. diameter; highest point of receiver from floor line, 15 in.; from floor line to highest point of motor, approximately 27 in.

Nos. 5 and 6: Receiver, 24-in. diameter; 23 in. high; over all height 42 in.

New Catalogue.

Our new catalogue in two colors with many valuable tables and data will be sent on request.

Turbine Air Line Pump.

For maintaining vacuum on heating systems and returning water of condensation directly into boiler and for withdrawing air only from heating systems. No gears, pulleys, belts, valves or plungers.



TURBINE AIR LINE
PUMP

A. S. CAMERON STEAM PUMP WORKS

Manufacturers of Pumping Machinery

GENERAL OFFICES

11 Broadway

NEW YORK, N. Y.

BRANCHES THE WORLD OVER

(For List see page 45)

Products.

CENTRIFUGAL PUMPS (Turbine and Volute) SINGLE DIRECT ACTING PUMPS.

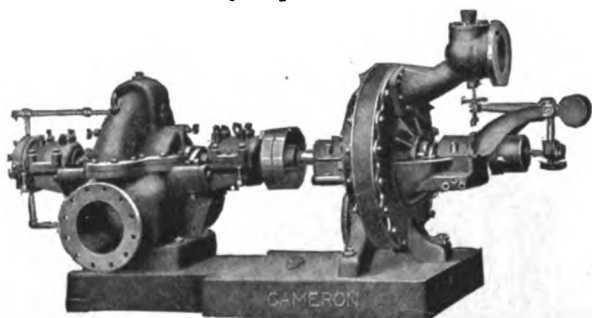
Cameron Pumps.

These pumps have been manufactured and sold for over 60 years and the name Cameron together with its acorn trade-mark is a guarantee that the pump will be both efficient and lasting. The idea of simplicity and rugged strength has been carried out in the manufacture of all Cameron equipment, together with the accompanying principle of the use of very few parts—each having exceptional strength and wearing qualities. Every Cameron pump is designed in accordance with the best engineering practice and from the viewpoint of the actual work which the particular pump is scheduled to perform. All metals used in the manufacture of Cameron pumps are carefully chosen for strength and wearing qualities together with a view to the nature of the fluids to be handled.

Centrifugal Pumps.

Cameron centrifugal pumps are manufactured in the following sizes and styles to meet service conditions:—

Classes "DV" and "FV" are single-stage, horizontal, double suction volute pumps made in sizes of from 2-in.

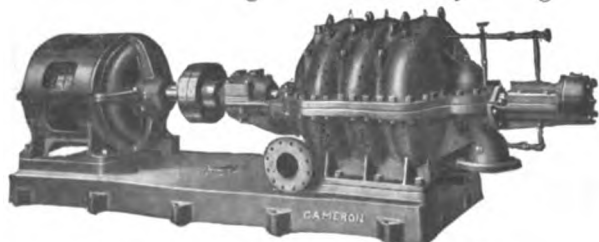


CENTRIFUGAL PUMP, CLASS "DV"

to 42-in. diameter discharge, with capacities from 90 to 20,000 g.p.m. under total heads of from 10 to 230 ft. Bulletin 7350.

Classes "MT" and "ST" are horizontal, single suction, multistage turbine pumps built for general high head service and in from 2 to 5 stages. They are manufactured in seven sizes varying between 2½-in. and 10-in. diameter discharge, with capacities from 125 to 2400 g.p.m. and operate against heads of from 45 to 230 ft. per stage.

Class "BT" single suction, multistage turbine pumps are made in 3 and 4 stages in one size only having a 5-in.



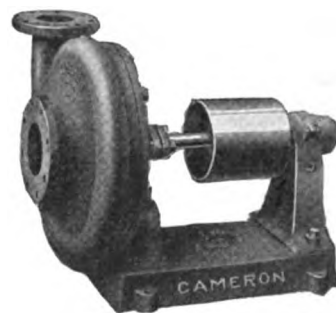
CENTRIFUGAL PUMP, CLASS "MT"

diameter discharge. These pumps have capacities of from 400 to 550 g.p.m. against pressures of from 150 to 250 lbs. per sq. in.

All pumps mentioned above are mounted on a heavy cast iron bedplate of sufficient size and strength to lend rigidity to the entire unit and accommodate the driver if the pump is direct coupled to steam turbine, engine, electric motor, gas engine or other form of direct driver. If the pumps are to be belt driven, two outboard pedestal bearings and a flexible coupling are furnished.

In addition to the double suction volute pumps and the single suction multistage turbine pumps, the company also manufactures a single suction, open impeller pump arranged for belt drive. These pumps are extremely simple, having but 15 integral parts.

Made in sizes from 1-in. to 12-in. diameter discharge and have capacities from 15 to 6200 g.p.m. against heads of from 40 to 70 ft.



SINGLE SUCTION OPEN IMPELLER PUMP

Single Direct Acting Pumps.

Known and universally recognized as having fewer working parts than any in the same class. Rugged construction, absence of outside valve gear, simplicity



SINGLE DIRECT ACTING PUMP

and special features in design and manufacture make them especially desirable for work entailing hard duty and continuous performance under adverse conditions. Many different models in both horizontal and vertical types to suit conditions. Cameron single sinking pumps are suited for shaft sinking, contracting and wherever a vertical pump can be used.

Test.

Before shipment, every Cameron pump is tested under a reproduction of the operating conditions for which it is sold. This test also shows the hydraulic conditions, efficiency, and power at all capacities.

Guarantee.

The pump is well finished throughout, and all material used is the most suitable for its particular duty. The workmanship is of high order and any parts proving defective in design, workmanship or material, will be replaced free of charge, f.o.b. works, within one year from date of shipment, provided the matter is brought to the immediate attention of the company.

CHIPPEWA PUMP CO., INC.

Manufacturers of Deep Well Power Pumps

CHIPPEWA FALLS, WIS.

CHICAGO OFFICE, 201 East Ontario Street—Telephone, Superior 8552

Products.

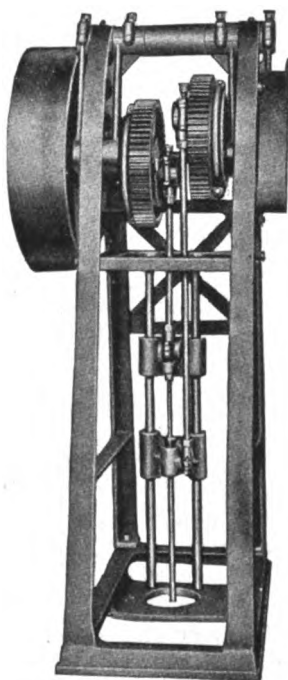
SINGLE CYLINDER, DOUBLE PLUNGER DEEP WELL POWER PUMPS.

Range and Adaptability.

Chippewa pumps are built in 8 sizes, ranging from 3 to 2500 gals. per minute, *with a particular type for every requirement.* Used in the 2 smallest sizes in connection with automatic fresh water systems. In all larger sizes they are used for municipalities, railroads, industrial plants, irrigation projects, refrigeration plants, creameries, cheese factories, etc.

The Steady Stream Principle.

The fact that liquids can be pumped and discharged in a steady stream by the use of Chippewa pumps is a very important factor when considering any pumping proposition. This non-pulsating feature is obtained by the use of our patented eccentric gear motion and the overlapping of the plungers on their upward stroke. After the pump is once started the column of water never comes to a standstill until the pump is shut down. This means a great saving in power, and also eliminates back lashing of the pump rods and racking of the pump parts.



TYPE C-12

Specifications of Pumps.

Frames—Made from close grained gray iron, free from blow- or sand-holes and carefully machined and fitted to standard gages. Frames of exceptionally heavy construction throughout.

Gears—Made from semisteel and in the largest sizes cast steel; teeth are cut from solid blank. In the large size pumps, 2 gears are used to drive each crosshead, giving very even distribution of load and eliminating side thrust.

Pinions—Drive pinions are cut from high carbon steel blanks.

Shafting—Shafts and pins are made from No. 1 cold rolled stock. The drive shaft is of sufficient length to take driving pulleys or gears and carries the drive pinions.

Bearings—Bearings are of very liberal dimensions both as to diameter and length. With the exception of head and drive shafts, which are babbitted, all bearings are equipped with phosphor bronze liners, and provision is made, wherever necessary, for taking up wear.

Crossheads—Made from crucible steel castings, and are of very rigid construction. Crosshead pins and connecting rod end pins are set in taper seats, with large lock nuts for tightening in place. Having almost perpendicular upward stroke there is hardly any wear on crosshead guides.

Crosshead Guides—On larger sizes these are gray iron columns carefully machined and fitted with bronze gibs. In the smaller sizes the crosshead guides are of cold rolled steel shafting.

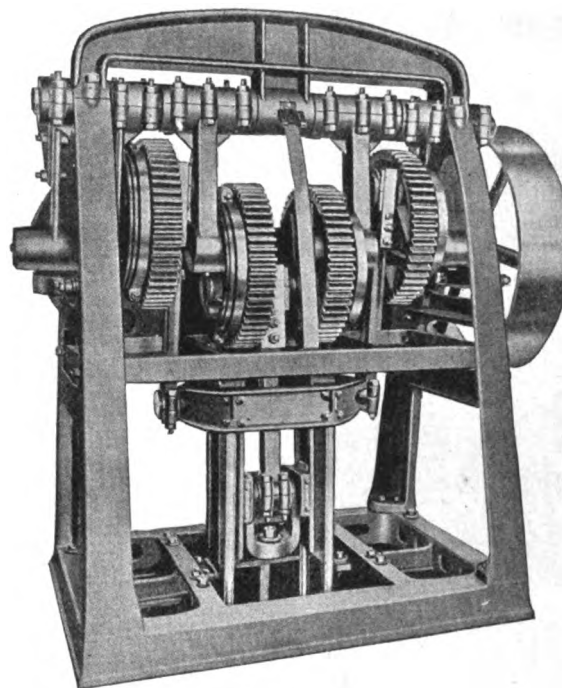
Hangers—Close grained gray iron, accurately machined and fitted with bronze bushings.

Connecting Rods—The connecting rods in the large pumps are crucible steel castings, and cold rolled steel in smaller sizes, fitted with all-bronze bearings or lined with special antifriction metal.

Cylinders—Rolled brass tubing, extra heavy gage.

Plungers—All-brass plungers, with double seat conical valves. Extra large water passages.

The packing head is removable for inspection, and removal of the sucker rods and plungers can be accomplished without disturbing the working head. Extra deep packing glands are provided.



TYPE F-24

Guarantee.

All Chippewa pumps are guaranteed to satisfactorily fulfill the requirements for which they are recommended.

Bulletins.

No attempt is made to fully describe our product on this page, but complete bulletins on any style Chippewa pump will be gladly sent on request.

CROWELL MANUFACTURING COMPANY

Vacuum Pumps, Pressure Blowers and Rotary Air Compressors

319 Franklin Avenue

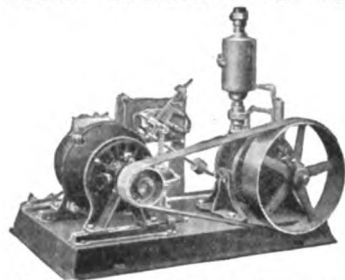
BROOKLYN, N. Y.

Products.

Sole manufacturers, under patents, of VACUUM PUMPS, ROTARY AIR COMPRESSORS and POSITIVE PRESSURE BLOWERS for all kinds of Laboratory Work, Chemical and Steam Heating Plants, Gas or Oil Furnaces, Blowpipes, etc., AIR RECEIVERS.

Rotary Vacuum Pump, Type C.

Designed for steam heating plants and automatically keeps the line clear without attention of any kind. Action and lubrication is the same as the Type D machines. Mounted as one unit with Sprague motor and automatic switch.



ROTARY VACUUM PUMP, TYPE C

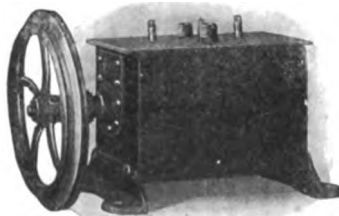
Starting and stopping device is positive. No power used except in operation. Will start on 1 or 2 in. of vacuum and will run up to 10 in. Degree of vacuum is not dependent on high operating speeds.

DATA, TYPE C ROTARY PUMP MOTOR DRIVEN OUTFIT*

No. 1-C, with 1/2 h. p. motor, for	4,000 sq. ft. or less of direct radiation
No. 2-C, with 1/2 h. p. motor, for	10,000 sq. ft. or less of direct radiation
No. 3-C, with 1 h. p. motor, for	20,000 sq. ft. or less of direct radiation
No. 4-C, with 2 h. p. motor, for	45,000 sq. ft. or less of direct radiation
No. 5-C, with 3 h. p. motor, for	55,000 sq. ft. or less of direct radiation
No. 6-C, with 4 h. p. motor, for	75,000 sq. ft. or less of direct radiation
No. 7-C, with 5 h. p. motor, for	110,000 sq. ft. or less of direct radiation

* Prices furnished on receipt of specifications as to voltage and current available and exact description of motor wanted.

SPECIAL NOTE—All types and sizes of pumps are also furnished with motor drive as above, to order only, and according to specifications.



TYPE O-D ROTARY VACUUM PUMP IN OIL IMMERSION BOX
Weight, 50 lbs.



TYPE O-D ROTARY VACUUM PUMP WITHOUT OIL IMMERSION BOX
Weight, 20 lbs.

Rotary Vacuum Pump, Type O-D.

For use in small laboratories and all other experimental work. Designed for intermittent operation and specially adapted for vacuum work. Can exhaust to a vacuum of 29 1/2 to 30 in. mercury column. Fitted in oil immersion box which makes it leak-proof. Furnished without box if desired. Capacity about 2 cu. ft. of free air per minute, requiring 1/4 h.p. to operate.

Rotary Compressor or Vacuum Pump, Type D.

Made in 9 sizes from 4 to 390 cu. ft. free air per minute, and are designed for a working pressure of 25 lbs. or less per sq. in. When used as vacuum pumps, all sizes will, under permissible atmospheric conditions, exhaust to a vacuum of from 29 to 30 in. mercury column. The action is simple, positive and durable. No valves, springs, gears or unbalanced parts.

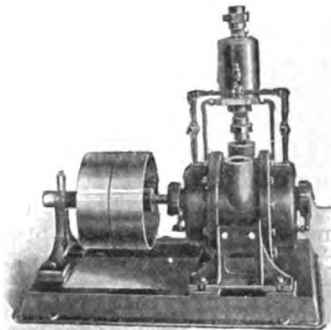
The system of lubrication is positive, and is automatically controlled by the air pressure or vacuum. Feed valves are adjustable for grade of lubricant used.

Rotates in one direction only, either for pressure or vacuum requiring no changes whatever. Heads are provided with water jackets for cooling.

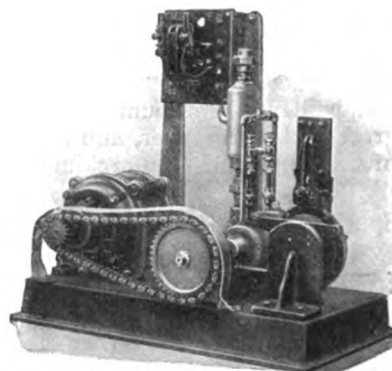
Only ordinary attention is required as to oiling. No special foundations are required.

Electric Control—Motor driven outfits can be fitted with Cutler-Hammer self-starter and diaphragm control, allowing the pump to start and stop automatically at the desired high and low pressure or vacuum point at which the regulator is set.

Sprague (General Electric Co.) motors are regularly furnished on all outfits, but other makes will be furnished, if specified.



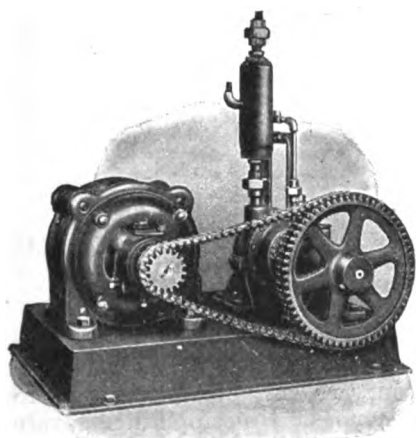
TYPE D COMPRESSOR OR VACUUM PUMP



TYPE D COMPRESSOR WITH CUTLER-HAMMER ELECTRIC SELF-STARTER

DATA, TYPE D ROTARY COMPRESSOR OR VACUUM PUMP

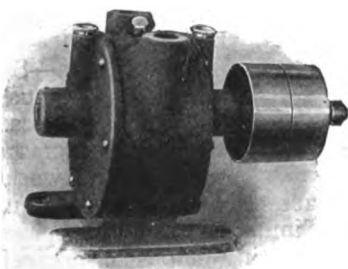
Size	Free air capacity		R.p.m. max. speed	Approx. h.p. at 15 lbs. pressure or 29 in. of vacuum	Pulleys tight and loose, in.	Pipe size, inlet and outlet, in.	Approx. net weight, lbs.	Floor space in.
	Cu. in. per rev.	Cu. ft. per min. at max. speed						
1-D	15	4.3	500	3/4	6x2	1/4	70	13x18
2-D	40	9.2	400	1	8x2	3/4	115	14x22
3-D	100	17	300	2	12x4	1	250	19x34
4-D	280	40.5	250	4	14x4	1 1/2	425	23x38
5-D	400	46	200	5	18x6	2	580	26x44
6-D	600	69.4	200	6 1/2	18x8	2	725	26x55
8-D	1000	115.7	200	9	20x8	2 1/2	1150	30x64
10-D	1650	190.9	200	12	22x10	3	1675	36x70
12-D	3390	390	200	20	24x10	4	2150	38x75

CHAIN DRIVE TYPE D COMPRESSOR
CONNECTED TO MOTOR

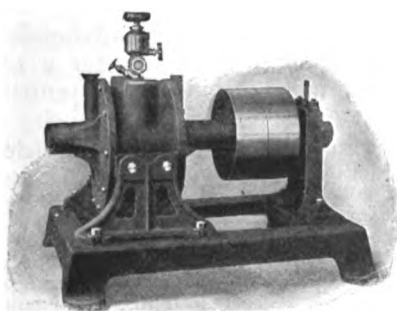
Chain Drive
—All sizes of Type D compressors or pumps can also be furnished set up on a special bed plate and connected by silent chain drive with motor as illustrated. These outfits are made up to order only and in accordance with specifications as to motor, etc., and prices will be quoted accordingly.

Positive Pressure Blowers.

Dominant Features—Crowell positive pressure blowers are adaptable and applied to many purposes. Types A and B, particularly Type A, are used exten-



Type A



Type B

POSITIVE PRESSURE BLOWERS

DATA, POSITIVE PRESSURE BLOWER

GENERAL DETAILS TYPES A AND B							TYPE A		TYPE B	
Size	Free air capacity		R.p.m. max. speed	Approx. h.p. at 3 lbs. pressure	Pulleys, in.	Pipe size, inlet and outlet, in.	Net wt., lbs.	Floor space, in.	Net wt., lbs.	Floor space, in.
	Cu. in. per rev.	Cu. ft. per min. at max. speed								
1	20	6.9	600	$\frac{1}{8}$	4x1	$1\frac{1}{2}$	24	10	42	14x10
2	45	13	500	$\frac{1}{4}$	4x1 $\frac{1}{2}$	$\frac{3}{4}$	34	12 $\frac{1}{2}$	55	16x11
3	125	25.3	350	$\frac{1}{2}$	6x2 $\frac{1}{2}$	1	90	22	145	25x20
4	280	40.5	250	1	9x3	1 $\frac{1}{2}$	170	28	240	30x23
5	460	53.2	200	1 $\frac{1}{2}$	10x3	2	225	34	330	37x25
6	690	79.8	200	2	12x4	2	320	38	570	41x25
8	1050	121.5	200	3 $\frac{1}{2}$	14x6	2 $\frac{1}{2}$	575	48	790	50x27
10	1660	192	200	5	18x6	3	770	54	1050	56x33
12	3390	392.3	200	7	20x6	4	1300	60	1770	62x36

SWEET'S CATALOGUE

sively with gas or oil in connection with furnaces, blow-pipes or burners for melting metals, hardening, tempering, annealing, forging, soldering, brazing, heating, etc. and also for the agitation of liquids or semiliquids, sand blast work, glass blowing, atomizing, vacuum cleaning, vacuum heating, laboratory purposes, etc.

Design—Within the volume capacity ratings, these blowers are adapted to all purposes requiring air under pressure of from 1 to 8 lbs. to the sq. in., or any degree of vacuum not exceeding 24 in.

Construction—The principle of construction is identical in both types. An internal drum and shaft carrying the sliding blades which operate in close contact with cylinder wall.

No springs, gears, valves or unbalanced parts. The action is very simple but positive even at lowest speeds. Pressure is not dependent upon high speeds or centrifugal force.

Operation—The durability, efficiency and general satisfactory operation of the large number of these blowers in use is the strongest testimonial as to correctness of design, material and workmanship.

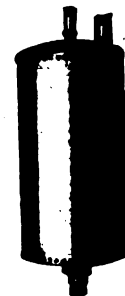
Type A blowers are of the same volume and pressure capacities as the corresponding sizes in Type B.

For hard, steady service under the high pressures, Type B blowers, on account of the additional weight and strength imparted by the base plate and end bearing for shaft, are extremely rigid and therefore usually preferable

Air Receivers.

When required, air receivers can be furnished for the different sizes of Type D blowers when used as air compressors, and the larger sizes can be fitted for connection to any of the smaller size compressors when wanted.

The relief valve can be set to blow off at any desired pressure. These receivers can also be used as vacuum tanks. Pressure and vacuum gauges can be furnished when required, at extra cost.



AIR RECEIVER

DATA, AIR RECEIVERS

Size	Dimensions, in.	Length, including relief valve, in.	Net weight, lbs.	Pipe size, inlet and outlet, in.
1	20x10	24	25	1/2
2	20x10	24	25	3/4
3	24x12	29	35	1
4	24x12	29	35	1 1/2
5	32x14	39	55	2
6	32x14	39	55	2
8	42x14	49	65	2 1/2
10	48x16	56	85	3
12	48x18	56	110	4

Crowell Quality.

Crowell products have won a countrywide reputation for simplicity, durability and dependability. They have had the test of years of service in a wide variety of work in which they have developed to the utmost all the quality for which they were built.

Crowell Service.

An engineering staff is maintained for consulting prospective customers on pump, blower and compressor problems. It may be depended on to make suitable recommendations in every case where it is permitted to make a thorough investigation of requirements.

COPPUS ENGINEERING & EQUIPMENT CO.

Manufacturers of Turbo Boiler Feed Pumps

340-350 Park Avenue
WORCESTER, MASS.

BRANCH OFFICES AND AGENCIES

CHICAGO, ILL.
CLEVELAND, OHIO
DENVER, COLO.

MINNEAPOLIS, MINN.
MONTGOMERY, ALA.
MONTREAL, CANADA
HAZELTON, PA.

NEW YORK, N. Y.
PHILADELPHIA, PA.
PITTSBURGH, PA.
NEW ORLEANS, LA.

SAN FRANCISCO, CAL.
WINNIPEG, MAN.
VANCOUVER, B. C.
SALT LAKE CITY, UTAH

Products.

CENTRIFUGAL TURBO BOILER FEED PUMPS.
STEAM TURBINES.

For Turbo Undergrate Blowers, see page 489.



TRADE-MARK

tem requires filling only a few times each year, compared with the daily oiling necessary for reciprocating pumps. No complicated governing devices and no sliding valves. Needs very little attention.

Coppus Centrifugal Turbo Boiler Feed Pump, Type CCC.

This pump is a complete unit in itself, having one shaft common to pump and steam turbine.

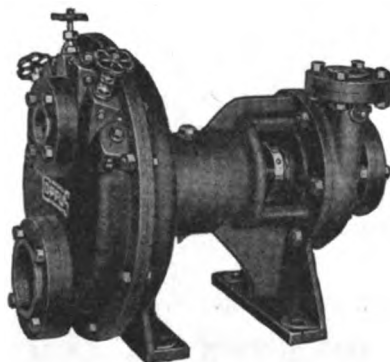
On the turbine end, mechanical packing of the labyrinth type is employed, which is steamtight for ordinary back pressures, can not and does not need to be adjusted and is not subject to wear. On the pump end is the only stuffing box of the unit, with high grade plastic metallic packing.

One oil reservoir serves both bearings and on account of the very ingenious oiling system, the oil level for the ball bearings is maintained regardless of the amount of oil in the oil chamber.

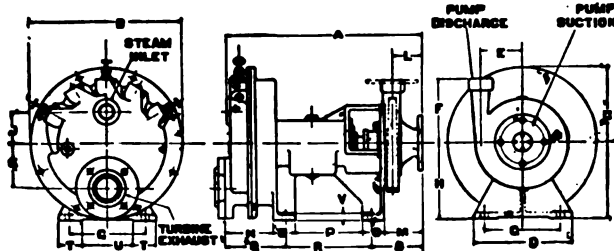
Excess pressure pump governor and safety stop valve are furnished with every pump, making possible positive and instant control of feed water and protection should water supply give out.

Advantages—

SIMPLICITY OF CONSTRUCTION AND LOW UPKEEP—Very few working parts. No valves to be reground or to cause back leakage. Only one stuffing box, easily re-packed. Oiling sys-



COPPUS CENTRIFUGAL TURBO BOILER FEED PUMP, TYPE CCC



DIMENSION DIAGRAM, COPPUS CENTRIFUGAL TURBO BOILER FEED PUMP, TYPE CCC

SIZES, CAPACITIES, DIMENSIONS, ETC., OF TYPE CCC TURBO BOILER FEED PUMPS

All dimensions are in inches																													
Size	Capacity, b.h.p.	Max. discharge pressure, lbs.	Steam consumption, lbs., per h.p.h.	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	Discharge	Suction	Exhaust	Inlet	Size foundation bolts
1	50-250	135	75-80	19 1/4	13 1/2	14 1/2	9 3/8	5 1/2	7	7 1/4	3	4 1/2	2 1/2	3 1/2	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	1 1/2 (p. tap)	1 1/2 (p. tap)	2	1 1/2 (p. tap)	1/2
1 1/2	250-500	150	65-70	22	16 1/2	16 1/2	11 1/4	6	8 1/2	8 1/2	2 1/2	3 1/2	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	14 1/2	1 1/2 (p. tap)	1 1/2 (p. tap)	3	1 1/2 (p. tap)	1/2	
2	500-1000	165	60-65	22	16 1/2	16 1/2	11 1/4	6	8 1/2	8 1/2	2 1/2	3 1/2	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	14 1/2	1 1/2 (p. tap)	1 1/2 (p. tap)	3	1 1/2 (p. tap)	1/2	
3	1000-1600	180	55-60	24 1/2	20 1/4	20 1/4	13 1/2	7	10	10 1/2	4 1/2	6 1/2	3 1/2	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	1 1/2 (p. tap)	1 1/2 (p. tap)	3	1 1/2 (p. tap)	1	
3	1600-3500	180	52-55	25	24 1/2	25 1/2	16 1/4	8	13	12 1/2	5 1/2	7 1/2	3 1/2	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	1 1/2 (p. tap)	1 1/2 (p. tap)	4	2 1/2	1	

*All flange pump and turbine connections are furnished with companion flanges.

DAYTON-DOWD COMPANY

Manufacturers of Centrifugal Pumps

345 York Street
QUINCY, ILL.

Products.

DAYTON-DOWD TYPE "CS" SPLIT CASE SINGLE-STAGE and MULTISTAGE CENTRIFUGAL PUMPS, both horizontal and vertical styles, belted and direct connected; TYPE "SS" SINGLE-STAGE PUMPS, horizontal and vertical styles, belt driven and direct connected; UNDERWRITERS' FIRE PUMPS.

Also Automatic Sump or Ejector Pumps, and Contractors' Portable Gasoline Engine Driven Pumping Outfits, direct connected and belt driven, mounted on truck or skids.

Uses.

Dayton-Dowd centrifugal pumps are adapted to every class of service where centrifugal pumps can be used: city water works, filtration plants, boiler feed, sewage pumping, irrigation, reclamation, sluicing, fire service, contractors' service, mine drainage, dry dock and marine pumping, brine circulation, hot water circulation; pumping oil, acids, chemicals, and numerous other applications.

Every pump is especially designed and built to meet the particular requirements of each installation. All pumps thoroughly tested, and must meet the exact conditions of service before leaving the works.

Dayton-Dowd Type "CS" Single-stage Double Suction, Centrifugal Pumps.

Built in sizes from 1¼-in. discharge to 36-in. discharge.

Casing split horizontally, which permits access to working parts by merely lifting top half of the casing, making it unnecessary to disturb pipe connections or alignment of the pump. Impellers are of "non-overloading" design, which effectually protects the motive power from being overloaded in case head is varied from normal.

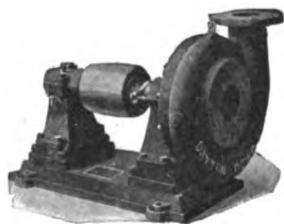


DAYTON-DOWD 10-IN. TYPE "CS" SINGLE-STAGE TURBINE DRIVEN PUMP

Dayton-Dowd Type "SS" Single-stage Pumps.

Adapted to any general pumping service where the head does not exceed 130 ft., as contractors' service, irrigation, drainage, sewage pumping, etc.

Furnished belt driven, and arranged for direct connection to motor or gas engine. Built in both horizontal and vertical styles.

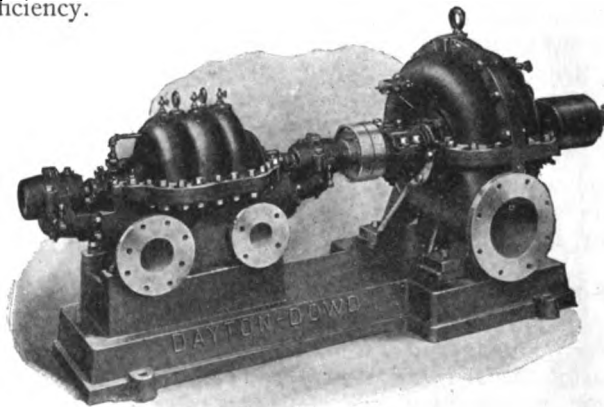


DAYTON-DOWD TYPE "SS" SINGLE-STAGE PUMP

Dayton-Dowd Type "CSU" Multistage Pumps.

For high pressure service, such as boiler feed, fire pressure systems, mine pumping, and in fact any pumping conditions where a high head is encountered. Furnished in the multistage construction, with pulley for belt drive, or with extended base and flexible coupling for direct connection to motor, turbine, etc.

Full advantage is taken of the old turbine principle in a new way to increase efficiency and obtain diffusion vane effect without intricate construction. Axial thrust entirely eliminated by means of an automatic balancing device of the disk type, which effectually keeps the rotating elements in their proper place of rotation. Simple and rugged, reliable in operation, up to the minute in design and construction, and developing the highest efficiency.

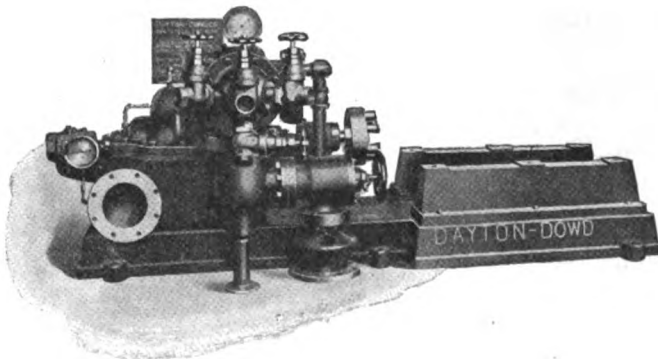


TYPE "CSU" 3-IN. 3-STAGE AUTOMATICALLY BALANCED TURBINE DRIVEN BOILER FEEDER

Dayton-Dowd Underwriters' Approved Fire Pumps.

Dayton-Dowd fire pumps are built in 500-gal., 750-gal., 1000-gal. and 1500-gal. sizes in the multistage construction to work against any desired pressure.

Dayton-Dowd fire pumps are built to conform to the underwriters' specifications, and are approved by both the National Board of Fire Underwriters and the Associated Factory Mutual Fire Insurance Association.



DAYTON-DOWD 1000-GAL. UNDERWRITERS' CENTRIFUGAL FIRE PUMP

THE DEMING COMPANY

Manufacturers of Hand and Power Pumps for All Uses

SALEM, OHIO

GENERAL AGENCIES FOR DEMING POWER PUMPS

ATLANTA, THE DUNN MACHINERY Co., 522 South Pryor Street
 BIRMINGHAM, MOORE-HANDLEY HARDWARE Co.
 BOSTON, CHARLES J. JAGER Co., 13-15 Custom House Street
 BUFFALO, ROOT, NEAL & Co., 178-80 Main Street
 CHARLESTON, W. VA., CHARLESTON ELECTRICAL SUPPLY Co.
 CHICAGO, HENION & HUBBELL, 223-31 North Jefferson Street
 DENVER, HENDRIE & BOLTHOFF MFG. & SUPPLY Co.
 DETROIT, KERR MACHINERY CORPORATION, Kerr Building
 SAN FRANCISCO, PORTLAND CRANE COMPANY

KANSAS CITY, ENGLISH TOOL & SUPPLY Co.
 LOS ANGELES, R. W. SPARLING, 945 North Main Street
 NEW ORLEANS, GIBBENS-FINNEY-GORDON Co.
 NEW YORK, RALPH B. CARTER Co., 152 Chambers Street
 PHILADELPHIA, W. P. DALLETT Co., 922-24 Sansom Street
 PITTSBURGH, HARRIS PUMP & SUPPLY Co., 320-22 Second Avenue
 RICHMOND, SYDNOR PUMP & WELL Co.

CANADA: MONTREAL, TORONTO, WINNIPEG, DARLING BROS., LTD.

Products.

DEMING PUMPING MACHINERY for operation by any power: TRIPLEX POWER PUMPS; DEEP WELL POWER WORKING HEADS; ARTESIAN WELL CYLINDERS; SELF-OILING PISTON PUMPS; DIAPHRAGM PUMPS.

Also manufacturers of Deming Hydro-pneumatic Water Systems, operated by hand or windmill, gasoline engine, or electric motor; Rotary Pumps; Hydraulic Pressure Test Pumps; Deep Well Power Pumps; Trench Pumps; Air, Ammonia, Creamery, Bilge, Sewage and Sump Pumps; Pumping Outfits, stationary and portable.

Agencies for Deming Pumps.

Many agencies, not mentioned above, carry in stock Deming hand and windmill pumps and cylinders, spray pumps, hydraulic rams, etc. The above agencies, however, specialize on Deming power pumps.

Co-operative Engineering Service.

Manufacturers, engineers, and others are invited to refer pumping and water system problems to the engineering department of this company. On receipt of layout of conditions and statement of requirements, an estimate for the pumping equipment will be submitted. Blue prints, also photographs showing typical installations on request.

Information Required for Estimate Basis.

(1) For what purpose pump is to be used; (2) maximum quantity to be pumped per minute, hour or day of 24 hours; (3) to what height liquid is to be lifted by suction, and diameter and length of suction pipe; (4) height or pressure against which liquid is to be discharged; (5) diameter and length of discharge pipe; (6) whether liquid to be pumped is hot or cold, salt or fresh, acid or clear, thick or gritty; (7) power available for driving pump; (8) if electric motor, state whether current is direct or alternating; if direct, give voltage; if alternating, state voltage, cycle and phase; (9) advise if pump is to be driven by belt from motor, or to have same direct connected by gearing or otherwise.

Catalogues and Bulletins.

General Catalogue No. 26; 256 pages. Lists the complete Deming line, with exception of triplex power pumps, of which only a few types are shown.

Bulletin No. 300, 40 pages, triplex power pumps.

Bulletin No. 310, 24 pages, horizontal piston power pumps.

Bulletin No. 320, 32 pages, power deep well working heads, cylinders, etc.

Water System Catalogue "D," 40 pages, complete hydro-pneumatic systems of water supply.

Triplex Power Pump, Fig. 50.

Standard design, single acting; designed for suction lift of 25 ft. or less.

Frame—Of large sizes, made in one casting with guides and crank shaft bearings lined with antifriction metal. In sizes 4 by 4 in. and smaller, frame and cylinder cast in one piece.

Crank Shaft—Of best open hearth steel casting in one piece.

Gearing—Machine cut, and is double in sizes 9 by 10 in. and larger. Gear ratios 5 to 1.

Pinion Shaft—Of steel, running in antifriction metal, and bolted to main housings.

Connecting Rods—In sizes 4 by 6 in. and larger, have bronze boxes with wedge and screw adjustment at crosshead end, and marine type babbitted boxes at crank end. Smaller sizes have bronze bushings at crosshead ends.

Crossheads—Run in bored guides. Sizes 4 by 6 in. and larger have bronze adjustable shoes.

Plungers—Of best cast iron, finished true and smooth; packing of ample depth.

Cylinders and Base—In one casting in sizes 10 by 10 in. and smaller; in larger sizes, the cylinders are in separate castings.

Valve Chambers—In sizes 3½ by 4 in. and larger, separate castings bolted to cylinders.

Valves—Of large area and readily accessible—for cold water are rubber disks, protected on top from cylindrically wound springs by brass plates; for hot water are either special hard composition or bronze valves.

Valve Seats—Bronze, of grid type, screwed into decks. Iron seats and valves furnished, if required.

Grease Cups—Furnished with all pumps.

Pumps furnished with bronze plungers, and varying otherwise from standard construction, at extra price.

Many other power pumps, also different types of drives are shown in the power pump bulletins.

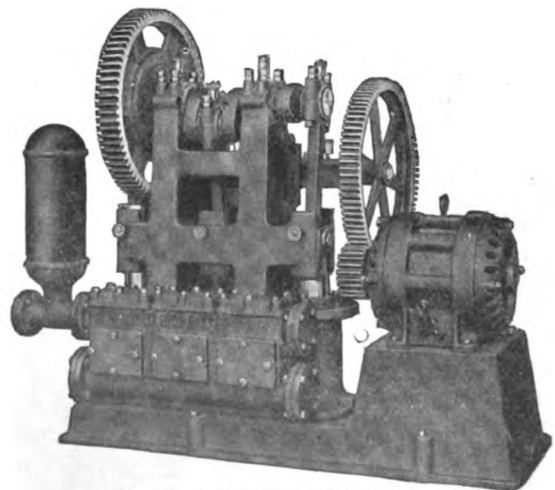


FIG. 50. TRIPLEX POWER PUMP
 Size 5½ x 8 with Type "B" drive

SIZES AND CAPACITIES, FIG. 50 TRIPLEX POWER PUMP

Plungers		Capacity		Max. working pressure, lbs.	Diam. pipes		*Tight and loose pulleys, in.	Cipher
Diam., in.	Stroke, in.	Usual r. p. m.	Gals. per min.		Suction, in.	Discharge, in.		
2	2	70	5.67	150	1½	1	8x 2	Obese
2½	2	70	8.89	150	1½	1	10x 2	Obelize
2½	3	60	11.4	150	2	1½	12x 3	Oaken
3	3	60	16.2	150	2	1½	14x 3	Oath
3½	3	60	22.	150	2	1½	16x 3	Oakling
3½	4	60	30.	150	2½	2	16x 4	Obelus
4	4	60	39.	150	2½	2	18x 4	Oakum
4	6	60	59.	160	2½	2	20x 5	Oarsman
4½	6	60	74.	150	3	2½	20x 5	Oaky
5	6	60	91.	150	3	2½	24x 5	Oasis
5½	8	60	147.	150	4	3	28x 6	Oatmeal
6	8	55	161.	140	4	3	30x 6	Obdurate
7	8	55	220.	150	5	4	30x 8	Obdurate
8	8	55	287.	150	5	4	36x 8	Obiter
8½	8	55	324.	140	6	5	36x 8	Obdure
9	10	50	413.	160	8	6	42x10	Obloquy
10	10	45	459.	150	8	6	42x12	Obsignate
11	12	42	622.	160	10	8	48x14	Obduct
12	12	42	740.	150	10	8	48x16	Obduction
12	14	40	820.	150	12	10	48x18	Observance
13	14	40	964.	140	12	10	48x20	Observant

*Note—Sizes 9 by 10 and larger regularly furnished with tight pulley only

Self-oiling Piston Pump, Fig. 896.

This pump is especially well adapted for supplying water on road construction projects, as the working parts are entirely enclosed, preventing interferences by irresponsible or maliciously inclined "tinkerers," and providing absolute safety for the pump tender.

All valves are quickly accessible from the top by removing only two nuts. All bearings and working parts are self-oiling. From the reservoir in the base the oil is carried by the main gear and distributed to bearings and working parts, then returned to the reservoir by a system of channels.

Fig. 896 is made in two sizes, 5 by 5 in. and 6 by 6 in., with capacities of 3000 and 4800 gals. per hour respectively. May be operated by gasoline engine or electric motor.

Several other types of piston pumps are made with capacities from 450 to 18,000 gals. per hour. Fig. 896 is, however, especially recommended for road work and general water supply, where the vertical discharge elevation is not more than 150 ft.

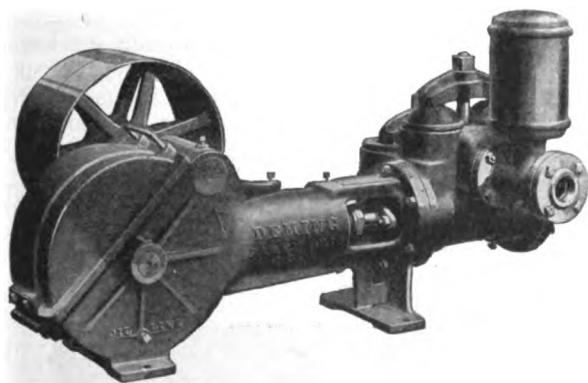


FIG. 896. SELF-OILING PISTON PUMP WITH PULLEYS

Diam., in.	Piston stroke, in.	Usual r. p. m.	Cap. per min. at maximum speed	Max. working pressure, lbs.	Diam. of pipes		Tight and loose pulleys, in.
					Suction, in.	Discharge, in.	
5	5	45 to 55	49.98	75	2½	2	16 x 4
6	6	40 to 50	79.64	75	3	2½	20 x 5

Diaphragm Pump, Fig. 1473.

Fig. 1473 power diaphragm pump, for handling large quantities of muddy and gritty water quickly and economically. The diaphragm is 12½-in. diameter, of best quality rubber, and valves are of metal, rubber faced, both being easily renewable. Waterways are

large and practically non-chokable. Furnished with 1½ h.p. engine. Gears of jack are machine cut from solid blanks to reduce friction and noise. Pump may also be had without engine and jack, for hand operation.

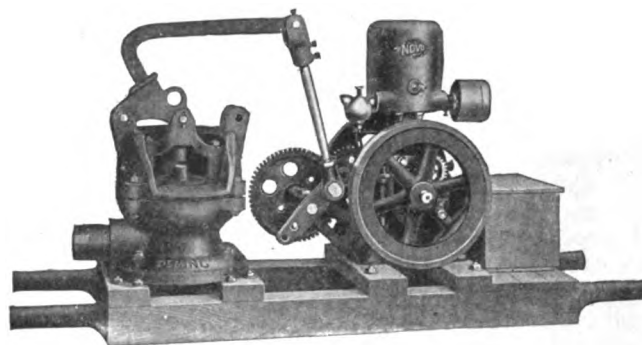


FIG. 1473. DIAPHRAGM PUMP

Outfit No.	Pump diaphragm, in.	Suction, in.	Cap. per hour, gals.	H. p. engine	Approx. weight, lbs.	Price	Extras *
2	12½	3	3500	1½	585	\$175.00	\$30.00

*Extra for 15-ft. of suction hose, including coupling and galvanized strainer

Deep Well Power Working Head, Fig. 80.

This pump, with differential plunger, is designed for operation of deep well cylinders, and contains many desirable features which extensive experience in this line of pumping machinery indicates as the best.

Bearings—Lined with best antifriction metal, the pinion shaft bearings being bolted to main housings.

Gearing—Machine cut, the main gear being bolted to a large flange integral with the crank shaft.

Connecting Rod—Of steel with marine type box at crank end, and bronze bushing at cross-head end.

Crosshead—Has bronze shoe adjustable for wear, and runs in polished guides.

Differential Plunger—Equalizes flow of water, with consequent greater economy and ease of operation.

Air Chamber—Supplied; also grease cups.

Discharge—Can be connected at either front or back of pump.

When electric motor or steam engine is to be direct connected, we can furnish these working heads with different types of drive, for which see the power pump bulletins.

FIG. 324. BRASS ARTESIAN WELL CYLINDER

SIZES AND CAPACITIES, FIG. 80

Stroke, in.	Max. diam. of pipes		Gear ratio	Tight and loose pulley, in.	Hght, in.	Cipher
	Suction, in.	Discharge, in.				
16	9	4	6 to 1	28 x 6	76	Orient
24	9	4	5¼ to 1	36 x 6	98½	Oriental

MAXIMUM SPEED AND CAPACITY PER MINUTE WITH FIG. 324 SINGLE ACTING CYLINDER

Diam. cylinder, in.	16-in stroke		24-in stroke		†Max. depth of well, ft.
	Revs.	Gals.	Revs.	Gals.	
4¼	35	34	28	41	540
4¾	35	42	28	51	450
5¼	35	52	28	63	360
5¾	35	62	28	75	300
6¼	35	74	28	89	250
6¾	35	86	28	104	210
7¼	35	114	28	137	150
8¾	35	137	28	164	130

†From lowest surface of water in well to highest point of delivery

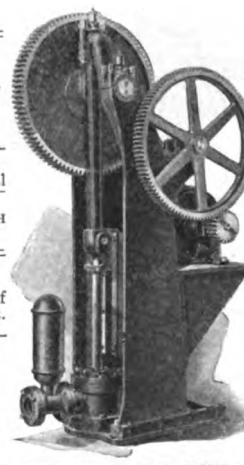


FIG. 80. DEEP WELL POWER WORKING HEAD

ERIE PUMP & ENGINE WORKS

Pumps and Steam Engines

CABLE ADDRESS:
"VIMECONS, NEW YORK"

142 Glenwood Avenue
MEDINA, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES
EXPORT OFFICE, 309 Broadway, NEW YORK, N. Y.

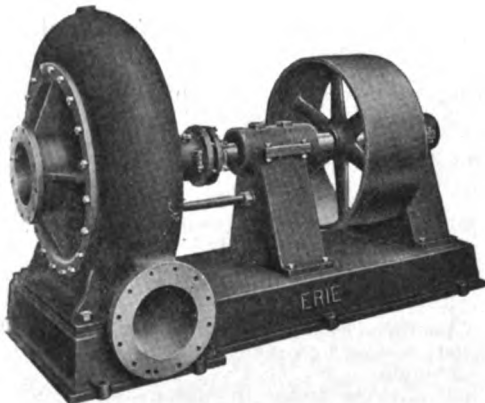
Products.

DREDGING PUMPS; SINGLE STAGE and MULTISTAGE CENTRIFUGAL PUMPS; SINGLE and DUPLEX VERTICAL AUTOMATIC SUMP PUMPS; MARINE CIRCULATING PUMPS.

Also Special Centrifugal Pumping Outfits for paper mills, sugar mills, chemical works, sewage, mine, irrigation and drainage services; Dredge Pump Accessories; Steam Engines.

Class "D" Dredge Pumps.

Built for hardest service in handling sand and gravel, river coal, paper stock, industrial and chemical plant sludges, etc. Special types for hydraulic fills and reclamation work. Low duty pumps furnished in cast iron and semisteel. High duty pumps furnished in extra heavy semisteel, and manganese steel construction, with water cooled, forced oil feed, marine thrust bearings. Special designs and layouts to give minimum handling costs. Portable outfits for roadbuilding purposes. Built for all standard forms of drive and prime movers.



CLASS "D" BELT DRIVEN DREDGE PUMP

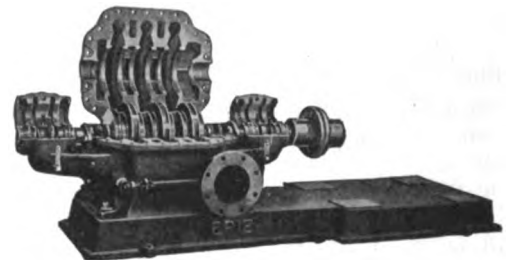
Number, size of suction and discharge (in.) and class letter	Cu. yds. of solids per hour			Brake h.p. recommended for each 10 ft. of total head	Will pass solids, the largest dimension of which is, in.	Diam. and face of pulley, in.	Approx. floor space, in.	Approx. shipping weights, low duty pumps, lbs.
	10%	15%	20%					
4 HHD	15	22	30	4	2 1/2	10 x 10	42 x 18	850
5 D	20	30	40	6	2 1/2	12 x 12	48 x 25	1250
6 D	30	45	60	8	4	18 x 12	54 x 30	1650
8 HHD	62	93	125	15	6	20 x 12	66 x 44	2900
10 D	100	150	200	25	8	30 x 14	75 x 46	5000
12 D	150	225	300	30	10	40 x 16	95 x 50	7500
15 LD	225	337	450	50	10	44 x 24	108 x 60	15000
18 LD	300	450	600	70	10	50 x 30	160 x 96	18000

Type "MS" Horizontally Split Shell Multistage Pumps.

Particularly adapted as boiler feed, elevator, and fire pumps. Also as supply pumps for hydraulic giants, municipal and industrial water supply, etc. For high pressures up to 400 lbs. per sq. in. and for lower pressures where the speed must be low. Built for all standard forms of drive and prime movers.

All sizes have horizontally split shells and have automatic balance construction eliminating end thrust

problems. Each stage has perfectly formed volute securing highest efficiency without the use of complicated diffusion vanes. Type "MS," Form "B" pumps have special balancing arrangement for handling mine water. Pumps supplied in all bronze construction when necessary. Fire pumps furnished with complete underwriter's fittings if required.

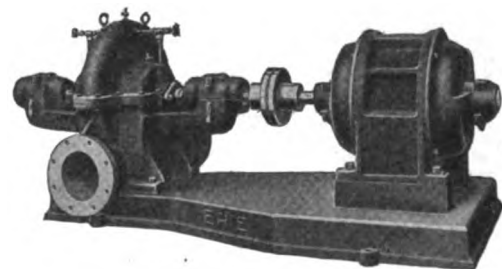


TYPE "MS" MOTOR DRIVEN PUMP

Size of pipe, in.	Dis. charge	Suction	Range of capacity, g.p.m.	Max. number of stages	Max. head per stage, in.	Max. head per stage, ft.	Efficiency in per cent (Use for preliminary estimates of horsepower required)	Floor space 5-stage pump, in.	Shipping weight 2-stage pump, lbs.	Shipping weight 5-stage pump, lbs.
					1750 r.p.m.	1160 r.p.m.				
1 1/2	2	2	50-100	7	75	35	45	60 x 20	1100	1700
2	3	3	100-200	6	90	40	50	70 x 22	1500	2100
3	4	4	200-375	6	105	45	55	80 x 26	1900	2800
4	5	5	375-600	6	120	50	60	110 x 32	2500	3400
5	6	6	600-900	6	150	70	63	115 x 34	3300	4400
6	8	8	900-1500	6	150	85	65	120 x 38	4000	5400
8	10	10	1500-2400	5	150	100	68	140 x 45	5000	6800

Type "S" Horizontally Split Shell Double Suction Pumps.

Suitable for any clear water pumping service with total head not exceeding 200 ft. This type gives the highest efficiency for municipal and industrial water supply, heating system, booster, circulating, white water,



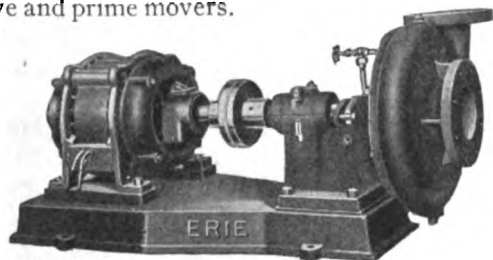
TYPE "S" MOTOR DRIVEN PUMP

Size of pipe, in.	Dis. charge	Suction	Range of capacity, g.p.m.	Max. head at 1750 r.p.m.	Max. head at 1160 r.p.m.	Efficiency in per cent (Use for preliminary estimates of horsepower required.)	Floor space, in.	Shipping weight, lbs.
1 1/2	2	2	50-100	60	25	45	50 x 20	400
2	3	3	100-200	105	45	50	50 x 20	600
3	4	4	200-350	125	55	55	60 x 24	900
4	5	5	350-550	145	60	63	70 x 30	1100
5	6	6	550-850	150	65	66	80 x 34	1400
6	8	8	850-1300	165	75	69	90 x 36	1650
8	10	10	1300-2300	200	90	70	100 x 38	2200
10	12	12	2300-3800	200	95	71	110 x 40	3200
12	14	14	3800-5500	200	115	72	125 x 48	4500
14	16	16	5500-7000	200	135	73	145 x 52	6300
16	18	18	7000-9500	200	170	74	150 x 56	8800

irrigation, mine and drainage pumps. Built for all standard forms of drive and prime movers. Supplied in all bronze construction if required.

Type "E" Single Suction Pumps.

Adapted for any clear water pumping service with total head not exceeding 150 ft. The single suction construction makes this pump especially suited for high suction lifts such as hot well and condensate service. Also adapted for use as house pumps, booster pumps, vinegar and fruit juice pumps, etc. Construction allows volute to be swung into any one of seven discharge positions to meet special piping layouts. Supplied in all bronze construction if required. Built for all standard forms of drive and prime movers.

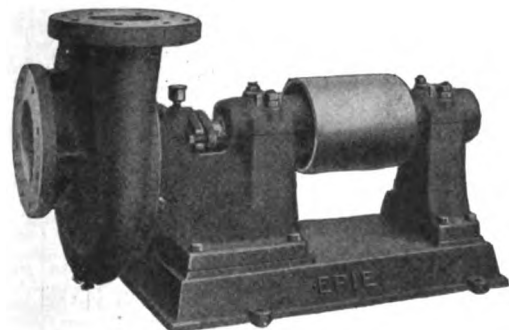


TYPE "E" MOTOR DRIVEN PUMP

Size of pipe, in.		Range of capacity, g.p.m.	Max. head at 1750 r.p.m.	Max. head at 1160 r.p.m.	Efficiency in per cent (Use for preliminary estimates of horsepower required)	Floor space, in.	Shipping weight, lbs.
Dis-charge	Suction						
1	1 1/4	5-40	48	20	25	32 x 18	130
1 1/4	1 1/2	40-75	85	35	30	36 x 22	325
1 1/2	2	75-120	105	45	35	38 x 22	375
2	3	120-175	110	50	40	40 x 24	400
3	4	175-250	145	60	48	46 x 29	525
4	5	250-450	150	65	57	50 x 35	650
5	6	450-800	150	80	59	56 x 38	950
6	8	800-1300	150	85	64	66 x 39	1100

Type "O" Single Suction, Open Type Impeller Pumps.

Designed for handling liquids containing solid and stringy materials or small amounts of grit, such as sewage, tannery sludge, paper stock, etc. Simplicity of construction makes this type especially suited to the requirements of contractors. Construction allows volute to be swung into any one of seven discharge positions to meet special piping layouts. Supplied in all bronze and other special constructions for handling acids and



TYPE "O" BELT DRIVEN PUMP

Size of pipe, in.		Range of capacity, g.p.m.	Max. head at 1750 r.p.m.	Max. head at 1160 r.p.m.	Efficiency in per cent (Use for preliminary estimates of horsepower required)	Floor space, in.	Shipping weight, lbs.
Dis-charge	Suction						
3/4	1	5-20	20	8	15	30 x 15	60
1	1 1/4	20-40	45	18	15	32 x 18	130
1 1/4	1 1/2	40-75	80	33	20	36 x 22	325
1 1/2	2	75-120	100	43	25	38 x 22	375
2	3	120-175	100	48	30	40 x 24	400
3	4	175-250	100	58	38	46 x 29	525
4	5	250-450	100	63	47	50 x 35	650
5	6	450-800	100	78	49	56 x 38	950
6	8	800-1200	100	83	54	66 x 39	1100

chemicals, crushed fruits, paints, molasses, oils, etc. Built for all standard forms of drive and prime movers.

Types "OV" and "EV" Vertical Pumps.

Most reliable and efficient types for use in public buildings, municipal and industrial plants. Type "OV" with open impeller is suitable for removing sewage and seepage water and draining cellars automatically. Type "EV" with enclosed impeller is adapted for automatically returning condensation from heating system to boiler. Each type has separate supporting and discharge piping, suction strainer, cover plate, pipe guide for float, individual force feed lubrication, ball thrust bearing, flexible coupling, and can be supplied complete with vertical motor, automatic controller, float switch and float. Constructed for slow or moderate speeds as required. Furnished in single or duplex types. Duplex pumps are built to allow the removal of either unit without disturbing the other. All sizes can be furnished with cast iron receiver tanks at an additional cost.



TYPE "OV" VERTICAL PUMP

DATA, TYPES "OV" AND "EV" VERTICAL PUMPS

Size of pipe, in.		Range of capacity, g.p.m. single pumps	Max. head, ft.	Speed, r.p.m.	Motor h.p.	Min. sump diam. single pumps, in.	Min. sump diam. duplex pumps, in.	Shipping weight single pumps, lbs.	Shipping weight duplex pumps, lbs.
Dis-charge	Suction								
3/4	1	5-15	20	1150-1750	1/2-3/4	24	36	500	900
1	1 1/4	15-30	25	1150-1750	3/4-1	24	36	600	1000
1 1/4	1 1/2	30-45	30	850-1150	3/4-1 1/2	36	48	1000	1800
1 1/2	2	45-60	30	850-1150	1-2	36	48	1100	2100
2	3	60-100	30	850-1150	1 1/2-2 1/2	36	48	1500	2800
3	4	100-150	30	850-1150	2-3	36	48	2000	3800
4	5	150-250	30	850-1150	2 1/2-5	36	48	2300	4500

Class "L" Marine Circulating Pumps.

Constructed in single and double suction types. Double suction pumps can be furnished with either vertically or horizontally split shells to meet particular conditions. Bronze fitted for fresh water service. Bronze or monel metal fitted for salt water. Direct connected to slow speed open frame or moderate speed A-frame vertical steam engines as required. This type of pump in iron fitted construction is well adapted for construction work, draining cofferdams, etc.



CLASS "L" SINGLE AND DOUBLE SUCTION ENGINE DRIVEN PUMPS

Size of pipe, in.		Range of capacity, g.p.m.	Max. head with open frame engine, ft.	Bore and stroke of open frame engine	Max. head with A-frame engine, ft.	Bore and stroke of A-frame engine	Floor space, in.	Shipping weight, lbs.
Dis-charge	Suction							
1 1/2	2 1/2	60-125	8	4 x 5	13	3 1/2 x 4	24 x 40	800
2	4	100-220	10	4 x 5	20	4 1/4 x 5	31 x 48	900
3	5	220-500	13	4 x 5	20	5 x 7	31 x 50	1000
4	6	410-900	15	5 x 5	20	5 x 7	35 x 51	1300
5	6	660-1400	15	6 x 6	25	6 x 7	38 x 62	1500
6	8	900-2000	15	7 x 7	35	8 x 8	38 x 66	2000
8	10	1640-3500	15	8 x 8	35	9 x 10	50 x 75	4500
10	12	2640-5000	15	10 x 10	30	11 x 10	56 x 80	5000
12	14	3720-7000	15	12 x 12	30	12 x 12	60 x 90	6500

ECONOMY PUMPING MACHINERY CO.

120-122 North Curtis Street
CHICAGO, ILL.

Products.

Manufacturers of SEWAGE EJECTORS, BILGE PUMPS, ELECTRIC CELLAR DRAINERS, CONDENSATION PUMPS and RECEIVERS, RETURN LINE and AIR LINE VACUUM PUMPS.

Also, Automatic Water Systems, electrically operated.

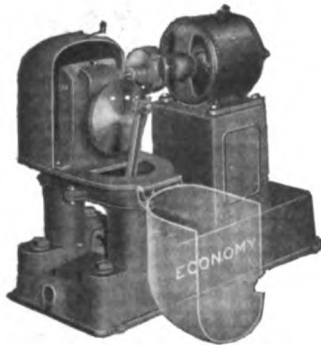


FIG. 2150. AIR LINE VACUUM PUMP

DATA, FIG. 2150

Unit No.	Max. cap., sq. ft.	Suction, ins.
1	4000	$\frac{3}{4}$
2	7500	$\frac{1}{2}$
3	12000	$1\frac{1}{4}$
4	17000	2
5	25000	$2\frac{1}{2}$

DATA, FIG. 2150 (CONTINUED)

Unit No.	Discharge, ins.	H. p.
1	$\frac{3}{4}$	$\frac{1}{4}$
2	$1\frac{1}{4}$	$\frac{1}{2}$
3	$1\frac{1}{4}$	1
4	$2\frac{1}{2}$	$1\frac{1}{2}$

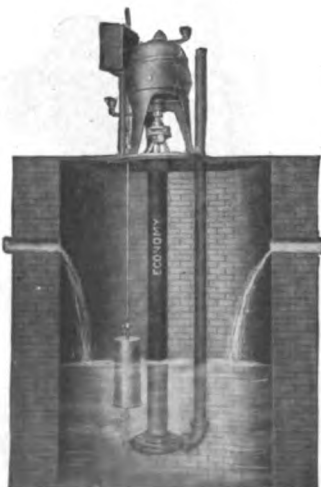


FIG. 2104. TYPES B AND C ECONOMY SUBMERGED BILGE AND SEWAGE PUMP

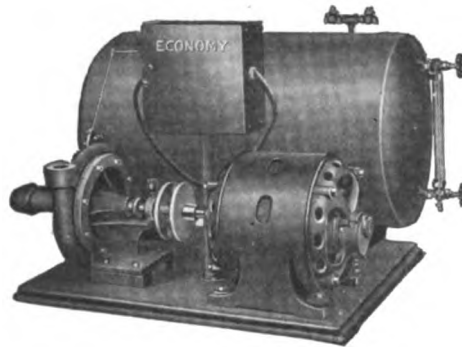


FIG. 2176. CONDENSATION PUMP AND RECEIVER

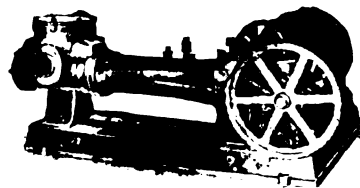


FIG. 2149. ECONOMY MOTOR DRIVEN RETURN LINE VACUUM PUMP, DOUBLE ACTING TYPE

DATA, FIG. 2149

Unit No.	Size, ins.	R.p.m.	Gal. per min.	H.p.	Sq. ft. direct radiation	Suction, ins.	Discharge, ins.
1	$2\frac{1}{2}$ x 5	60	12	$\frac{1}{8}$	1500	$1\frac{1}{4}$	1
2	3 x 5	50	16	$\frac{1}{2}$	2500	$1\frac{1}{2}$	$1\frac{1}{4}$
3	4 x 5	50	30	$\frac{3}{4}$	3500	2	$1\frac{1}{2}$
4	5 x 6	50	50	1	5000	$2\frac{1}{2}$	$1\frac{1}{2}$
5	6 x 6	45	65	$1\frac{1}{2}$	8500	$2\frac{1}{2}$	2
$5\frac{1}{2}$	$6\frac{1}{2}$ x 6	45	75	2	12000	$2\frac{1}{2}$	$2\frac{1}{2}$
6	5 x 10	45	80	2	15000	3	$2\frac{1}{2}$
7	6 x 10	40	100	3	20000	$3\frac{1}{2}$	$2\frac{1}{2}$
8	7 x 10	40	133	3	30000	$3\frac{1}{2}$	3
9	8 x 12	30	155	5	40000	4	$3\frac{1}{2}$
10	9 x 12	30	182	$5\frac{1}{2}$	47500	5	$3\frac{1}{2}$
11	10 x 12	30	245	$7\frac{1}{2}$	60000	6	4
12	12 x 12	30	300	10	75000	6	5

DIMENSIONS FIG. 2104, TYPES B AND C

Gals. per min. per pump	7 to 12	10 to 15	15 to 20	20 to 30	35 to 50	60 to 75	80 to 100	125 to 150	200 to 250	300 to 400	500 to 725	800 to 1200
To pump against ft. head	8 to 12	10 to 14	12 to 20	15 to 30	15 to 30	15 to 35	15 to 35	15 to 35	15 to 40	15 to 40	15 to 40	15 to 40
H. p.	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{2}$	1	1	2	3	5	$7\frac{1}{2}$	$7\frac{1}{2}$
Discharge pipe, ins.	$\frac{3}{4}$	1	1	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	$2\frac{1}{2}$	3	4	5
Diam., ins., of basin, either B or C	20, 24, 30	20, 24, 30	20, 24, 30	24, 30, 42	24, 30, 48	30, 36, 42	30, 36, 42	36, 42, 48	36, 42, 48	48, 54, 60	48, 54, 60	54, 60, 72
Depth of basin	Optional to suit requirements											

NOTE—Type B, duplex. Type C, single pump
Speed of all units up to 100 g.p.m., 1750 r.p.m.
Speed of all units above 100 g.p.m., 1200 r.p.m.



FIG. 2175. UNDERGROUND CONDENSATION PUMP AND RECEIVER

DATA, FIGS. 2175 AND 2176

Unit No.	Sq. ft. direct radiation will drain
5	1000
6	2000
$6\frac{1}{2}$	3500
7	5000
$7\frac{1}{2}$	7500
8	10000
9	25000
10	35000 to 50000 as specified

DATA, FIGS. 2175 AND 2176 (CONTINUED)

Unit No.	Boiler pressure, lbs.	H. p.
5	5	$\frac{1}{4}$
6	10	$\frac{1}{2}$
$6\frac{1}{2}$	10	$\frac{3}{4}$
7	10	$1\frac{1}{2}$
$7\frac{1}{2}$	10	$1\frac{1}{2}$
8	15	1
9	15	2
10	15 to 30	3 to 5

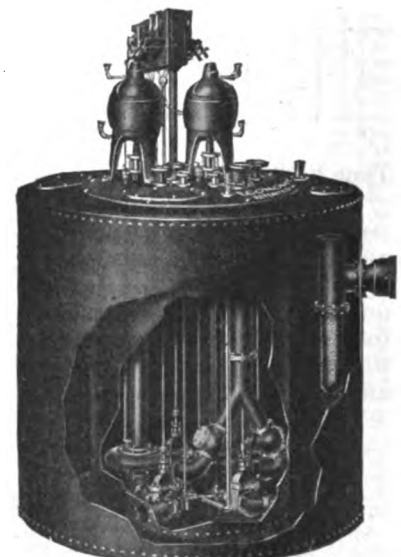


FIG. 2119. TYPE A ECONOMY DRY PUMP CHAMBER AUTOMATIC SEWAGE EJECTOR

Unit No.	4	5	6	7	8	9
Cap. each pump, gals.	50 to 75	100 to 125	150 to 175	200 to 250	300 to 400	450 to 600
H. p.	1 to $1\frac{1}{2}$	$1\frac{1}{2}$ to 2	2 to 3	3 to 4	4 to 5	5 to 10
Standard speeds	1000 to 1200	1000 to 1200	850 to 1200	850 to 1200	550 to 1000	550 to 1000
Discharge pipe, ins.	3	4	4	5	6	8
Diam. pump chamber, ins.	48	48	48	54	54	60
Diam. sewage recept., ins.	78	78	78	84	84	90
Ejector depth, ft.	As conditions require					
Size sewer inlets	No. and size required					

FAIRBANKS, MORSE & CO.

Manufacturers of Pumps

CHICAGO, ILL.

Products.

PUMPS: STEAM, POWER, and CENTRIFUGAL.

Also Fairbanks Scales—all kinds; Air Compressors and Hoists.

For Oil Engines, see page 852; for Electric Motors, see page 589.

Fairbanks-Morse Pumps.

Fairbanks-Morse pump installations are giving continuous service and satisfaction in municipal plants, mines, oil fields, railroads, rice fields, irrigation projects, canneries, bleacheries, smelteries and in manufacturing plants in all sorts of industry.



Fairbanks-Morse pumps are constructed and finished in a manner insuring durability, efficiency, reliability, ease of operation and low cost of maintenance. Guaranteed by Fairbanks-Morse quality.

Owing to the wide variety of pumping equipment required to supply the diversified needs of various industries and projects, an attempt has been made to show but a few installations, the purpose of which is to give a general idea of the adaptability of Fairbanks-Morse pumps to various lines of work.

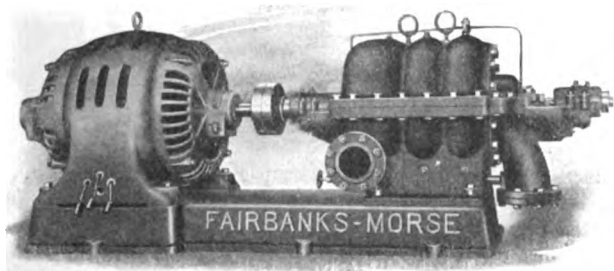
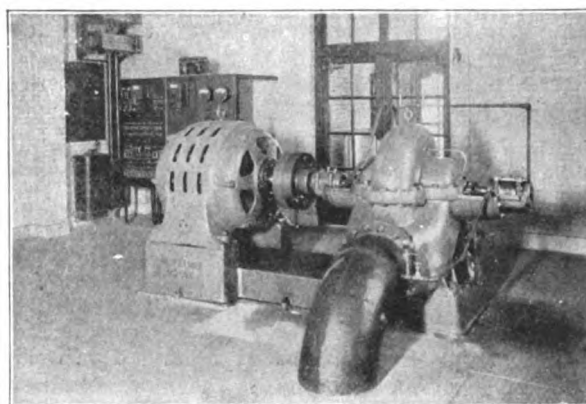
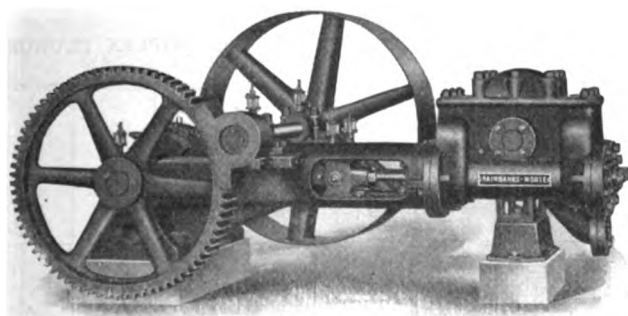


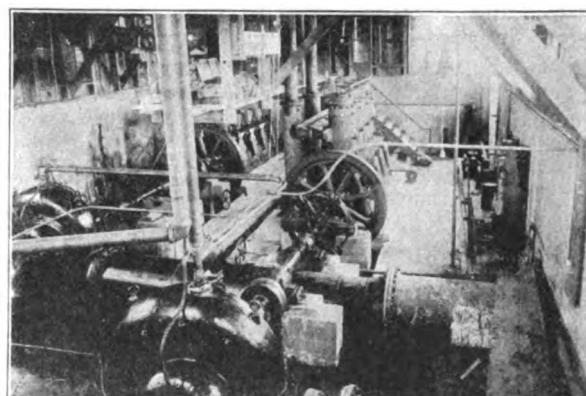
FIG. 1000. 5-INCH, 3-STAGE, HORIZONTALLY SPLIT CASING CENTRIFUGAL PUMP, DIRECT CONNECTED TO 75 H.P. FAIRBANKS-MORSE INDUCTION MOTOR



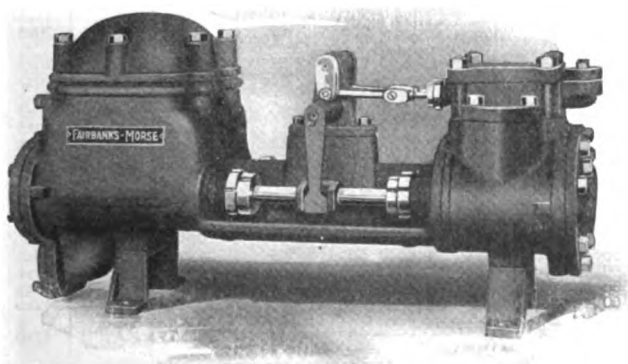
PUMPING EQUIPMENT, MUNICIPAL PLANT



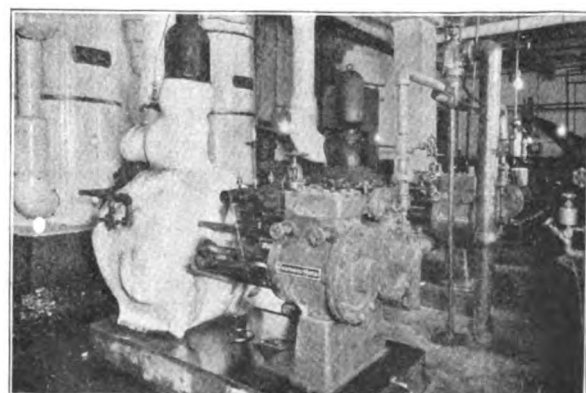
DUPLIX PISTON PATTERN POWER PUMP



IRRIGATION PROJECT INSTALLATION, FAIRBANKS-MORSE CENTRIFUGAL PUMPS AND "Y" OIL ENGINES



BOILER FEED PUMP, DUPLIX PISTON PATTERN



STEAM PUMP INSTALLATION, COLD STORAGE PLANT

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Engineers

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Products.

SINGLE CYLINDER, DUPLEX and TRIPLEX POWER PUMPS, SINGLE and DOUBLE ACTING; SINGLE STAGE and MULTISTAGE, HORIZONTAL and VERTICAL CENTRIFUGAL PUMPS; DEEP WELL TRIPLEX PUMPS; DEEP WELL WORKING HEADS and CYLINDERS; VACUUM PUMPS; HYDRAULIC RAMS.

Also manufacturers of Air Compressors; Rotary and Diaphragm Pumps; Boiler Testing Pumps; Bilge, Quarry, Spray and Windmill Pumps; Turbo Driven Pumps; Hydraulic Pressure Pumps; House or Tank Pumps; Force and Lift Pumps; Pumps for Private House Water Systems; Pumping Outfits; Turbo Pumping Outfits; Special Pumps for all services.

Uses and Service.

The Goulds line includes types and capacities for all pumping services. Some of the more common of these are:

General water supply; boiler feeding, hydraulic elevator and pressure machinery service; condenser service; fire protection; vacuum service on heating systems; circulating cooling water for gas engines; pumping brine, ammonia, tar, soap, clay, sewage, chemicals, wine, acids, etc.; stuff pumping in paper mills, vacuum service in paper mills, refineries, etc.; pumping oils and gasoline; mine pumping; pumping out excavations, etc.

For service with pneumatic tanks, they can be furnished to pump both air and water.

These pumps can be furnished for belt, chain, gear or direct drive from all types of drivers.

The Goulds line also includes all types of hand pumps for all services.

The pumps illustrated and described here are only a few of a very complete line. A set of bulletins, describing all the Gould types made, will be sent on request.

Single Acting Triplex Plunger Pumps (Bulletin 101).

For general water supply, municipal water works, boiler feeding, hydraulic elevators, mine pumping, etc. Furnished for any standard form of drive.

Frame—Close grained iron, cast in one piece with cross-head guides and cylinders, forming exceptionally rigid construction and accurate alignment of all working parts.

Crank Shaft—High carbon open hearth steel accurately machined to gauge.

Bearings—Crank shaft and pinion shaft bearings are of babbitt metal.

Gearing—Gear and pinion charcoal iron, machine cut from the solid. A gear guard covers the pinion and adjacent teeth of the gear. Gear ratio 5 to 1.

Crossheads—Sizes 4 by 6 in. and larger, fitted with adjust-

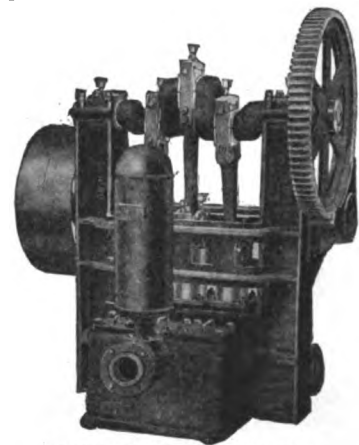
able bronze shoes which run in bored guides. Sizes 3½ by 4 in. and smaller; the crossheads are cylindrical in form, made of bronze, and run in bored guides.

Connecting Rods—

Sizes 4 by 6 in. and larger, strap head and wedge adjustment with bronze boxes at crank end and adjustable bronze boxes, marine type, at cross-head end. Sizes 3½ by 4 in. and smaller have adjustable boxes babbitted at crank end and bronze bushings at cross head end.

Cylinders—Close grained iron, cast in one piece, with standards.

Plungers—Sizes 2½ by 4 in. and larger are fitted with hard cast iron plungers. Sizes 2 by 3 in. and smaller have bronze plungers accurately machined and ground true and smooth.



GOULDS SINGLE ACTING
TRIPLEX PLUNGER PUMP

Made in various types, for working pressures from 100 to 300 lbs., and for elevations from 231 to 293 ft. Capacities ranging from 120 to 21,000 gals. per hour

DATA, FIG. 1696 TYPE, SINGLE ACTING TRIPLEX PLUNGER PUMP

Displacement, gals. per minute	Size of pump		Displacement 1 revolution of crank shaft, gals.	Revolutions per minute	Horsepower at catalogue rating	Size of suction and discharge, in.	Tight and loose pulleys, in.
	Diam., in.	Stroke, in.					
2	1¼	2	0.031	67	.35	¾	12x1½
4	1¾	2½	0.078	52	.64	1	12x2½
6	2	3	0.122	50	.96	1¼	12x2½
6	1¾	2½	0.078	77	.89	1	12x2½
9	2	3	0.122	75	1.33	1¼	12x2½
12	2¼	4	0.255	48	1.71	1½	15x3
18	2½	4	0.255	71	2.46	1½	15x3
18	3	4	0.367	50	2.29	1½	15x3
25	3	4	0.367	79	3.07	1½	15x3
25	3½	4	0.501	50	3.07	2	15x3
40	4	6	0.978	42	4.60	2	20x3
50	4	6	0.978	52	5.65	2	20x3
60	4	6	0.978	62	6.72	2	20x3
100	5	8	2.041	50	10.60	3	30x5
125	5	8	2.041	62	13.00	3	30x5
125	6	8	2.938	43	13.20	4	30x6
150	6	8	2.938	52	15.80	4	30x6
175	6	8	2.938	60	18.30	4	30x6
175	7	8	4.000	44	19.00	4	36x6
200	7	8	4.000	50	21.30	4	36x6
250	7	8	4.000	63	26.00	4	36x6
250	7	10	5.000	50	26.60	5	36x6
300	7	10	5.000	60	31.30	5	36x6
300	8	10	6.520	46	32.00	5	42x6
350	8	10	6.520	54	36.50	5	42x6

Ratings based on pumping cold water.

For high suction lifts select pumps to run at slow speeds.

Glands—Sizes 2½ by 4 in. and larger have iron glands. Sizes 2 by 3 in. and smaller have bronze glands.

Base and Valve Boxes—Charcoal iron, in one casting, of liberal proportion, affording large valve area.

Valves—3 by 4 in. and smaller bronze valves. 3½ by 4 in. and larger, for cold water, rubber disks on bronze grid seats with cylindrically wound springs. For hot water, the grid seat valve with special disk is recommended.

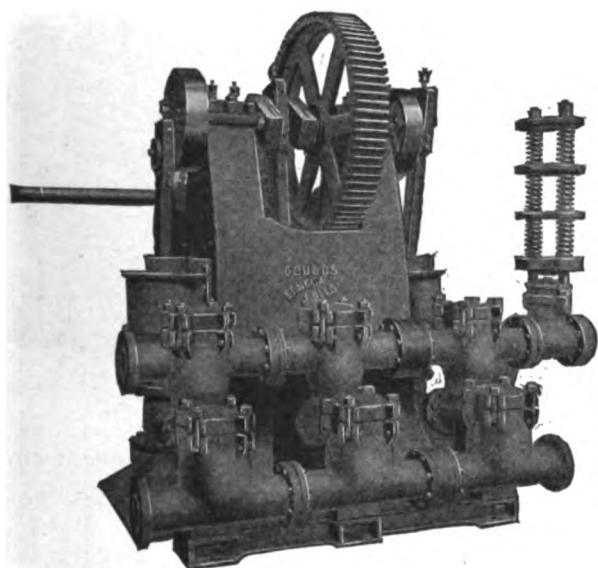
Air Chambers—Supplied with pump. Vacuum chamber to order.

Special Construction—Phosphor bronze plungers, lined cylinders and glands, rawhide pinion, etc., to order.

Single Acting Triplex Plunger Pumps (Bulletin 103).

For general water supply, municipal water works, boiler feeding, hydraulic elevators, mine pumping, oil pipe lines, accumulators, hydraulic presses, etc.

Furnished for any standard form of drive.



SINGLE ACTING TRIPLEX PLUNGER PUMP

Made for working pressures from 100 to 1,500 lbs. and for elevations from 230 to 3,500 ft. Capacities ranging from 3,060 to 69,060 gals. per hour

DATA, FIG. 1585 TYPE, SINGLE ACTING TRIPLEX PLUNGER PUMP

Displacement, gals. per minute	For working pressure, lbs.	Pattern	Plungers		Displacement 1 revolution of crank shaft, gals.	Revolutions per minute	Horsepower at catalogue rating	Size of pipe		Geared	Pulley
			Diam., in.	Stroke, in.				Suction, in.	Discharge, in.		
387	200	B	10	16	16.32	36	80.5	12	10	5.06 to 1	Pulley extra according to size. Always specify dimensions and speed of motor pulley and required number of gals. per min.
648	185	B	10½	16	18.00	36	82.3	12	10	5.06 to 1	
711	165	B	11	16	19.74	36	80.5	12	10	5.06 to 1	
846	130	B	12	16	23.49	36	75.5	12	10	5.06 to 1	
916	120	B	12½	16	25.46	36	75.5	12	10	5.06 to 1	
992	112	B	13	16	27.57	36	76.4	12	10	5.06 to 1	
1151	100	B	14	16	31.98	36	79.0	12	10	5.06 to 1	
387	225	A	10	16	16.32	36	90.5	12	10	5.06 to 1	
648	200	A	10½	16	18.00	36	89.0	12	10	5.06 to 1	
711	185	A	11	16	19.74	36	90.3	12	10	5.06 to 1	
846	150	A	12	16	23.49	36	87.2	12	10	5.06 to 1	
916	140	A	12½	16	25.46	36	88.0	12	10	5.06 to 1	
177	900	LA	5½	16	4.93	36	105.0	6	6	5.43 to 1	
211	800	LA	6	16	5.87	36	115.0	6	6	5.43 to 1	
220	775	LA	6½	16	6.12	36	113.0	6	6	5.43 to 1	
229	750	LA	6¾	16	6.37	36	117.7	6	6	5.43 to 1	
618	250	LA	10¾	16	17.18	36	106.0	12	10	5.43 to 1	

Ratings based on pumping cold water.

Frame—Consists of two standards which carry the main bearings, the seats for the two outside cylinders and the out-

side crosshead guides. Standards are held together by the center crosshead guide and the seat for the center cylinder.

Crank Shaft—High carbon open hearth steel, accurately machined to gauge. Fitted with crank disks at the ends of the crank shaft.

Bearings—Crank shaft bearings are phosphor bronze and pinion shaft bearings are of babbitt metal.

Gearing—Gear, charcoal iron, machine cut from the solid. Pinion, forged steel. Gear guard covers the pinion and adjacent teeth of the gear.

Crossheads—Fitted with adjustable bronze shoes which run in bored guides.

Connecting Rods—Cast steel, strap head and wedge adjustment with bronze boxes at crank end and adjustable bronze boxes, marine type, at crosshead end.

Cylinders—Separate charcoal iron castings, bronze lined.

Plungers—Hard cast iron, accurately machined, ground true and smooth.

Glands—Iron, and of easy access for adjustment and re-packing.

Valve Boxes—Separate charcoal iron castings, each containing a set of suction and discharge valves.

Valves—Special to meet requirements.

Air Chamber—Supplied on all pumps for pressures up to 400 lbs. On pumps for pressures above 400 lbs., a spring alleviator can be furnished at extra price.

Pinion Shaft and Pulley—For belt drive an extended pinion shaft is regularly furnished; but the pulley and outboard bearing required are extra.

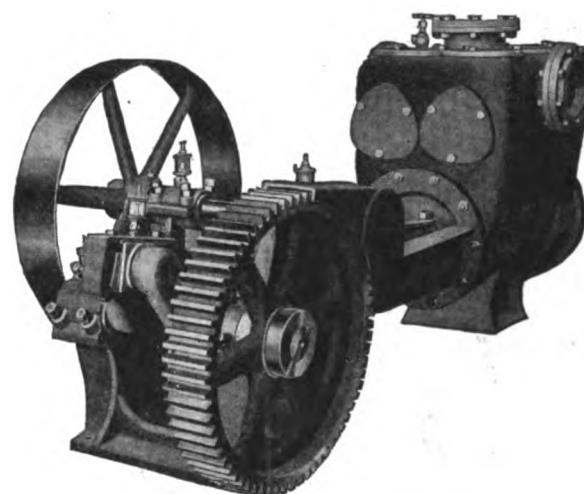
Pipe Connections—At either end of pump.

Special Construction—Phosphor bronze plungers, bronze lined glands, etc., to order.

Horizontal Double Acting Piston Vacuum Pumps (Bulletin 106).

For vacuum heating systems, suction box on paper machines, vacuum pans and surface condensers.

Frame—Cast iron in one piece bolted to the cylinder, supporting the bearings and crosshead guides.



HORIZONTAL DOUBLE ACTING PISTON VACUUM PUMP

Displacements of 10,200 to 81,000 gals. per hour

DATA, FIG. 1049 TYPE, HORIZONTAL DOUBLE ACTING PISTON VACUUM PUMP

Displacement, gals. per minute	Pistons		Displacement 1 revolution of crank shaft, gals.	Revolutions per minute	Size of pipe		Geared	Single pulley, in.
	Diam., in.	Stroke, in.			Suction, in.	Discharge, in.		
170	8	10	4.28	40	5	5	4 to 1	30x4
265	10	10	6.73	40	5	5	4 to 1	30x5
385	12	10	9.72	40	5	5	4 to 1	30x5
525	14	10	13.22	40	6	6	4 to 1	30x5
700	14	14	18.51	38	6	6	4 to 1	36x6
1000	16	16	27.62	37	8	8	4 to 1	36x6
1350	18	18	39.31	35	10	10	4 to 1	42x8

Continued on next page

Crank Shaft—High carbon open hearth steel, accurately machined to gauge.

Bearings—Crank shaft and pinion shaft bearings are of babbit metal.

Gearing—Gear and pinion charcoal iron, machine cut from the solid. A gear guard covers the pinion and adjacent teeth of the gear.

Crossheads—Cast iron, with adjustable planed crosshead guides.

Connecting Rods—Steel, and fitted with phosphor bronze boxes, strap heads and wedge adjustment at crank end and gib and key at crosshead end.

Cylinder—Charcoal iron, fitted with removable cast bronze lining, bolted in. This lining can be turned to distribute the wear.

Piston—Bronze, with a bronze follower and fitted with fibrous packing.

Piston Rod—Tobin bronze.

Stuffing Box and Gland—Bronze, fitted with fibrous packing.

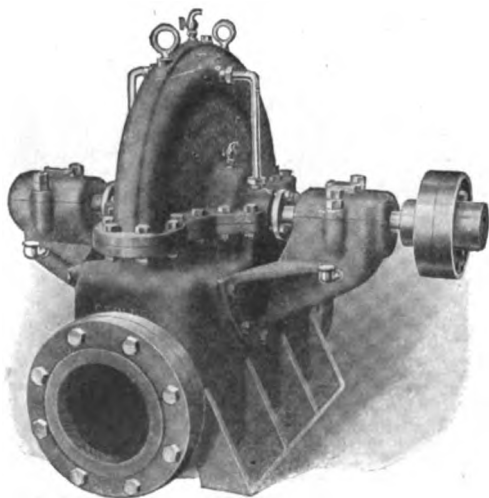
Valves—Rubber disks on bronze grid seats with cylindrically wound springs.

Pipe Connections—Suction at top and one side of cylinder, discharge at the other side, except 8 by 10-in. and 10 by 10-in. sizes, which have side suction only.

Single Stage, Double Suction Centrifugal Pumps (Bulletin 110).

For general water supply, hot water circulating in heating systems, for irrigating, booster or mine service, where the total net head does not exceed 150 ft., this pump is superior, due to the high efficiency obtained.

The prominent features of this type of pump are: Simple construction, single moving element; can be cared for by unskilled labor; no valves to get out of order, and with electricity will operate noiselessly. It is possible to close valve in discharge pipe without serious injury to the pump or driving mechanism. Built for all standard forms of drive.



GOULDS SINGLE STAGE DOUBLE SUCTION CENTRIFUGAL PUMP

Capacities from 4,800 to 480,000 gals. per hour

Impeller—Close grained iron, accurately machined to a smooth finish. It is of the enclosed type, so designed as to give high efficiency and make it impossible to seriously overload the motive power under any conditions at the specified speed.

Shaft—Special alloy steel, heat treated, accurately machined to gauge.

Bearings—Removable shells lined with best quality anti-friction metal. They are of the ring oiling type, provided with large oil reservoirs.

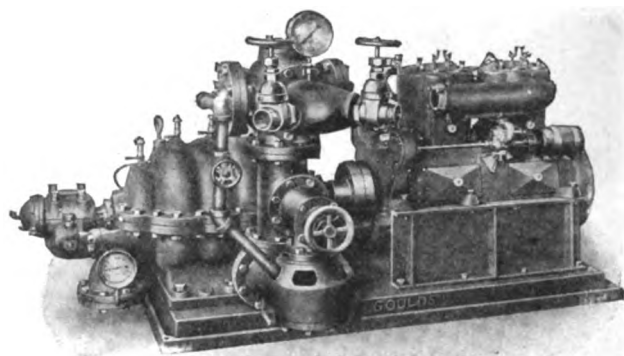
Stuffing Box—Provided with brass water sealing rings, which prevent air entering the pump.

Casing—Close grained iron, divided horizontally, the two halves bolted together, giving easy access to the interior.

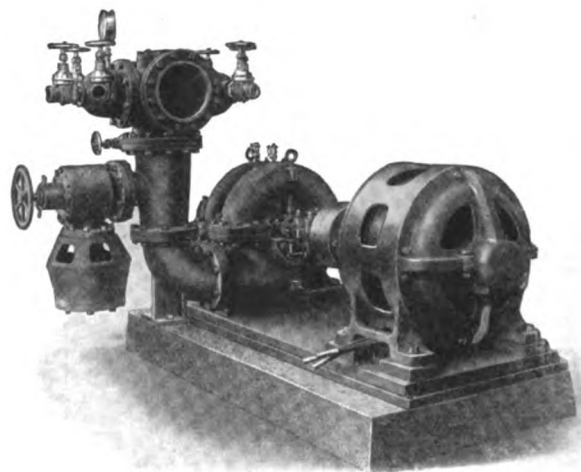
Housing—Bearings of ring oiling type, mounted in housings bolted to lower half of pump casing. Housings are provided with removable shells, lined with the best genuine babbit which is bored and scraped to fit the shaft.

Centrifugal Fire Pumps (Bulletin 118).

These pumps have all the characteristics that are desirable for fire protection service. They have the indorsement of the Associated Factory Mutual Fire Insurance Companies, Underwriters' Laboratories, Inc., the National Board of Fire Underwriters and the National Fire Protection Association, and have proved by the rigid tests given them to be up to standard in every respect.



ENGINE DRIVEN CENTRIFUGAL FIRE PUMP FOR STAND-BY SERVICE



2-STAGE, NO. 8, 1500-GALLON CENTRIFUGAL FIRE PUMP, ELECTRIC MOTOR DRIVEN

DATA, FIG. 3014 TYPE, CENTRIFUGAL FIRE PUMP

Pump number	Gals. per minute	Number of 1 1/4-in. streams	Total head, lbs.	Approximate speed, revolutions per minute	Horsepower of motor required	Size of suction and discharge, in.	Approximate weight, lbs., without motor
4	500	2	100	1700	50	6	2800
5	750	3	100	1700	75	8	3600
6	1000	4	100	1700	100	8	4000
8S	1500	6	100	1700	150	10	4500

†Can be arranged for other pressures and speeds.

*Weight includes pump mounted upon extended bed plate and flexible coupling. Does not include weight of motor or other driver

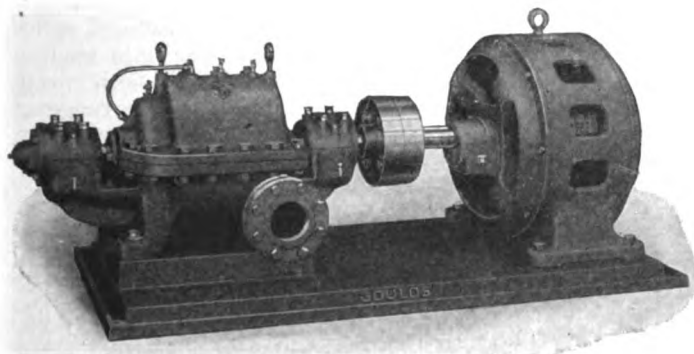
Multistage Centrifugal Pumps (Bulletin 120).

For pumping installations where the head is greater than can be efficiently dealt with in a single stage, we offer the multistage.

These pumps embody all the latest features, the value of which experience has fully demonstrated.

Where the size of the pump has permitted, the casing is horizontally divided, with the suction and discharge nozzles cast upon the lower half of the casing. This applies to sizes Nos. 4, 5, 6 and 8. The small sizes, Nos. 2-S, 2-L and 3, have vertically divided casings of the sectional type, which are held together by horizontal bolts in accordance with the best practice.

These pumps can be furnished in 2 to 5 stages. The small sizes can be built up to 6 stages.



MULTISTAGE CENTRIFUGAL PUMP

DATA, FIG. 3300 TYPE, MULTISTAGE CENTRIFUGAL PUMP

Pump number	Size of pipe		Range of capacity, gals. per minute	Maximum head
	Discharge, in.	Suction, in.		
2S and 2L	2	2	50 to 100	250 lbs. or 580 ft.
3	3	3	100 to 200	
4	4	4	175 to 400	
5	5	5	250 to 700	
6	6	6	600 to 1200	
8	8	8	1000 to 2000	

Deep Well Working Heads (Bulletin 108).

For operating single and double acting deep well cylinders.

Frame—Consists of two cast iron standards bolted to the base, strongly braced and fastened together with center guide and tie pieces, forming a very rigid construction.

Crank Shaft—High carbon open hearth steel, accurately machined to gauge.

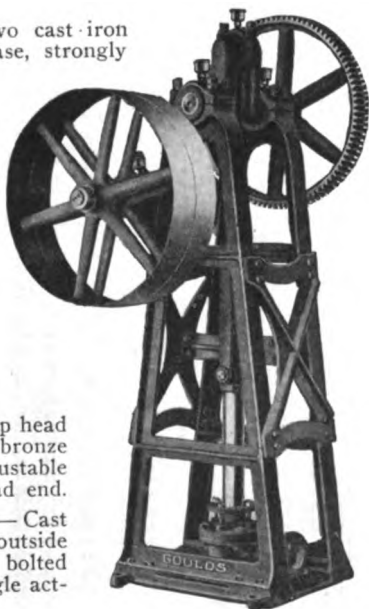
Bearings—Crank and pinion shaft bearings, babbitt metal.

Gearing—Charcoal iron, machine cut from the solid.

Connecting Rod—Strap head with wedge adjustment and bronze box at crank end, and adjustable babbitted boxes at crosshead end.

Differential Plunger—Cast iron, working through an outside packed stuffing box with bolted gland. Furnished with single acting cylinders only.

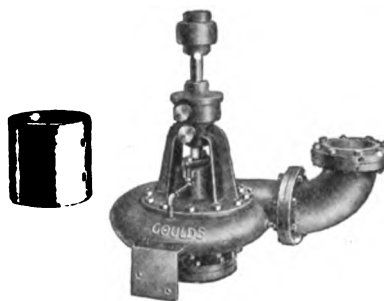
Air Chamber—Regularly furnished.



GOULDS DEEP WELL WORKING HEADS

Vertical Single Stage Centrifugal Pump (Bulletin 114).

The Goulds new vertical centrifugal pump is made for service in a pit where the water level is at such a depth below the surface of the ground that the ordinary horizontal shaft pump can not be used. The pump is installed in the pit above or below the water level. A steel shaft is extended to the surface, where a pulley is mounted upon it for belt drive. The shaft can also be direct connected to a vertical electric motor at this point.



GOULDS VERTICAL SINGLE STAGE CENTRIFUGAL PUMP



PUMP MOUNTED IN STEEL FRAME, DIRECT CONNECTED TO AN ELECTRIC MOTOR

Co-operative Service.

Parties contemplating the installation of pumping equipment are invited to present their problems to this organization, which is prepared to assist in selecting the proper and most economical pump for their purposes.

Guarantee.

Every Goulds pump is guaranteed to satisfactorily perform the specific work for which it is sold.

Bulletins.

The following bulletins, any of which will be sent on request, give complete specifications on the various standard types of Goulds Power Pumps:

- No. 100. Double Acting, Single Cylinder Piston Pumps.
- No. 101. Single Acting Triplex Plunger Pumps, Outside Guided Type.
- No. 102. Single Acting Triplex Plunger Pumps, Large Capacity and High Pressure Types.
- No. 104. Double Acting Triplex Piston Pumps, Vertical Type.
- No. 105. Single Stage, Single Side Suction Centrifugal Pumps.
- No. 106. Vacuum and Stuff Pumps.
- No. 107. Deep Well Triplex Pumps.
- No. 108. Deep Well Working Heads and Cylinders.
- No. 109. Portable Mine Pumps.
- No. 110. Single Stage, Double Suction Centrifugal Pumps.
- No. 111. Centrifugal Sump Pumps.
- No. 112. Handy Data on Power Pumping.
- No. 113. Rotary Pumps.
- No. 114. Vertical, Single Stage Centrifugal Pumps.
- No. 115. Double Acting Plunger Pumps, Horizontal Type.
- No. 116. Single Acting Triplex Pressure Pumps.
- No. 118. Centrifugal Fire Pumps.
- No. 119. Single Stage, Single Suction Centrifugal Pumps.
- No. 120. Multistage Centrifugal Pumps.
- No. 122. Centrifugal Pump Sales Service Data.

THE GARDNER GOVERNOR COMPANY

Manufacturers of Pumps, Compressors and Governors

QUINCY, ILL.

REPRESENTATIVES

CHICAGO, ILL., Fisher Building SAN FRANCISCO, CAL., 509 Harvard Street NEW YORK, N. Y., Singer Building
PHILADELPHIA, PA., 604 Arch Street LOS ANGELES, CAL., 409 East Third Street

Products.

PUMPS: Duplex Steam Pumps and Duplex Power Pumps for all services.

GOVERNORS: Throttling Engine Governors, Speed and Pressure Regulators and Pump Governors.

COMPRESSORS: Horizontal Single-stage Air Compressors, Horizontal Two-stage Air Compressors and Horizontal Air Cooled Two-stage Garage Compressors; Vertical Single-stage Water Cooled Compressors. Vertical Two-stage Water Cooled Compressors, Vertical Air Cooled Compressors, and Garage Compressors.

Gardner Products.

For 62 years THE GARDNER GOVERNOR COMPANY have been building quality products. Every Gardner pump, compressor and governor reflects the experience of an organization of skilled engineers and workmen, trained half of their lives in the Gardner shops.

Pumps.

Gardner pumps are manufactured in styles and sizes suitable for practically every purpose and are built for hard continuous usage. The following table shows duplex power pumps only. Complete data on other lines will be sent on request.

GARDNER DUPLEX POWER PUMPS—PACKED PISTON TYPE

Size		Rev. per min.	Motor h. p.	Capacity, gals.	Pipe sizes, in.	Pulley		Weight, lbs.	Approx. over all dimen- sions, in.									
Diam. water cyl., in.	Length of stroke, in.					Diam., in.	Belt		Length	Height								
		Max. water pressure per sq. in., lbs.	Crank shaft	At max. speed and pressure (see note)	Min. h.p. recommend- ed for any service	Per rev. of crank shaft	Per min. at max. speed	Suction	Discharge	Width, in.	Single or double	Standard pump	Arranged for top motor mounting					
2	4	300	75/375	5	$\frac{3}{4}$	216	16	21 $\frac{1}{2}$	1 $\frac{1}{4}$	16	3	S	540	630	41	26	21	
3	4	150	75/375	5	$\frac{3}{4}$	48	36	2	1 $\frac{1}{2}$	1 $\frac{1}{4}$	16	3	S	560	650	41	26	21
3 $\frac{1}{2}$	4	100	75/375	5	$\frac{3}{4}$	76	57	2 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{4}$	16	3	S	600	700	43	26	21
4	5	150	60/300	7	1	84	50	2 $\frac{1}{2}$	1 $\frac{1}{2}$	20	4	S	680	775	44	28	23	
4 $\frac{1}{2}$	5	80	60/300	6	1	152	91	3	2 $\frac{1}{2}$	20	4	S	800	900	48	28	33	
4 $\frac{3}{4}$	6	150	60/300	10	1 $\frac{1}{4}$	132	80	3	2 $\frac{1}{2}$	24	4	D	1000	1150	52	33	35	
5	6	75	60/300	10	1 $\frac{1}{4}$	268	160	4	3	24	4	D	1250	1375	56	33	45	
5 $\frac{1}{2}$	10	175	50/250	20	3	274	137	4	3	30	6	D	2000	2175	71	40	48	
5 $\frac{3}{4}$	10	150	50/250	20	3	340	170	4	3	30	6	D	2100	2300	71	40	48	
6	10	100	50/250	20	3	488	245	5	4	30	6	D	2250	2450	73	40	51	
6 $\frac{1}{2}$	10	175	50/250	35	5	488	245	5	4	40	8	D	3700	3950	78	48	53	
7	10	150	50/250	40	5	668	334	6	5	40	8	D	3800	4000	92	48	59	
7 $\frac{1}{2}$	10	115	50/250	40	5	872	436	6	5	40	8	D	4000	4200	92	48	59	
8	10	150	50/250	40	5	668	334	6	5	40	8	D	4450	4650	92	48	71	
8 $\frac{1}{2}$	10	115	50/250	40	5	872	436	6	5	40	8	D	4450	4650	92	48	71	

Horsepower required is in direct proportion to speed and pressure, except at very low pressures power runs higher proportionately because of friction load.

*Regularly fitted with cast iron removable liners in water cylinders. Cast brass liners furnished at an extra price. All other sizes regularly fitted with drawn brass liners in water cylinders.

Standard pumps are regularly furnished with tight pulley only. Loose pulley can be supplied at an extra cost.

Tobin bronze piston rods furnished regularly on all pumps.

Governors.

Gardner governors are made in a variety of styles to handle the various conditions that appear in modern steam engine regulation. They are built in both spring and gravity types, and are adaptable to a wide range of service, including stationary, portable, or traction steam engines, air compressors, and pumps.

CLASS "A" STANDARD GOVERNORS

Size of governor Diam. of opening, in.	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7	8	9	10	12
Diam. of base flange, in.	Sc'd	5	6	7	7 1/2	8 1/2	9	9 1/4	10	11	12 1/2	13 1/2	15	16	19
Diam. side flange, in.	Sc'd	Sc'd	Sc'd	7	7 1/2	8 1/2	9	9 1/4	10	11	12 1/2	13 1/2	15	16	19
Center to side flange, in.	3 1/4	3 1/2	4 1/2	5 1/2	6 1/8	6 1/2	6 5/8	7	7 3/8	8 1/4	9	10 1/8	11	13	15
Base to center of inlet, in.	3 1/4	4	4 1/4	5 1/4	6 1/8	6 1/2	6 5/8	7 3/8	7 3/4	8 1/4	9 1/4	10 1/8	11	15	15
Extreme height, in.	22 1/2	22 1/2	27	28 1/2	31 1/8	32 1/2	37	37 1/2	45 1/2	45 5/8	51 1/4	53	55	63	65 1/2
Largest radius of balls, in.	5	5	6	6 1/2	7 1/2	7 1/2	8 1/2	8 1/2	10	11	12	12	15	15	15
Center to end of shaft, in.	11	11	12 1/2	15	15	17	17	17	21	21	25 1/2	25 1/2	28	28	28
Diam. pulley, in.	3	3	5	5	5 1/2	5 1/2	6	6	7	7	10	11	12	12	12
Width belt, in.	1 1/2	1 1/2	2	2	2	2	2 1/2	2 1/2	3	3	3	3	3	3	3
Rev. per min. of pulley	250	250	200	200	170	170	160	160	150	150	130	130	130	115	115
Diam. cyl.—300 ft. piston speed, in.	6	7	9	12	14	16	18	20	22	26	31	36	40	45	54
Diam. cyl.—400 ft. piston speed, in.	5	6	8	10	12	14	16	18	20	23	27	31	35	39	47
Diam. cyl.—500 ft. piston speed, in.	4 1/2	5	7	9	10	12	14	16	18	21	24	28	31	35	42
Diam. cyl.—600 ft. piston speed, in.	4	4 1/2	6	8	9	11	13	15	16	19	22	25	28	32	39

Last four lines give proper size of governor for different diameter of single cylinder engines at various piston speeds. For example: A 12-in. engine running at 400 ft.-piston speed should have a 3-in. governor. To find piston speed, multiply the number of revolutions per minute by twice the length of stroke in inches and divide by 12. Duplex or two-cylinder engines require one size larger governor than single cylinder engines of same size.

Compressors.

Gardner compressors are built in horizontal and vertical types, single- and two-stage, steam or power actuated for practically every commercial requirement.

SINGLE ENCLOSED TYPE BELT DRIVEN AIR COMPRESSOR—CLASS B-S

Size cyl.		Max. speed per min.	Displacement cu. ft., max. speed	Max. air pressure, lbs.	H. p. required, max. air pressure max. speed	Pipe openings, in.			Band wheel	Floor space		Shipping weight, lbs.	
Diam., in.	Stroke, in.					Suction	Discharge	Jacket		Length, ft. in.	Width, ft. in.		Height, ft. in.
6	6	300	59	125	13	2	2	2 1/2	6 1/2	5	3 1/2	3 1/2-10	1300
7	6	300	80	100	16	2 1/2	2 1/2	2 1/2	6 1/2	5	3 1/2	3 1/2-10	1420
8	6	300	104	70	16	3	2 1/2	2 1/2	6 1/2	5	3 1/2	3 1/2-10	1550
10	6	300	164	30	15	3 1/2	3 1/2	2 1/2	6 1/2	5	3 1/2	3 1/2-10	1675
8	8	275	128	125	28	3	2 1/2	4 1/4	8 1/2	6	10 1/2	3 1/2-8	2250
9	8	275	162	100	32	3	3	4 1/4	8 1/2	6	10 1/2	3 1/2-8	2390
10	8	275	200	70	32	3 1/2	3 1/2	4 1/4	8 1/2	7	2-11	3 1/2-8	2550
12	8	275	288	40	32	4 1/2	4 1/2	4 1/4	8 1/2	7	3-11	3 1/2-10	2700
14	8	275	391	25	32	5	4 1/2	4 1/4	8 1/2	7	2-11	4-1	2890
9	10	250	184	125	40	3	3	4 1/4	8 1/2	7-11	3	0-3-11	2640
10	10	250	227	100	44	3 1/2	3 1/2	4 1/4	8 1/2	7-8	3	0-3-11	2890
12	10	250	327	60	50	4 1/2	4 1/2	4 1/4	8 1/2	8	0-3	0-3-11	3050
14	10	250	445	35	45	5	4 1/2	4 1/4	8 1/2	7-11	3	0-4-1	3275
15	10	250	511	30	46	5	5	4 1/4	8 1/2	7-11	3	0-4-1	3325
10	12	250	272	125	59	4	4	50	10 7/8	9	1-3	4-4-4	3500
11	12	250	329	100	63	4 1/2	4 1/2	50	10 7/8	9	1-3	4-4-4	3970
12	12	220	345	85	64	4 1/2	4 1/2	50	10 7/8	9	3-3	4-4-4	4160
14	12	220	469	55	63	5	5	56	10 7/8	9	4-3	4-4-10	4390
16	12	220	614	35	62	6	5	56	10 7/8	9	4-3	4-4-10	4780
17	12	220	693	30	62	6	6	56	10 7/8	9	6-3	4-4-10	4825
18	12	220	777	25	61	6	6	56	10 7/8	9	6-3	4-4-10	4950
12	12	220	345	125	75	4 1/2	4 1/2	56	12 1/2	9	7-3	10-6-0	5200
14	12	220	469	100	89	5	5	70	12 1/2	10	0-3	10-6-0	5800
16	12	220	614	60	94	6	5	70	12 1/2	10	0-3	10-6-0	5980
17	12	220	693	50	88	6	6	70	12 1/2	10	2-3	10-6-0	6200
18	12	220	777	40	85	6	6	70	12 1/2	10	2-3	10-6-0	6680
20	12	220	960	30	85	8	6	70	12 1/2	10	5-3	10-6-0	6950

LUITWIELER PUMPING ENGINE CO.

123 Ames Street
ROCHESTER, N. Y.

PACIFIC COAST BRANCH, 707 North Main Street; LOS ANGELES, CAL.

Products.

The LUITWIELER SYSTEM of NON-PULSATING PUMPING MACHINERY: DEEP WELL and TRIPLEX POWER PUMPS; HYDRO-PNEUMATIC PRESSURE SYSTEMS.

Scope of Use.

The Luitwieler system of non-pulsating pumping machinery is in use by city, village and corporate water works, private water supply, railroad tank service, cotton mills, chemical works, mines, manufacturing plants, irrigation, and all general and special purposes for which pumps are used, and particularly where it is desired to entirely eliminate pulsation, noise, jar, pound, vibration, etc.

Pumping Deep Wells With Electric Power.

Where electric energy is obtainable it is economically used as a driving power. Luitwieler pumping machinery consumes very little current; and the evenness and steadiness of load adapts it particularly to drive direct connected to motor by gearing.

Electrically operated pumps can be controlled automatically by float switch or pressure control so that little attention is required.

A large percentage of Luitwieler pumps are driven direct connected to electric motors.

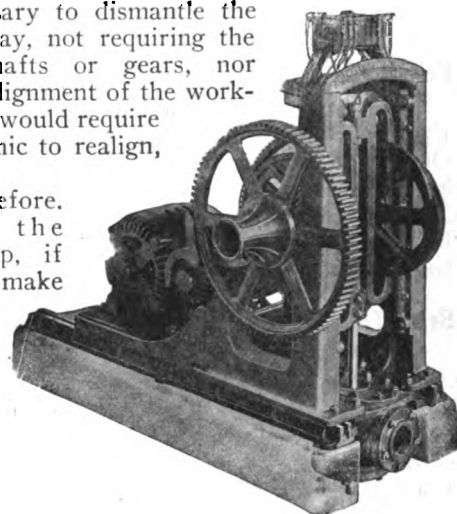
Pistons—The two pistons in the single working barrel are operated by pump rods which are balanced and of equal weight. One piston rod is hollow, and the other piston rod is solid. Each rod is attached to a yoke having an upper and lower roller. The cams, rotating against these rollers, move the yokes and pump rods up and down uniformly. The shape of the cams is such that before one cam stops lifting, the other cam takes the load. This makes the water movement continuous, without the pulsating action found in crank and steam pumps. No check valves are required, as the pistons keep the water moving continuously in a solid stream.

Simplicity—The Luitwieler non-pulsating pump

has few parts, only about one-third the number found in the average pulsating pump on the market.

Unlike most deep well systems, it is not necessary to dismantle the pump in any way, not requiring the removal of shafts or gears, nor changes to the alignment of the working parts, which would require a skilled mechanic to realign, when installing.

It is therefore, possible with the Luitwieler pump, if necessary to make repairs, to disconnect the rods, slide the head back on the sliding rails, and begin the operation of pulling out the rods in a few minutes.



ELECTRICALLY DRIVEN DEEP WELL PUMP

The illustration herewith shows the method of connecting pistons and rods to pumping engine. The solid rod is connected to right-hand cross head at top and the hollow rod is connected to left-hand cross head at bottom. Rods are in line with center of well.

Working barrel may be located at any desired point at which the pistons are submerged when pumping. Such submergence should be not less than 5 ft., and sometimes 20 ft. is desirable. The self-contained feature is highly desirable and a satisfactory one.

Automatic Pumps.

The Luitwieler automatic system of water supply is particularly desirable for the farm, suburban home, hotel, asylum, industrial plant, municipality, etc. Special attention has been given both to the open tank and to the closed tank (hydro-pneumatic) systems.

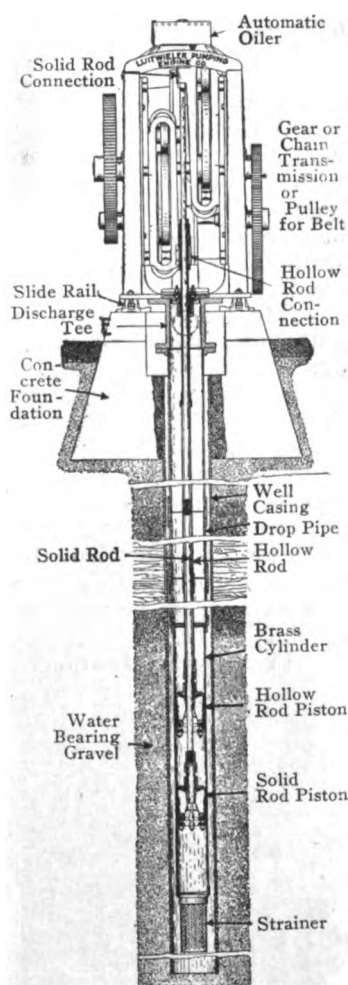
The system is equipped with self-starters for both A.C. and D.C. motors; diaphragm pressure regulator or gage type pressure regulator; float switch in either closed or open type, and other necessary devices for the automatic operation of these pumps.

SIZES, DIMENSIONS AND WEIGHTS OF DEEP WELL PUMPING ENGINES WITH EXTENDED BASES

Number	Stroke, in.	Width, in.	Length over slide rails, in.	Height, in.	Shipping weight, lbs.	
					Without motor or motor base	With motor base and reduction gear
401	4	19	24	23	350	435
702	7	25	35	32	750	870
1004	10	29	50	41	1300	1480
1205	12	42	76	53	2300	2600
1510	15	51	79	60	3300	3650
1815	18	63	92	70	5200	5900
1822	18	65	91	71	6200	6100
1830	18	68	91	72	7500	8400
1840	18	68	91	72	8200	9200
1850	18	92	118	81	12000	13500

Guarantee.

All machinery is guaranteed to be well made of first class material, and if proved defective within one year from date of sale, defective parts will be replaced free of charge, f.o.b. cars at factory.



DETAILS OF LUITWIELER PUMP
Arrangement on foundation and rod and column section

THE KINNEY MANUFACTURING CO.

Manufacturers of Pumps

3529-3541 Washington Street
BOSTON, MASS.

BRANCH OFFICES

NEW YORK, N. Y.

PHILADELPHIA, PA.
HOUSTON, TEX.

CHICAGO, ILL.
SAN FRANCISCO, CAL.

KANSAS CITY, MO.

Products.

ROTATING PLUNGER TYPE STEAM JACKETED PUMPS; TURBINE DRIVEN PUMPS; GASOLINE ENGINE DRIVEN PUMPS; ELECTRICALLY DRIVEN PUMPS; BELT DRIVEN PUMPS; STRAINERS.

For Road Oiling Equipment, see page 110; for Friction Clutch Pulleys and Cut-o.f Couplings, see page 1144.

Brief Description of Kinney Pumps.

The Kinney pump is positive and direct in its action both as to suction and discharge. There are only 4 main working parts, and there are no valves, lobes, gears, internal springs, overhanging valves, intermeshing cogs or other complicated parts which constitute a continual source of trouble, especially in pumping heavy viscous material. Its action is free from pulsation and consequent loss, making it highly efficient both mechanically and volumetrically. It is extensively and successfully used in pumping all grades of heavy viscous material such as molasses, asphalts, heavy Mexican crude oils, glucose, soapstock, as well as the lightest and most volatile liquids.

It may be adapted to any kind of mechanical drive. The Kinney pump may be furnished in any capacity up to 5000 gals. per minute and for any discharge pressure up to 300 lbs. gage per sq. in. All Kinney pumps will, with the suction blanked off, pull a vacuum on the suction side to within 1 in. of the barometer.

Given below are illustrations and brief descriptions of a few of Kinney types in use today.

Rotating Plunger Type Steam Jacketed Pumps.

Kinney rotating plunger type steam jacketed pump (Fig. 191) direct connected by flexible coupling through a turbo type speed reducer to a steam turbine and controlled by emergency pump governor.

Prices on application.

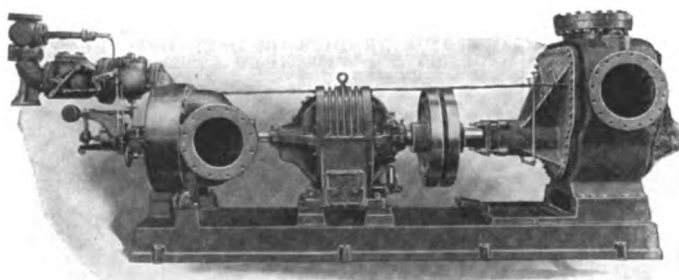


FIG. 191. KINNEY ROTATING PLUNGER TYPE STEAM JACKETED PUMP

Turbine Driven Pumping Unit.

The Kinney marine unit (Fig. 181), direct connected to a steam turbine and controlled by an automatic

pressure pump governor. Both pump and turbine are manufactured by THE KINNEY MANUFACTURING CO.

for use in marine work and are designed for fuel oil and lubricating oil. This pump is built in capacities from 10 gals. per minute at 300 lbs. pressure to 45 gals. per minute at 50 lbs. pressure. The unit is very compact, being self-contained. It is fitted with a lantern type of stuffing box which prevents all packing trouble.

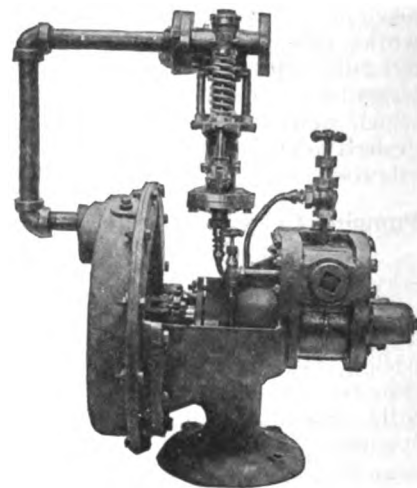


FIG. 181. KINNEY TURBINE DRIVEN PUMPING UNIT

The discharge from this pump is uniform and without pulsation. This feature is of great value in pumping fuel oil to burners for firing marine boilers. Its freedom from pulsation and smooth, uniform delivery insure long life to baffle plates and bridge walls of fire chambers.

The illustration below (Fig. 182) shows another type of Kinney turbine drive pumping unit. A high pressure unit with gear and pinion reduction and pump governor. It is particularly adapted for fuel oil burner systems of any capacity, at a working pressure up to 300 lbs. per sq. in.

Prices on application.

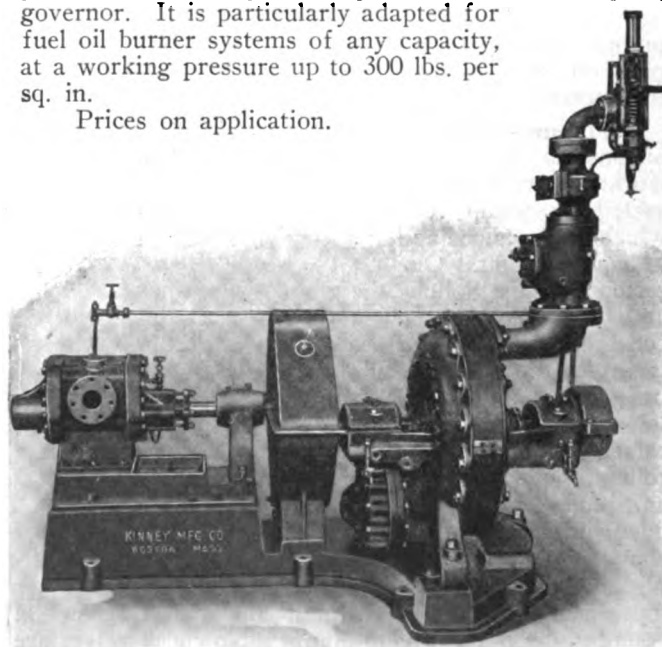


FIG. 182. KINNEY TURBINE DRIVEN PUMPING UNIT

Gasoline Engine Driven Pumping Unit.

This gasoline engine driven pump (Fig. 192) is direct connected through gear and pinion and Kinney friction oil bath clutch to a 100 h.p., 6-cylinder gasoline engine.

It is designed for handling heavy crude oil. These units are furnished in any size and capacity and for all kinds of heavy viscous materials as well as lighter fluids. Prices on application.

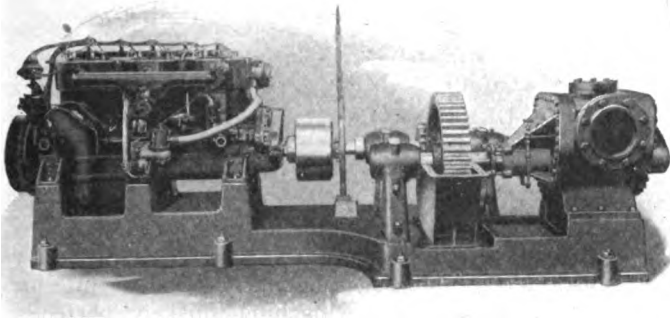


FIG. 192. KINNEY GASOLINE ENGINE DRIVEN PUMPING UNIT

Steam Jacketed Pumping Unit.

This type is furnished in any size and capacity. The illustration (Fig. 184) shows the pump connected through flexible coupling to a vertical, all enclosed type of engine with forced lubrication. This unit has the advantage of great flexibility of speed and variation of capacity.

Prices on application.

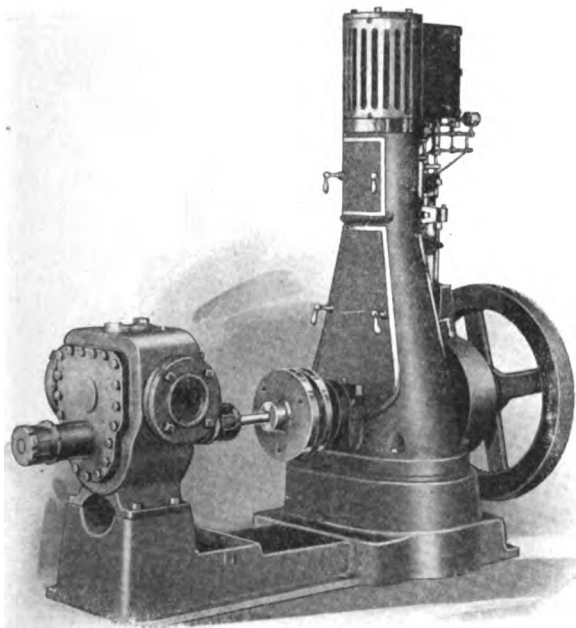


FIG. 184. KINNEY STEAM JACKETED PUMPING UNIT

Electric Driven Pumping Unit.

Pump (Fig. 194) is connected to a motor by a silent chain.

It is also furnished gear driven and is adapted for pumping all kinds of heavy viscous materials as well as liquids of a lighter gravity.

Prices on application.

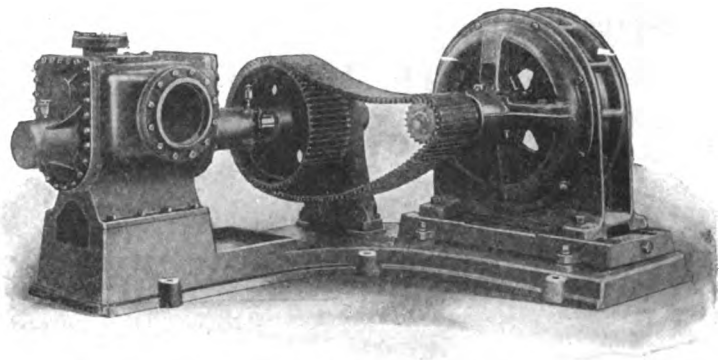


FIG. 194. KINNEY ELECTRIC DRIVEN PUMPING UNIT

Belt Driven Pump with Tight and Loose Pulleys.

This type of pump (Fig. 195) is furnished in any size and of any capacity, and is adapted for handling all heavy viscous materials as well as liquids of lighter gravity.

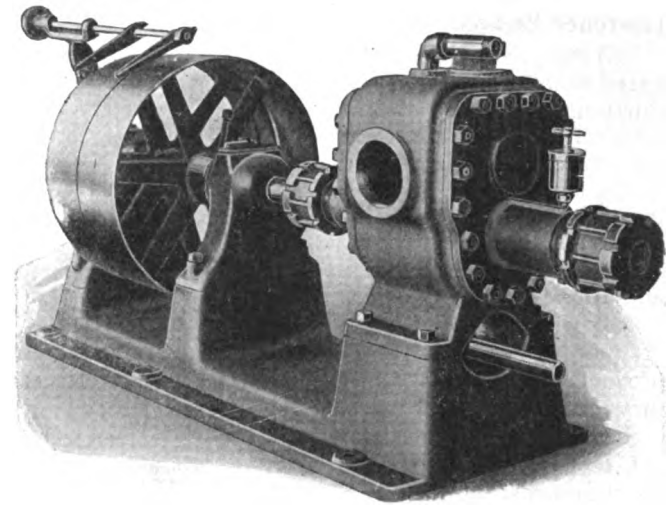


FIG. 195. KINNEY BELT DRIVEN PUMP WITH TIGHT AND LOOSE PULLEYS

Strainers.

Both the plain and steam jacketed strainers are furnished in any size. The steam jacketed type is particularly adapted for use in connection with the pumping of heavy viscous materials where heat is required to keep the material in a fluid state.

Strainers are of the basket type. When basket is removed, all insoluble matter is removed with it.

Prices on application.

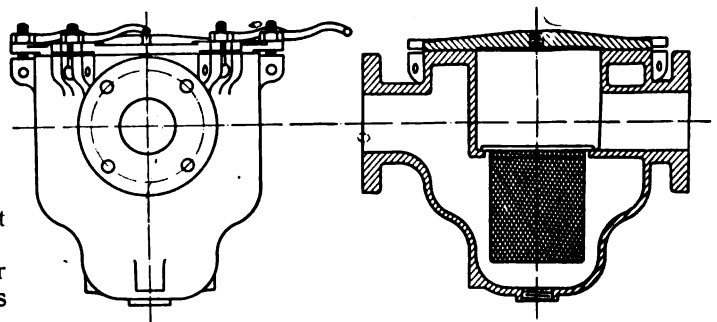


FIG. 164. DETAILS OF KINNEY STRAINER

ESTABLISHED 1882

THE LAWRENCE MACHINE COMPANY

Improved Centrifugal Pumping Machinery

MAIN OFFICE AND FACTORY
LAWRENCE, MASS.

NEW YORK OFFICE: 30 Church Street

SELLING AGENTS

BOSTON, MASS., LENANE SUPPLY Co., 261 Franklin Street

NEW ORLEANS, LA., A. BALDWIN & Co., Ltd.

Products.

IMPROVED CENTRIFUGAL PUMPING MACHINERY: Horizontal and Vertical Types, Single or Multistage, Solid or Split Casing, for all purposes.

Lawrence Pumps.

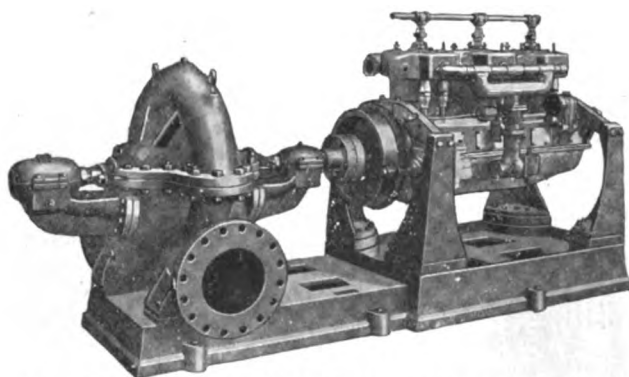
THE LAWRENCE MACHINE COMPANY has been engaged in manufacturing for thirty-nine years, during which time it has devoted its entire time and thought to the development of centrifugal pumps. The Lawrence line includes pumps for every service, any head, and for any type of drive.

Lawrence pumps are of the highest grade improved construction, and they are designed to give highest efficiency; they are not, therefore, always lowest in first cost. It has been the company's aim to pro-

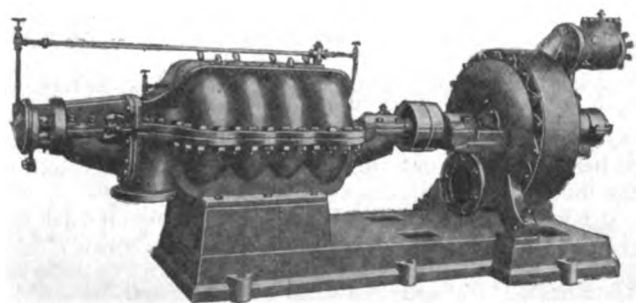
duce only high grade machinery of the most modern type.

Every part is carefully built to templates. This assures ready duplication of parts, any of which may be substituted at once without fitting. The interior surfaces of all pumps are machine finished, perfectly smooth wherever possible; all joints are planed or turned, and all parts mounted on machined surfaces. They are always in line and require no adjusting.

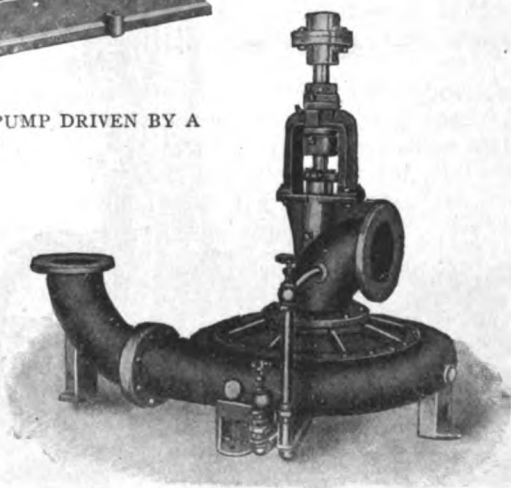
Capacity ratings are based on a velocity of approximately 10 ft. per second through the discharge orifice; the use of larger units is recommended as being more economical than increasing the discharge velocity with its resultant high friction loss.



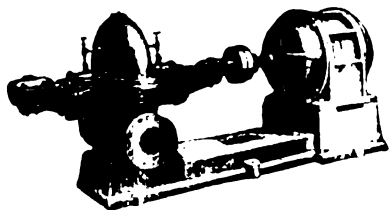
8-IN. HORIZONTALLY SPLIT CASING PUMP DRIVEN BY A GASOLINE ENGINE



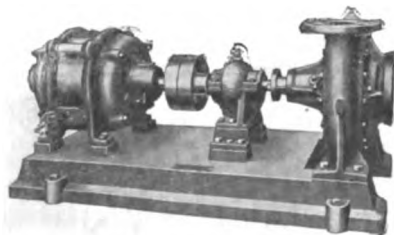
LAWRENCE MULTISTAGE PUMP



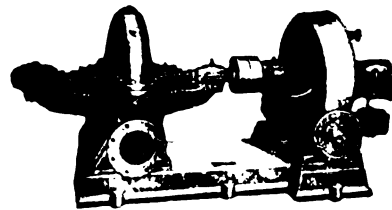
10-IN., VERTICAL, TOP SUCTION PUMP



IMPROVED 5-IN. DOUBLE SUCTION
SINGLE STAGE PUMP
Horizontal split casing



SINGLE SUCTION SOLID VOLUTE
PUMP



IMPROVED 8-IN. DOUBLE SUCTION
SINGLE STAGE PUMP
Horizontal split casing

SWEET'S CATALOGUE

Continued on next page

Accessories.

Lawrence pumps are furnished complete with driving pulley, steam engine or turbine, motor, gasoline engine or other special drive as desired. They are also furnished mounted for the later addition by the purchaser of any special motive unit desired.

The company is prepared to quote net prices on exhaust ejectors, suction and discharge pipe, reducers, elbows, valves, etc., as may be required in connection with its pumping machinery.

Special Purpose Pumps.

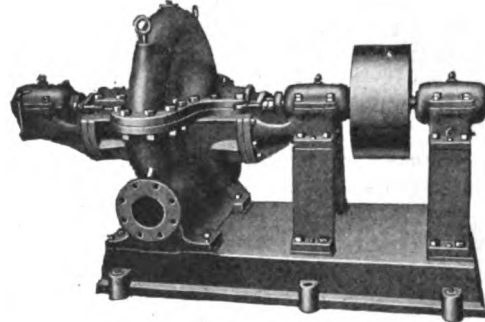
Pumps for many special purposes form part of the standard line and can be supplied from stock designs. Included in this class are sugarhouse and other heavy liquid pumps; sand and dredging pumps; irrigation pumps; contractor's portable, gasoline engine driven pumps; and automatic, electrically operated sump or other intermittent service pumps. A few of these special types are illustrated herein.

Service.

This company is in a position to be of valuable assistance to all parties considering the use or installation of centrifugal pumping machinery. It is always

pleased to give its customers the advantage of the knowledge and experience gained through many years of designing, building, erecting and installing centrifugal pumps.

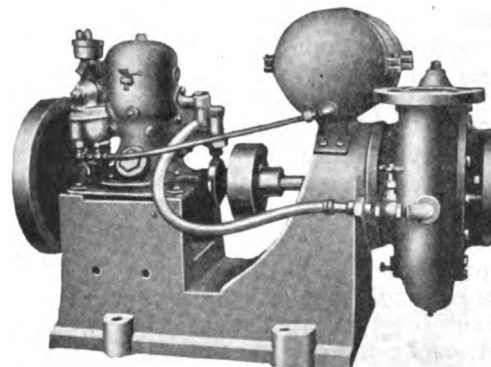
When requesting information or advice, and when ordering, the fullest possible information should be given, including: suction and discharge heads; viscosity and temperature of liquid; a diagram showing relative direction of suction and discharge, looking at pump from side or end farthest from the drive; power available; and speed of line shaft, motor or engine, if supplied by purchaser.



BELT DRIVEN SPECIAL HEAVY PUMP FOR SUGARHOUSE SERVICE



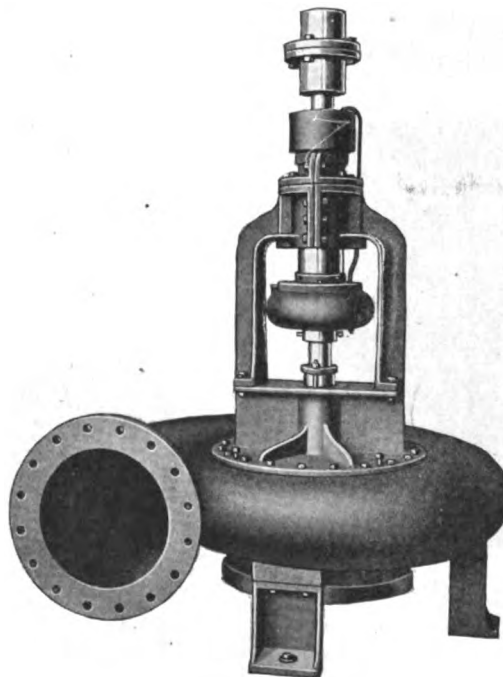
48-IN. DRAINAGE AND IRRIGATION PUMP



GASOLINE ENGINE DRIVEN PORTABLE UNIT FOR CONTRACTORS' USE



8-IN. VERTICAL TYPE MULTI-STAGE PUMP



LAWRENCE VERTICAL PUMP
Bearings are self-oiling marine type thrust bearing



AUTOMATIC SUMP PUMP
For handling seepage, bilge water or sewage

LEA-COURTENAY COMPANY

Manufacturers of Centrifugal Pumping Machinery

15 Maine Street
NEWARK, N. J.

BRANCHES IN PRINCIPAL CITIES

Products and Services.

CENTRIFUGAL PUMPS which include: Double Suction Single Stage Pumps; Single Suction Multistage Pumps; Underwriters' Fire Pumps.

Also manufacturers of House and Tank Pumps; Spray Pumps and Gasoline Driven Portable Pumping Sets.

LEA-COURTENAY COMPANY maintains a corps of engineers who are experts in their line. Their services are available, without obligation, for the solution of pumping machinery problems and for the selection of pumps which will properly fulfill requirements. Lea-Courtenay pumps are manufactured in standard sizes, all parts being practically interchangeable. Impellers, however, are always made to suit individual conditions.

Description.

Lea-Courtenay pumps are furnished with motor, turbine and gasoline engine drive; with capacities from 100 to 7500 gals. per minute, at any head up to a total head of 1000 ft. They handle hot and cold liquids of any consistency; are made of cast iron and of special bronze mixtures for mine water.

Tests.

To prove their ability to perform the service for which they are intended, all pumps made by this company are subjected to severe and rigid tests in a separate test plant, equipped with the most modern appliances, including a complete set of Venturi meters. Pumps are tested under actual service conditions; i. e. for boiler feed work, the pumps are tested with hot water at the temperature for which the pump has been ordered, and with a total head on the suction side to correspond exactly with that the pump is to work against.



FIG. 325. TESTING A LEA-COURTENAY 8-IN., 5-STAGE, ALL-BRONZE PUMP—ONE OF TWO FURNISHED A LARGE PENNSYLVANIA COAL COMPANY

Note the variable speed turbine, special reduction gear set and the Swiss torsion dynamometer

In testing all pumps a Swiss torsion dynamometer is used, which this company considers the only accurate means of measuring brake horsepower. It is more defi-

nite than a curve made by a motor manufacturer which is correct for one speed and load only and which requires allowances for different conditions. By the Lea-Courtenay method of testing, *the actual brake horsepower is secured on every individual pump* that is shipped from the plant.

Lea-Courtenay Single Stage Pumps—known as Double Suction Volute.

Designed with and without diffusion vanes. The main case consists of only two parts and is horizontally split, with the suction and discharge always in the bottom half so that the top half may be easily removed without disturbing the suction and discharge pipe connections. All parts are easily accessible and pumps are bronze fitted throughout. On account of the double suction type of impeller taking water from both sides, this type of pump works in almost perfect hydraulic balance and is free from end thrust.

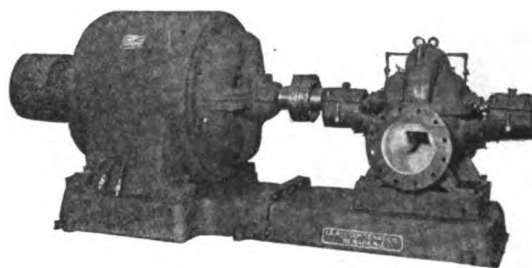


FIG. 474. LEA-COURTENAY 12-IN. DOUBLE SUCTION VOLUTE PUMP DIRECT CONNECTED TO 400 H. P. MOTOR
Delivering 4500 gals. per minute against 241-ft. head at 1750 r.p.m.

Double suction volute pumps are adaptable for a large range of uses. For irrigation and reclamation service, where large quantities of water are to be raised to moderate heads, they give excellent service. In power plants, they are used to advantage with steam turbine drive for general service against moderate pressures. Large packing houses are also using both steam turbine and motor driven single stage pumps for circulating brine. In large hot water heating plants the single stage pump fulfills all requirements for circulating water.

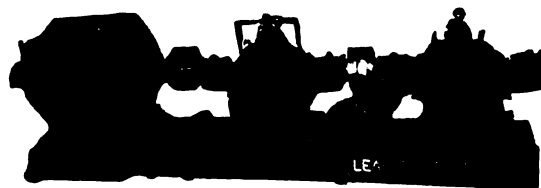


FIG. 488. LEA-COURTENAY 8-IN. WATER WORKS UNIT
Consisting of two pumps in series driven by motor, for water quantity of 2000 to 2500 gals. per minute against 300- to 350-ft. head

Single stage pumps have been built by this company for heads as high as 285 ft.; without diffusion vanes; running at 1750 r.p.m. Very desirable pumps for water works service where motor drive is the chief form of power.

Lea-Courtenay Single Suction Multistage Pumps.

The single suction multistage pumps without diffusion vanes are designed particularly for high head continuous duty, as will be seen from Fig. 518. The 5-in. and larger sizes all have heavy holding-down bolts between the stages to cut down the leakage from stage to stage, thereby maintaining the efficiency and pressure continuously. The intake up to the impeller on this type of pump is such, that when the water leaves the impeller it is not guided into the second impeller by return passages constructed with vanes of various types, but it is simply discharged into a volute (practically the same as in the double suction volute single stage pumps), and is led into the second impeller without shock loss. The velocity head is transformed into pressure head in such a manner that an extremely high efficiency is maintained. All multistage pumps are hydraulically balanced in a very simple way, without intricate mechanism, positively, and as fully described in special bulletins.

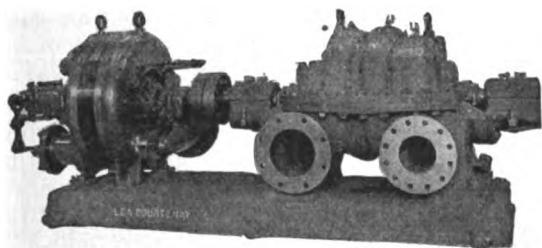


FIG. 518. LEA-COURTENAY 6-IN. 3-STAGE TANDEM BALANCED MULTISTAGE PUMP DIRECT CONNECTED TO STEAM TURBINE

Normal conditions 1000 gals. against 300 lbs. pressure at 2500 r.p.m.

Lea-Courtenay Centrifugal Fire Pumps.

Built in accordance with specifications of the Associated Factory Mutual Fire Insurance Companies, National Board of Fire Underwriters and National Fire Protective Association, covering requirements for a simple and absolutely dependable fire pump, operated by means of power secured from outside sources.

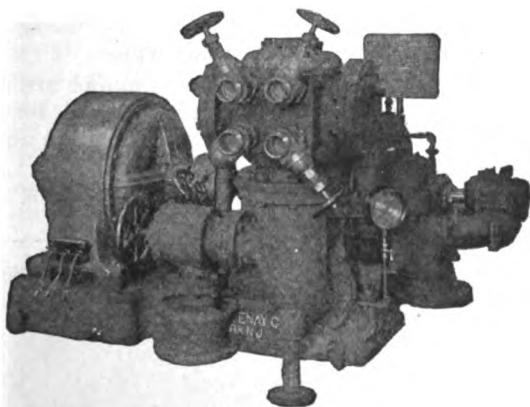


FIG. 786. LEA-COURTENAY STANDARD 1000-GAL. MOTOR DRIVEN UNDERWRITERS' FIRE PUMP

Designed for all pressures and built on National standard specifications. Has been approved by all Underwriter Boards and is made in sizes of 500, 750, 1000 and 1500 gals.

In addition to the standard pump shown, special designs have been developed and are in service, meeting requirements of local ordinances.

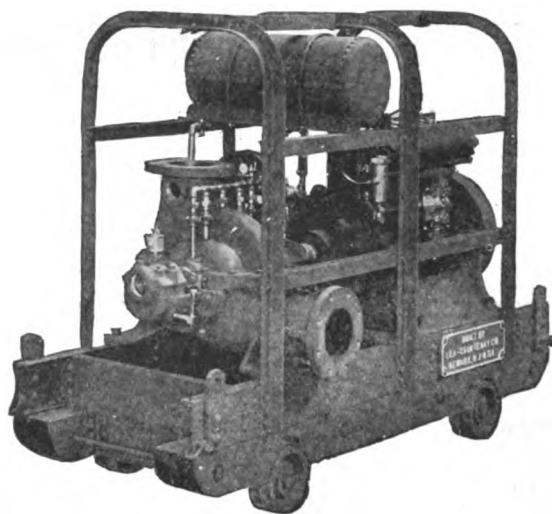


FIG. 473. LEA-COURTENAY SPECIAL SELF-CONTAINED GASOLINE ENGINE DRIVEN PUMP UNIT

One of a number furnished to the United States Government for salvaging ships. Very desirable for emergency pumping of various kinds. Two of these units are now in use in Norfolk, Va., pumping 11,000 gals. of water a minute to meet temporary needs of the city water supply.

Fire pumps installed, if desired, and advice given as to requirements which must be met in any part of the country and any auxiliary apparatus to meet requirements of installation.

A specially designed fire pump unit, gasoline engine driven, has been perfected for isolated conditions where only one source of power is available, either electric or steam turbine, and where it is necessary to have a stand-by unit. This unit is accepted by the underwriters for special requirements.

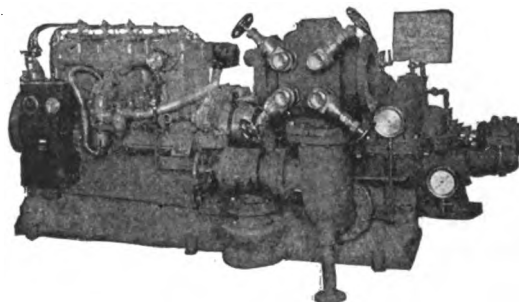


FIG. 789. LEA-COURTENAY SELF-CONTAINED GASOLINE ENGINE DRIVEN FIRE PUMP UNIT

Delivering 1000 gals. under 100 lbs. pressure at 1200 r.p.m. Complete with self-starting equipment

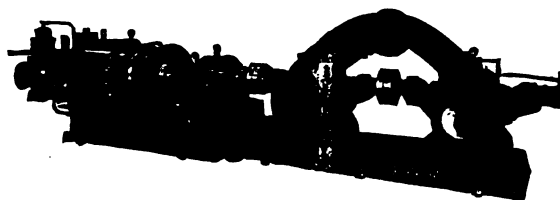


FIG. 476. LEA-COURTENAY 10-IN. PUMPS ARRANGED IN SERIES

Delivering 3000 gals. per minute against 180 lbs. pressure. This arrangement is very desirable where gritty water is handled at extremely high heads or under conditions where a hydraulically balanced pump could not be used, yet where a pumping unit of very high efficiency is required.

MANISTEE IRON WORKS COMPANY

Manufacturers of Centrifugal Pumps

MANISTEE, MICH.

OFFICES IN ALL LARGE CITIES

Products.

ROTURBO CENTRIFUGAL PUMPS.

Also manufacturers of Fire Protection Pumps, House or Tank Pumps, Vacuum Pumps, Pumping Sets, etc.

For Roturbo Rotary Jet Condensers and Air Pumps, see page 798.

Roturbo Centrifugal Pumps.

The most salient feature of the Roturbo centrifugal pump is the patent pressure chamber impeller, upon which are based several distinctive and unique features.

The Patent Pressure Chamber Impeller—The construction of this impeller, which, instead of being a flat disk runner with the main object of securing velocity of the liquid that is afterwards converted into pressure head in the diffusers or volute, is designed in the form of a drum or pressure chamber—the object aimed at being to secure a constant pressure inside of the revolving impeller equivalent to the pressure required. The impeller having a large capacity, the water inside, as it approaches the rim, becomes practically stationary, relative to the impeller—thus eliminating

frictional losses and wear and generating force directly.

In the rim of the impeller there is arranged a series of turbine blades, which, owing to the extremely rearward direction in which they point, direct the course of the water so that it has a turbine effect upon the impeller, that increases as the volume increases.

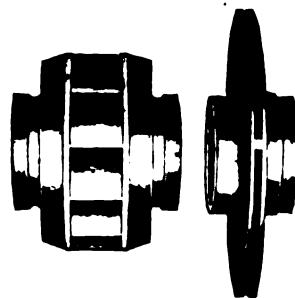
Advantages—The result of this turbine effect is to transfer the power, which would otherwise be absorbed by the driving mechanism, to the rim of the impeller, making a comparatively flat efficiency curve. Also, an extremely flat brake horsepower curve and a gradually drooping head and volume curve are obtained without artificially “choking” the flow of water through the impeller.

A unique manner of directing the flow of water through the pump is used to place the shaft in hydraulic balance. This accomplishes the purpose perfectly without the use of “balancing pistons or posts” in the impeller, eliminating causes of trouble and furthering simplicity of construction.

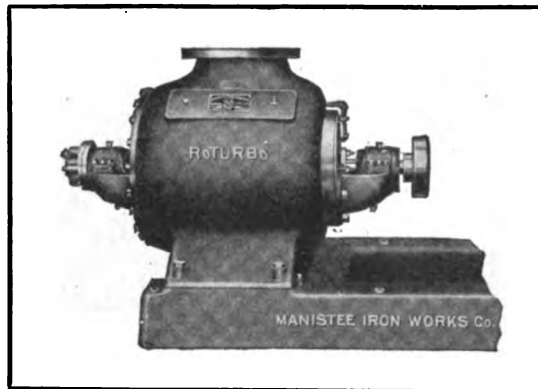
Sizes and Types.

Roturbo pumps are made in all sizes, for all services, for any type of drive to suit existing conditions.

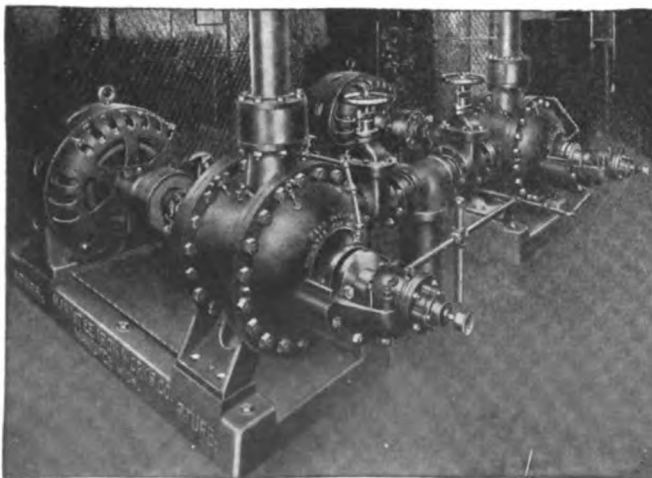
Send for catalogues.



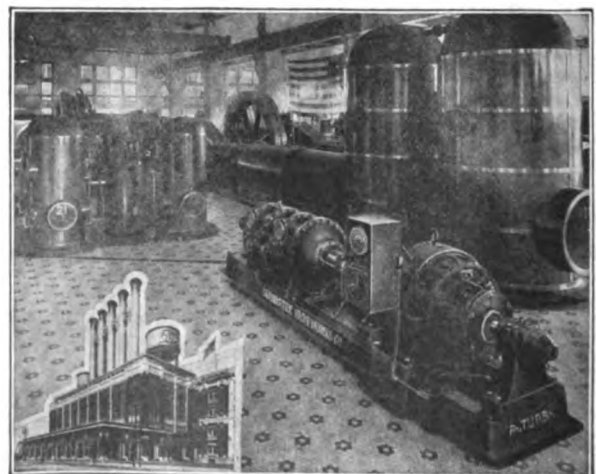
LEFT—ROTURBO IMPELLER
RIGHT—ORDINARY FLAT
DISC IMPELLER



SINGLE STAGE PUMP



4-STAGE PUMPS—ELEVATOR SERVICE



8-STAGE PUMP BOILER FEED

NATIONAL TRANSIT PUMP & MACHINE COMPANY

N. A. NEWTON, GENERAL SALES MANAGER

Manufacturers of Oil and Gas Pumping Machinery

HOME OFFICE AND WORKS

OIL CITY, PA

DISTRICT OFFICES

NEW YORK, N. Y., 30 Church Street
PHILADELPHIA, PA., DeLong Building
KANSAS CITY, MO., Reliance Building

PITTSBURGH, PA., Farmers Bank Building
CLEVELAND, OHIO, Park Building
DENVER, COLO., Foster Building
HOUSTON, TEX., Mason Building

AGENCIES

BALTIMORE, MD., MORTON McI. DUKEHART & Co., INC.,
Light Street and Key Highway
BEAUMONT, TEX., E. L. WILSON HARDWARE Co.
CASPER, WYO., CASPER SUPPLY Co.
CHARLOTTE, N. M., THOS. B. WHITTED
LITTLE ROCK, ARK., POWER EQUIPMENT Co.
LOS ANGELES, CAL., ASSOCIATED SUPPLY Co.

MINNEAPOLIS, MINN., L. E. POLLARD Co., 423 Fifth Street,
South
NEW ORLEANS, LA., GLOBE SUPPLY & MACHINE Co.
ST. LOUIS, MO., REEVES & SKINNER MACHINERY Co.
SALT LAKE CITY, UTAH, F. C. RICHMOND MACHINERY Co.
SAN FRANCISCO, CAL., ASSOCIATED SUPPLY Co.
TULSA, OKLA., FRICK-REID SUPPLY Co.

Products.

DIRECT ACTING STEAM PUMPS; POWER PUMPS.

Also manufacturers of Horizontal and Vertical Marine Pumps, Crank and Flywheel Pumping Machinery, Gas Engines, Gas Engine Driven Natural Gas Pumping Units, Pipe Line Tools and Equipment.

Services.

This company invites the attention of prospective pump purchasers to its products. For over forty years the company has been producing pumps of the better kind, having in view cheaper pumping service rather than cheap pumps. Every opportunity to help in the solution of pumping problems is welcomed.

Direct Acting Steam Pumps.

A complete line of trade pumps is manufactured covering all general service requirements. Working pressures from 75 to 200 lbs. Tube or removable brass liners, depending on the character of material pumped.

Also our famous Klein type, duplex piston pumps, good for working pressures up to 500 lbs.

The design of these pumps is such that all parts are easily accessible for inspection and repair, and the fluid passages are large and direct with ample valve area.

pump. Also for high pressures, 300 lbs. and over, we recommend plunger type pumps. Stuffing boxes at each end are easily and quickly accessible. Moving parts are easily removable.

Transit plunger pumps are made in every standard size, with working pressures up to 2500 lbs.

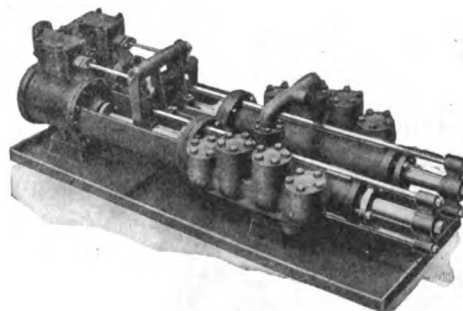


FIG. 116. HORIZONTAL DUPLEX, DIRECTING ACTING, END PACKED PLUNGER STEAM PUMP, POT VALVE TYPE

Vertical Triplex Power Pumps.

Built for pressures up to 1000 lbs. Pumps of this type can be furnished for any service, in sizes up to 6 by 18 in.

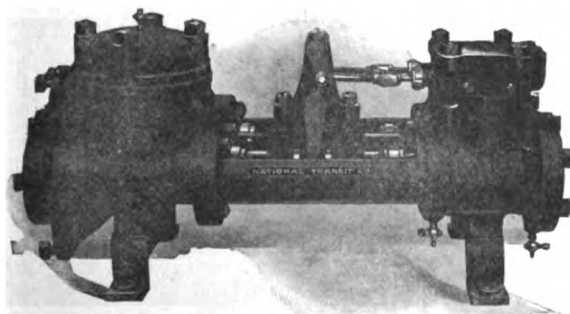


FIG. 627. HORIZONTAL DUPLEX DIRECT ACTING STEAM PUMP, GENERAL SERVICE TYPE

Plunger Type Pumps.

Where the fluid pumped contains more or less grit, a plunger type pump is more to be desired than a piston

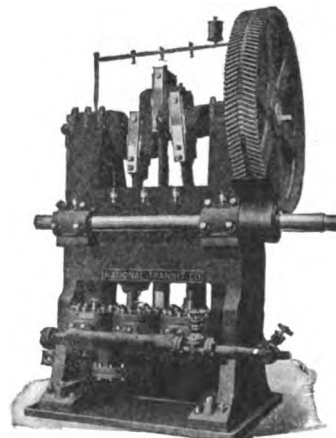


FIG. 521. VERTICAL TRIPLEX SINGLE ACTING POWER PUMP, POT VALVE TYPE

MIDWEST ENGINE COMPANY

Pumps and Turbines

INDIANAPOLIS, IND.

BRANCH OFFICES

ANDERSON, IND.
BIRMINGHAM, ALA.
BALTIMORE, MD.
BOSTON, MASS.
CLEVELAND, OHIO

CHICAGO, ILL.
DENVER, COLO.
DETROIT, MICH.
EL PASO, TEX.
HOUSTON, TEX.
SEATTLE, WASH.

KANSAS CITY, MO.
LITTLE ROCK, ARK.
NEW YORK, N. Y.
NEW ORLEANS, LA.
PHILADELPHIA, PA.
TULSA, OKLA.

PITTSBURGH, PA.
SAN FRANCISCO, CAL.
SALT LAKE CITY, UTAH
ST. LOUIS, MO.
ST. PAUL, MINN.

Products.

PUMPS: Acid Resisting; Boiler Feed; Centrifugal, Turbine and Volute; Deep Well Centrifugal, Axial and Reciprocating; Fire, Power, Water Works.

STEAM TURBINES.

Also manufacturers of Turbo Blowers and Generators.

Dependable Power.

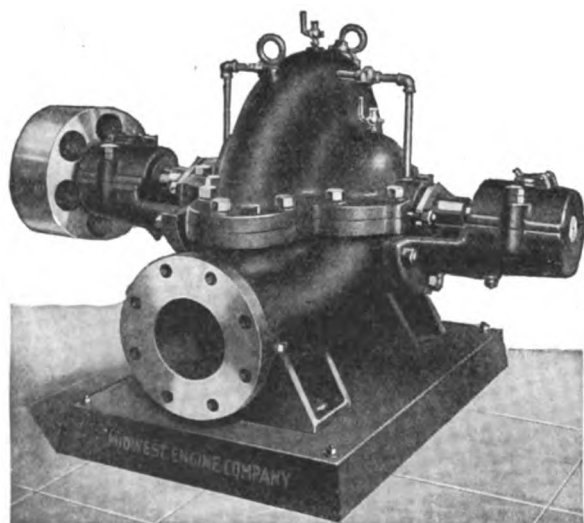
The production facilities of the MIDWEST ENGINE COMPANY, from original design to final test, are complete in every detail. They represent forty-eight years of experience devoted to the manufacture of power apparatus and have established for this company a reputation for producing dependable power.

Single Suction Pumps.

Built in 1 to 20 in. sizes. Horizontal and vertical, heads up to 80 to 125 ft. Any form of drive. A low-price dependable pump.

Double Suction Centrifugal Pumps.

Sizes 1½ to 36 in. Horizontal or vertical. Volute or diffuser types. Heads up to 230 ft. Any form of



DOUBLE SUCTION CENTRIFUGAL PUMP

drive. Simple in design, rugged in construction and highly efficient.

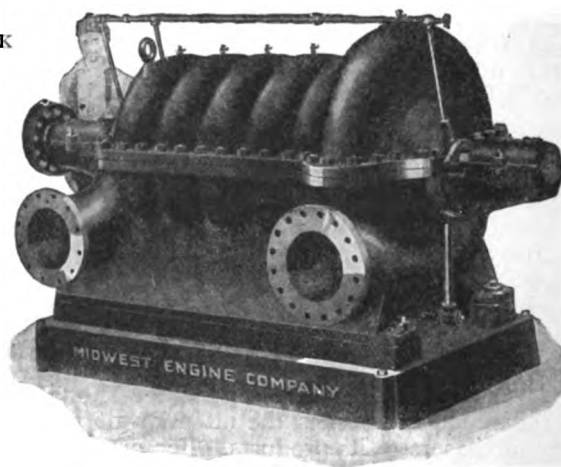
Multistage Centrifugal Pumps.

Sizes, 1½ to 12 in., 2 to 6 stages. Horizontal or vertical. Volute or diffuser types. Heads from 230 to 1400 ft. Any form of drive. Used for elevator service, boiler feeding, fire pump, and all mine hydraulic



TRADE-MARK

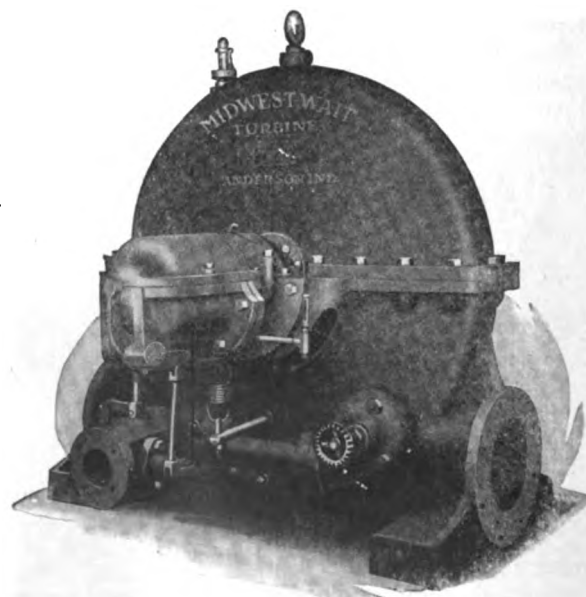
work where high heads or pressures and highest efficiencies as well as continuous service are demanded.



MULTISTAGE CENTRIFUGAL PUMP

Steam Turbines.

Single or multistage. Multiple velocity stage type. For driving pumps, electrical generators, blowers, exhaust fans and other auxiliaries. Sizes 1 to 1000 h.p. Midwest turbines combine perfect design, distinctive features, high economies, heavy construction, and common sense.



STEAM TURBINE

Acid Resisting Mine Pumps.

The MIDWEST ENGINE COMPANY makes all types of pumps of Meco metal, an ideal acid resisting metal. Meco metal pumps successfully withstand the corrosive action of sulphuric acid mine water *regardless of its strength*.

Meco metal is an exclusive Midwest product backed by Midwest dependability.

If there are bad sulphuric acid water conditions, the installation of a Midwest Meco metal pump will eliminate replacements and increase profits.

Boiler Feed Pump.

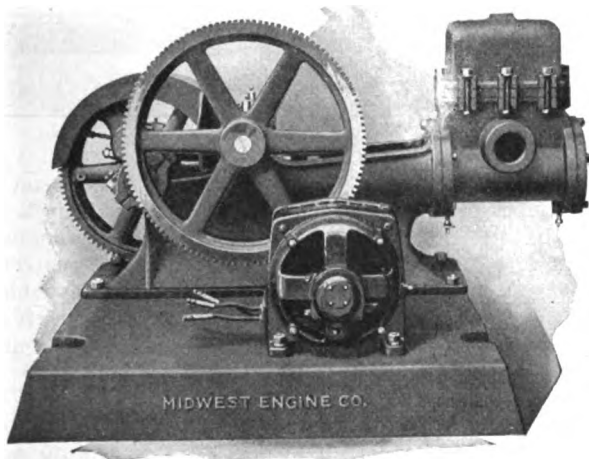
Made only in the centrifugal type. Sizes, 1½ to 12 in., 2 to 6 stages, for all boiler pressures. Arranged for any form of drive. Direct connected to a Midwest-Wait turbine, makes an ideal and very popular unit.

Underwriters' Fire Pump.

Sizes, 500, 750, 1000, 1500 gals. Centrifugal multi-stage type. Any form of drive. Furnished with standard underwriters' fittings.

Single Geared Power Pumps.

Power driven, double acting and built in various capacities from 6 to 160 g.p.m. Made with or without



SINGLE GEARED POWER PUMP

truck for mounting. Any form of drive. A heavy pump throughout that is built for hard service.

Duplex Geared Power Pumps.

Power driven, double acting. Wide range of sizes. Any form of drive. Designed and built for general hard service.

Deep Well Pumps.

Reciprocating, centrifugal deep well, axial deep well types. For well sizes up to 26 in. Belted or



DEEP WELL PUMP

motor driven heads. Well designed and built for continuous service.

Pneumatic Water Systems.

Complete electric automatic water systems in various sizes for mines, factories, residences, etc.

Midwest Standards.

- (1) A thorough knowledge of design.
- (2) Years of experience in building steam and hydraulic equipment.
- (3) Complete manufacturing facilities.
- (4) Highest grade of raw materials.
- (5) Thoroughly competent mechanics.
- (6) Complete inspection system.
- (7) Completely equipped testing laboratory for testing apparatus *under actual operating conditions*.
- (8) Efficiencies guaranteed actually made.

Service.

Our years of experience and engineering assistance are at your service.

We believe when Midwest apparatus is bought our responsibility begins. Satisfying service right from the start.

Any Midwest apparatus is guaranteed to give continued service.

MORRIS MACHINE WORKS

Hydraulic Dredging Machinery and Centrifugal Pumps

MAIN OFFICE AND WORKS
BALDWINVILLE, N. Y.

BRANCH OFFICES

NEW YORK, N. Y., HUNGERFORD BROS. & Co., 39-41
Cortlandt Street
CHICAGO, ILL., HENION & HUBBELL, 217-221 North
Jefferson Street
HOUSTON, TEX., H. A. PAINE
CHARLOTTE, N. C., Realty Building
PITTSBURGH, PA., HARRIS PUMP & SUPPLY Co.
BOSTON, MASS., STARKWEATHER & BROADHURST, 53 State
Street
BUFFALO, N. Y., ROOT, NEAL & Co.
CLEVELAND, OHIO, STRONG, CARLISLE & HAMMOND

TORONTO, CAN., STOREY PUMP & EQUIPMENT Co.

KANSAS CITY, MO., ENGLISH TOOL & SUPPLY Co.
ST. LOUIS, MO., N. O. NELSON MFG. Co.
NEW ORLEANS, LA., JOHN H. MURPHY IRON WORKS
CHARLESTON, S. C., CAMERON & BARKLEY Co.
TAMPA, FLA., CAMERON & BARKLEY Co.
SAN FRANCISCO, CAL., HARRON, RICKARD & McCONE
LOS ANGELES, CAL., HARRON, RICKARD & McCONE
SEATTLE, WASH., PUGET SOUND MACHINERY DEPOT
PORTLAND, ORE., GORDON & FINKHEIMER
ST. PAUL, MINN., ROBINSON, CARY & SANDS
PHILADELPHIA, PA., JACOB SHANNON & Co.

Products.

HYDRAULIC DREDGES; DREDGING PUMPS: Steam, Belt or Electric Motor Driven, Lined or Unlined.

DREDGING and PUMPING ACCESSORIES: Suction Hose; Ejectors; Flap and Foot Valves; Iron Elbows; Suction and Discharge Pipe; Flanges and Increasers.

STANDARD CENTRIFUGAL PUMPS for handling Water or Sewage: Belt, Steam, Turbine, Electric or Gasoline Motor Driven; Horizontal or Vertical Shaft; Submerged or Side or Double Suction Type; Single Stage or Multi-stage; Low or High Lift; High or Low Pressure; Horizontal Split.

Also Steam Engines: Single Cylinder Stationary and Marine Type, Single Cylinder, Compound, Triple Expansion, Vertical and Horizontal Types.

Special Centrifugal Pumping Outfits can be furnished complete, including driving engine, turbine or motor, or the pump only, adapted to engine or motor furnished by customer.

Experience.

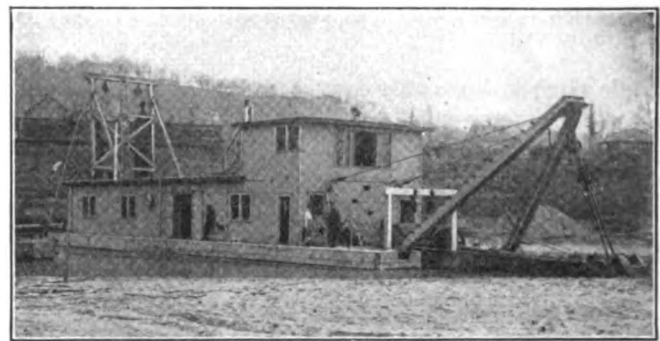
During the 57 years devoted to this line of work, Morris experience has covered all services for which centrifugal pumps are used. Over 60,000 Morris pumps are in service in this country and abroad.

Hydraulic Dredging.

The hydraulic or suction dredge has been proved to be the most economical in handling sand, gravel, silt, mud, clay, loam, etc.; in fact, all classes of material, except solid rock. It not only dredges the material, but, with one operation, also delivers it to the desired point, and, besides, no other type dredge has the enormous capacity of some hydraulic dredges that are in service. The cost of the dredge, considering its capacity, is less than any other type. Morris dredging pumps have, in the Government dredges on the Mississippi River, handled over 3,000 cu. yds. of material per hour.

In operation, the dredging pump creates a partial vacuum in the suction pipe, producing a strong velocity of water in it, sufficient to draw in the material and keep it moving; the pump also produces the pressure necessary to force through the discharge pipe line to distance desired, and at the same time elevates to reasonable height.

Where the sand and gravel lie loose and the suction force of the pump is sufficient to draw it into the pipe without the aid of an agitator, the dredge becomes exceedingly simple. It consists principally of the dredg-



20-IN. DREDGE

ing pump with its driving equipment mounted on a scow; the suction being a pipe of sufficient length to reach to the bottom, with a piece of flexible suction hose in it to give necessary flexibility. The material is delivered into a flat deck scow with raised sides which retain the sand, and the water flows back into the river. Sometimes these dredge boats are self-propelling and provided with hoppers into which the material is pumped.

For general dredging service where all classes of material will be handled, it is necessary to use an agitator or cutter to cut and loosen the material before drawing it into the suction pipe. The suction pipe is mounted within a structural steel ladder, of suitable length and of heavy proportion, hinged to the dredge. The cutter is provided with a series of cutting blades and mounted on a powerful shaft supported on the ladder, and driven through gearing from an independent engine. If properly constructed, even shale rock can be dredged.

Naturally the dredge is most efficient when handling the greatest amount of material with the least amount of water. By the use of the rotary cutter and by systematically swinging the dredge and moving forward on the spuds, which are arranged in the stern as anchors, the amount of material fed to the pump can be regulated so that the maximum percentage of material is constantly carried.

PUMPS—Dredges are usually equipped with either 12-, 15-, 18-, or 20-in. pumps, the 20-in. having become a standard. The capacity of a pump depends on size, character of material and available power. In average dredging, allowing for delays, the output may be estimated at from 10% to 15%.

The power required to drive the dredging pump depends on the elevation to which the material is to be

raised, the length of delivery pipe, and character of material. For most economical operation the velocity through the pipe line should not be higher than is just necessary to carry the material satisfactorily. The practical maximum discharge pressure is from 45 to 55 lbs. For a long pipe line it is necessary to use relay pumps. As the pump must be built with large openings to pass all classes of material, the efficiency should be largely disregarded.

ENGINES—15-in. and larger dredging pumps are usually direct connected to compound or triple expansion engines, but can be connected to electric motors. Complete dredges have been built by this company, in which dredging pump, cutter, hoisting engine and all machinery is operated by electricity. An electric dredge requires a smaller working force than a steam dredge.

MORRIS MACHINE WORKS design and build complete dredges, including pump and driving engine, the hull and all machinery required, for steam or electricity.

Dredging Pumps.

BELT DRIVEN—This standard pump is the result of years of manufacturing dredging pumps and is very heavy and strong for average service. The pump shell is in one very heavy casting, with extra metal in parts most subject to wear. A removable disc is fitted to the suction side of the shell, giving easy

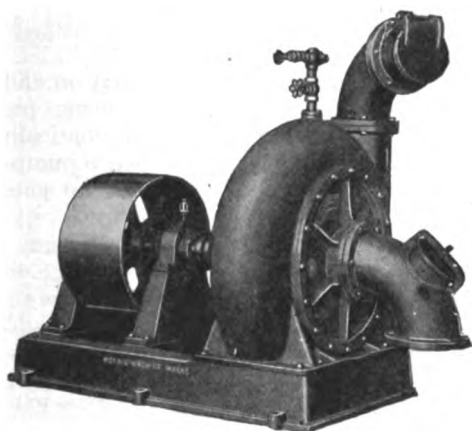
access to the interior or for the removal of the impeller. The impeller is of large size for moderate speed, with ample space between it and pump shell so that stones can not get wedged in.

Adjustable stuffing box bearing is of large size, fitted with water injection to keep sand out. Extra heavy frame and shaft pillow block have ample bearing surface. Pumps are regularly furnished complete with suction and discharge elbows, flap valve and ejector for priming.

STEAM DRIVEN—Standard dredging pumps are also furnished direct connected to single and double vertical simple engines. They are largely used by contractors in pumping out excavations, etc., on account of their ability of passing large solids.

Solid Lined Dredging Pumps (Patented).

This pump was designed for handling tailings or slimes in connection with gold recovery plants. A number are in use in this and foreign countries, and hundreds in South Africa. It has also found extensive use for ordinary dredging.

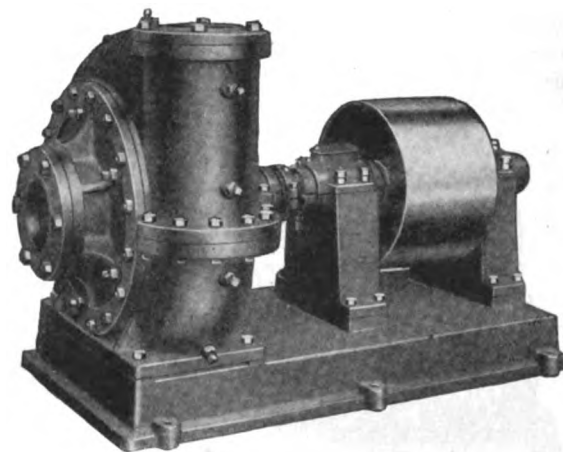


NEW SPECIAL HYDRAULIC SAND AND DREDGING PUMP

No. pump (diam. discharge opening), in.	Diam. suction, in.	Cu. yds. material per hour, 10% to 20% of solids			H. p. re- quired for each 10 ft. ele- vation	Will pass solids, diam., in.
		10%	15%	20%		
4	4	14	21	28	4	2
6	6	30	45	60	8	4 1/2
8	8	60	90	120	15	6
10	10	90	135	180	25	8
12	12	125	190	250	30	10
15	15	210	315	420	50	10
18	18	300	450	600	70	10
20	20	360	540	720	80	10
24	24	480	700	960	100	10
32	32	900	1350	1800	200	10
36	36	1140	1710	2280	250	12
48	48	2040	3220	4080	450	12

No. pump (diam. discharge opening), in.	Diam. and face of pulley, in.	Floor space required, in.	Shipping weight, lbs.	Price of pump with suction and discharge elbow, flap- valve and ejector	Price extra for steel lining
4	12x12	40x31	980	\$210.00	\$70.00
6	20x12	68x40	2125	300.00	100.00
8	24x14	72x48	3670	475.00	130.00
10	30x15	94x54	4975	600.00	170.00
12	36x20	114x66	7825	850.00	230.00
15	42x24	154x78	15200	1775.00	.....
18	43x30	160x80	16125	2000.00	.....
20					
24					
32					
36					
48					
Prices on application.					

These pumps should run at rated speeds; or for forced work, speeds can be increased by from 10% to 25%.



SOLID LINED DREDGING PUMP (PATENTED)

No. pump (diam. dis- charge opening), in.	H. p. for each ft. head	Nominal capacity, gals. per min.	Diam. and face of pulley, in.	Floor space, in.	Shipping weight, lbs.	Price manganese steel lined
2	0.1	110	8x8	46x20	625	\$245.00
3	0.22	260	10x10	47x27	1050	260.00
4	0.35	430	12x10	48x29	1150	275.00
5	0.5	700	14x10	59x33	2000	425.00
6	0.68	1000	14x12	60x38	2400	525.00
7	0.86	1350	18x14	74x44	3500	700.00
8	1.2	1800	20x14	75x47	4700	825.00
10	1.9	2800	22x16	84x50	5500	1040.00
10	1.9	2800	24x16	90x60	7000	1200.00
12	2.5	4000	24x16	92x63	9400	1700.00

No. pump (diam. discharge opening), in.	Price cast iron lined	Price extra suction elbow with bearing	Revolutions per minute for given heads					
			10 ft.	20 ft.	30 ft.	40 ft.	50 ft.	60 ft.
2	\$160.00	.....	505	715	875	1005	1125	1230
3	170.00	.....	400	570	700	805	910	985
4	185.00	\$26.00	435	610	745	865	970	1055
5	230.00	32.00	400	570	700	805	910	985
6	360.00	40.00	340	475	580	670	750	815
7	470.00	44.00	320	450	545	635	710	775
8	600.00	48.00	290	410	500	575	640	700
10	700.00	60.00	315	445	540	630	705	770
10	840.00	60.00	240	340	415	480	540	590
12	1150.00	70.00	220	315	380	440	490	540

Prices are for pumps, and do not include elbows, valves, or ejector. Extra price for suction elbow includes a bearing in elbow with pump shaft extended through pump into elbow.

Horsepower and speeds are for total head, i. e., actual elevation plus friction head in piping and fittings.

Single pumps should not be used for heads higher than 60 ft. For higher heads, use 2-stage pumps. Prices on application.

For 10-in. pump, 2 patterns: one for high speed and one for low speed as preferred.

These pumps also built with tight and loose pulleys, or with base extended for direct connection to motor.

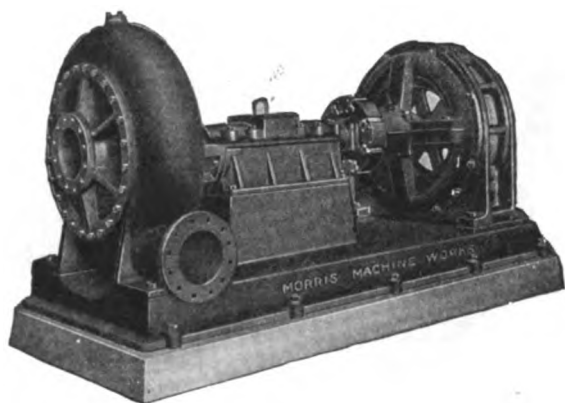
These pumps are now built in sizes from 2- to 12-in. discharge. Lining is made of manganese steel, or hard cast iron, and makes practically an independent pump enclosed within a cast iron casing. Everything is of heavy proportions; the shaft is large, the bearings of a special type, the stuffing box made to reduce the wear to the smallest possible extent.

Adjustments are made from the outside. There are no bolts or screws in the lining. No wear can come on the outer pump case, as it is completely protected by the lining. By removing the upper half of the pump shell, the lining can be taken out; or by removing the disc on the pump shell and the inner disc on the lining, the runner, of enclosed type, can be taken out.

The first cost, owing to its construction and extremely heavy proportions, is comparatively high; but when compared to its lasting qualities it will be found economical in operation.

Heavy Duty Sand and Gravel Pumps.

Designed for severe service and increased output. The double enclosed thrust bearing operating in oil eliminates troublesome thrust. The shell is extra heavy at points of wear. Stuffing box is arranged for water circulation. This type is also built for belt drive and direct connected to steam engine.



10-INCH HEAVY SERVICE DREDGING PUMP DIRECT CONNECTED TO 125 H.P. ELECTRIC MOTOR

Morris Dredging and Pumping Accessories and Parts.

Each individual unit or part of Morris machinery is designed and manufactured with uniform care, which insures machines of mechanical perfection and rugged construction. The MORRIS MACHINE WORKS guarantees its products as to design, materials and workmanship.

The Morris engineering department is at the service of clients who are in need of advice on pumping problems.

SUCTION HOSE—For contractors' and dredgers' use, a "smooth bore" rubber hose is recommended for suction purposes. Sizes above 18 in. can be made to order in any length required at 10 days' notice. Hose is furnished complete with nipples, bands and flanges for making connections to pump.

PRICE LIST OF SUCTION HOSE

Size, in.	2	3	4	5	6	7	8	9	10	12
Price, per ft.	\$2.60	4.50	6.50	8.50	10.50	13.50	16.50	19.50	22.50	27.50

PRICE LIST OF DOUBLE GALVANIZED SPIRAL RIVETED PIPE FOR SUCTION

Size, in.	3	4	5	6	7	8	9
Price, per ft.	\$0.55	0.80	1.10	1.35	1.55	1.90	2.25

Size, in.	10	12	14	15	18	22	24
Price, per ft.	\$2.90	3.50	4.50	4.90	7.10	12.00	14.00

SPIRAL RIVETED PIPE, DIPPED IN ASPHALTUM (RECOMMENDED FOR DISCHARGE PIPE)—Can be had in lengths up to 20 ft. Flanges, gaskets and bolts are charged for extra. For shorter lengths than 5 ft. the charge is the same as for 5-ft. lengths.

PRICE LIST OF SPIRAL RIVETED PIPE, DIPPED IN ASPHALTUM

Thickness, W. G.	18						
Size, in.	3	4	5	6	7	8	9
Price, per ft.	\$0.40	0.50	0.60	0.70	0.80	0.90	1.00

Thickness, W. G.	16		14			12	
Size, in.	10	12	14	15	18	22	24
Price, per ft.	\$1.40	1.75	2.50	2.65	3.25	5.00	5.50

EJECTORS—Used in priming or charging pumps when steam can be obtained. A flap valve, enclosed flap valve or foot valve, or gate valve is used in connection with the ejector. Prices include valves for connecting.

PRICE LIST OF EJECTORS

No. and size of pump	1½ and 1¾	2 and 2½	3	4	5 and 6
No. of ejector	1	1	2	3	4
Diam. steam pipe, in.	¾	¾	¾	¾	1
Diam. delivery and suction pipe, in.	¾	¾	¾	1	1½
Price of ejector and valves	\$8.00	8.00	12.00	15.00	25.00

No. and size of pump	8 and 10	12 and 15	18	22
No. of ejector	5	6	7	5
Diam. steam pipe, in.	1	1¼	1¼	2
Diam. delivery and suction pipe, in.	1½	2	2½	3
Price of ejector and valves	\$30.00	35.00	45.00	55.00

FLAP VALVES—A flap valve is used on end of discharge pipe to prevent air from entering pipe when using ejector. It opens and closes automatically.

Enclosed flap valve is placed between pump and discharge pipe. Quotations will be made on gate valves, if flap valves can not be used conveniently.

PRICE LIST OF FLAP VALVES. (FLANGED)

No. of pump	1½	1¾	2	2½	3	4	5
Price, flap valve	\$5.00	6.00	8.00	9.00	9.00	13.00	19.00
Price, flap valve (enclosed)						\$35.00	

No. of pump	6	8	10	12	15	18	22
Price, flap valve	\$22.00	28.00	36.00	44.00	60.00	88.00	150.00
Price, flap valve (enclosed)	\$55.00	95.00	130.00	175.00	290.00	375.00	

FOOT VALVES—Placed at bottom of suction pipe to hold column of water and keep pump primed. Strainer is not furnished, unless ordered, except on iron valves, in which case no extra charge is made.

PRICE LIST OF FOOT VALVES

No. of pump	1½	1¾	2	2½	3	4	5
Price, iron foot valves	\$5.00	6.00	7.00	8.00	9.00	12.00	15.00
Price, brass foot valves	\$8.00	9.00	12.00	15.00	18.00	25.00	30.00

No. of pump	6	8	10	12	15	18	22
Price, iron foot valves	\$20.00	30.00	40.00	50.00	75.00	110.00	150.00
Price, brass foot valves	\$40.00						

PRICE LIST OF LONG RADIUS PLAIN AND SWIVEL IRON ELBOWS

Size, in.	1½	1¾	2	2½	3	4	5	6
Plain elbow	\$1.00	1.25	1.50	1.75	2.50	3.50	4.00	5.00
Swivel elbow	\$1.25	1.60	1.90	2.10	3.50	4.40	5.00	7.25
Plain elbow, with hand hole					\$4.25			6.50

Size, in.	8	10	12	14	15	18	20	22
Plain elbow	\$10.00	15.00	17.50	22.00	25.00	30.00	38.00	50.00
Swivel elbow	\$12.50	19.00	22.00	27.00	31.50	37.50	47.50	62.00
Plain elbow, with hand hole	\$12.00	17.50	20.00	26.50	30.00	36.00		

PRICE LIST OF IRON FLANGES, THREADED FOR STANDARD WROUGHT IRON PIPE

Size, in.	1½	1¾	2	2½	3	4	5
Price	\$0.50	0.60	0.70	0.80	0.95	1.25	1.50

Size, in.	6	7	8	10	12	14	15
Price	\$1.75	2.00	2.50	3.00	3.75	5.00	8.00

PRICE LIST OF IRON INCREASERS, FLANGED

Size, in. (diam. large and small openings)	1½ to 2	1½ to 2½	1½ to 2	1½ to 2½	2 to 2½	2 to 3
Length, in.	4	4	4½	4½	4½	4½
Price	\$1.50	1.70	1.85	2.10	2.50	2.90

Size, in. (diam. large and small openings)	2½ to 3	2½ to 3½	3 to 4	3 to 4½	4 to 5
Length, in.	5	5	5	5	6
Price	\$3.35	3.75	4.20	4.60	5.00

Size, in. (diam. large and small openings)	4 to 6	5 to 6	6 to 7	6 to 8	8 to 10
Length, in.	6	7½	9	9	12
Price	\$6.70	8.30	10.00	12.00	20.00

Size, in. (diam. large and small openings)	10 to 12	12 to 14	12 to 15	15 to 18	18 to 20
Length, in.	15	15	15	18	18
Price	\$25.00	28.00	30.00	40.00	47.00

Installation and Operation Morris Centrifugal Pumps.

The suction elevation or lift should be made as low as possible; the suction pipe short and direct with a minimum number of elbows or bends, and absolutely airtight. The total suction head (the actual elevation plus frictional resistances through suction piping) should not exceed 25 ft., and preferably much less. The larger the discharge pipe is and the fewer number of elbows, the less the friction head and power required to drive the pump.

Foundations are not so heavy as for a reciprocating pump, but amply rigid and strong to properly support the pump and maintain correct alignment. Pump should be correctly leveled on the foundation, and not bolted down until shaft is in line and turns freely in the bearings. If direct connected, the alignment of the coupling should be proved.

With a suction lift, if pump is handling clean water, the water seal can be supplied by water from the pressure portion of the pump shell; but otherwise at least 20 lbs. pressure should be supplied from any convenient source.

If a foot valve is used, particularly with pumps working under high lifts or delivering through long pipe lines, there is danger of injury to the pump, due to excessive pressure produced by water ram when the pump is stopped and the water commences to run backwards through the pipe until the foot valve is suddenly closed. In such cases place a gate valve on the discharge, which should be closed before the pump is shut down.

Provide a strainer on the suction intake to prevent large solids from entering the pump. Hot water must flow by gravity to the pump. See that pump turns in the right direction.

If the pump is operated at the correct speed for the total head, it will deliver the quantity of water for which it was built. If the head is greater, the discharge quantity will be diminished; and if less, it means an increased capacity.

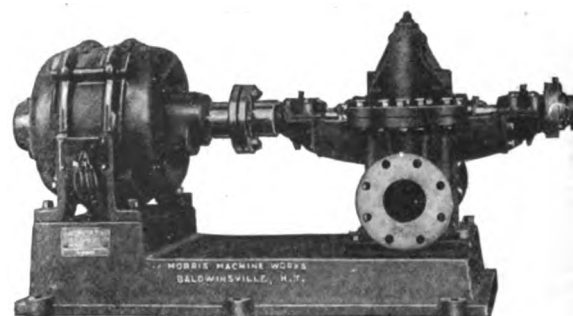
Horizontal Split, Double Suction and Multistage Pumps.

SINGLE STAGE—This type of pump is especially adapted for high efficiency and for operating at high speed for direct connection to electric motor or turbine. It is also built for belt drive. Suction and discharge openings are in the bottom half of shell, therefore top can be removed without disconnecting them.

Brief specifications are: bronze enclosed impeller, bronze sleeved steel shaft, removable babbitted bearing

shells, S. K. F. ball bearing flexible coupling, bronze stuffing box glands.

Built in sizes 2 to 20 in. Also built of acid resisting bronze for operating in aciduous water.

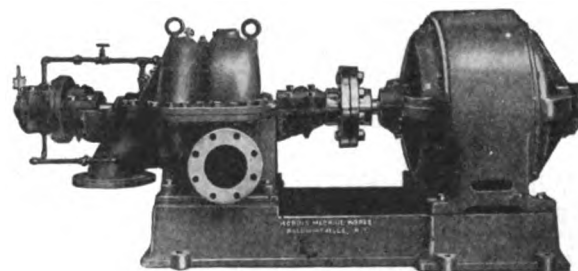


HORIZONTAL SPLIT, DOUBLE SUCTION PUMP

MULTISTAGE—Where the head is too high for the double suction pump this company builds a multistage pump.

This type is designed along the same lines as the single stage double suction type, except that, being side suction, it develops an end thrust. This thrust is taken care of by a water cooled marine type bearing, running in oil. Leakage between stages is prevented by bronze labyrinth rings.

Built in sizes 2 to 14 in. Number of stages depending on the head. Also built of acid resisting bronze for operating in aciduous water.

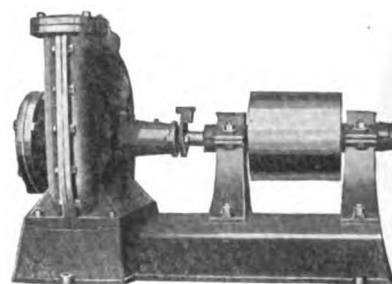


HORIZONTAL SPLIT, MULTISTAGE PUMP

Morris Improved Standard Belt Driven Horizontal Pumps.

The horizontal pump is the type most extensively used for all purposes. It is of iron construction.

The pump is intended for all classes of service where a strong, substantial pump, able to take care of itself with the least of attention, is required. The pump shell is mounted directly on the base; a substantial bearing on each side of the pulley is lined with bab-bitt; the steel shaft is of large diameter; the stuffing box bearing is long and babbitt lined; the box is deep and arranged with gland. All parts are accurately machine fitted. Pump is furnished complete with oilers, and with or without primer.



IMPROVED STANDARD HORIZONTAL RIGHT HAND PUMP

DATA, MORRIS IMPROVED STANDARD IRON HORIZONTAL PUMP

No. pump (diam. discharge opening), in.	Size pipe flange on suction, in.	Economical capacity, gals. per min.	H. p. required for each ft. elevation	Diam. and face of pulley, in.	Floor space required without primer, in.
1	1½	30	.0625	4x 3¼	12x 17
1½	2	70	.058	6x 6	17x 31
2	2	90	.075	7x 8	21x 32
2½	3	120	.10	8x 8	23x 37
3	3	180	.15	8x 8	24x 38
4	4	260	.22	8x 8	25x 39
5	5	470	.30	10x10	29x 41
6	6	735	.45	12x12	34x 54
8	8	1050	.59	15x12	37x 55
10	10	2000	1.00	20x12	45x 64
12	12	3000	1.52	24x12	51x 69
15	15	4200	2.00	30x14	63x 71
18	18	7000	3.50	40x15	77x 80
18*	18	7000	3.50	30x15	60x 68
20	20	10000	4.50	40x16	93x103
22	22	10000	4.50	30x16	66x 72
24	24	12000	5.40	36x20	73x 83
24	24	13000	5.50	48x20	126x130
24	24	15000	6.50	48x36	94x137

No. pump (diam. discharge opening), in.	Shipping weight without primer, lbs.	Shipping weight with primer, lbs.	Price without primer	Price with primer	Price extra if brass fitted
1	85	....	\$30.00	....	\$9.00
1½	175	220	45.00	\$60.00	12.00
2	260	305	60.00	75.00	15.00
2½	350	415	75.00	95.00	18.00
3	360	430	90.00	110.00	22.00
4	415	495	110.00	135.00	25.00
5	615	720	130.00	160.00	40.00
6	940	1075	165.00	200.00	60.00
8	1180	1345	200.00	245.00	90.00
10	2065	2430	310.00	375.00	130.00
12	2610	2940	395.00	470.00	165.00
15	3615	....	500.00	....	275.00
18	7100	....	850.00	....	....
18*	3150	....	710.00	....	....
20	9000	....	1300.00	....	....
22	4835	....	1150.00	....	....
24	6800	....	1600.00	....	....
24	....	....	....	....	....

*Refers to low lift pumps. Prices on larger pumps on application. For priming pumps above 10-in. use foot valve or flap valve with steam ejector, which are extra. Prices on application.

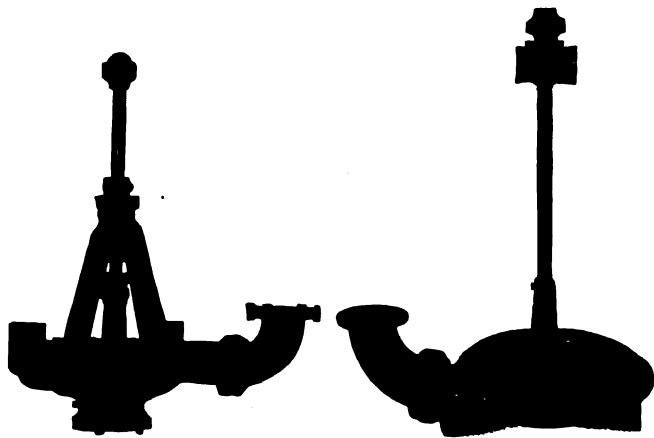
Morris Vertical Pumps, Submerged and Suction Types.

While a horizontal shaft pump should be used wherever possible, there are many situations where a vertical shaft pump would be better adapted.

The submerged type is intended to be placed entirely submerged in water. It is therefore always primed and ready to start and there is not even a stuffing box to look after.

The suction type is intended to be placed in a pit where it is impossible or impractical to use a horizontal shaft pump, but above the water line so that it will operate with a suction lift. It can also operate submerged.

MORRIS MACHINE WORKS furnish vertical pumps, single or multistage, and will make recommendations upon receipt of full data as to service.



Suction Type

Submerged Type

VERTICAL PUMPS

DATA, MORRIS IRON VERTICAL PUMPS

No. pump (diam. discharge opening), in.	Economical capacity, gal. per min.	H. p. required for each ft. elevation	Diam. and face of pulley, in.	Floor space required, in.	Distance from bottom of pump to center coupling, ft. in.	Coupling bored for connecting shaft, in.
1½	70	.058	5x 6	17x 21	2 9	1 1
1½	90	.075	6x 6	21x 29	3 0	1 1
2	120	.10	7x 8	23x 30	3 4	1 1
2½	180	.15	7x 8	24x 30	3 4	1 1
3	260	.22	7x 8	25x 32	3 6	1 1
4	470	.30	8x10	29x 39	4 0	1 1
5	735	.45	10x10	34x 45	4 7	1 1
6	1050	.59	12x12	37x 48	4 7	1 1
8	2000	1.00	18x12	45x 56	5 5	2 2
10	3000	1.52	20x12	51x 68	5 5	2 2
12	4200	2.00	24x14	63x 72	6 0	2 2
15	7000	3.50	30x16	77x102	6 6	3 3
15*	7000	3.50	30x15	60x 71	6 6	3 3
18	10000	4.50	36x18	98x126	7 0	3 3
18*	10000	4.50	30x16	66x 78	6 6	3 3
20	12000	5.40	36x20	73x 92	4 6	4 4

No. pump (diam. discharge opening), in.	Shipping weight lbs., submerged type	Shipping weight lbs., suction type	Price extra bearings, each	Price extra bearings, each	Price complete as per foot-note, submerged type	Price complete as per foot-note, suction type
1½	110	135	\$1.00	\$1.50	\$40.00	\$62.00
1½	165	200	1.00	1.50	50.00	78.00
2	198	237	1.50	2.00	65.00	100.00
2½	220	265	1.50	2.00	80.00	124.00
3	235	282	1.50	2.00	95.00	147.00
4	380	455	2.00	2.50	110.00	170.00
5	605	725	2.50	3.00	140.00	216.00
6	740	890	3.00	3.50	170.00	285.00
8	1320	1585	4.00	4.00	265.00	445.00
10	1430	1715	4.00	4.00	330.00	550.00
12	2640	3160	5.00	5.50	420.00	700.00
15	4830	5790	8.00	8.00	600.00	1000.00
15*	2400	2880	8.00	8.00	480.00	800.00
18	5300	6400	10.00	12.00	950.00	1585.00
18*	2600	3100	10.00	12.00	850.00	1420.00
20	4300	5200	15.00	20.00	1255.00	2100.00

*Refers to low lift pumps. Each pump is furnished complete with discharge elbow, one pair couplings, pulley, and one bearing.

Methods of Priming Centrifugal Pumps.

All pumps placed above water supply must, before starting, be primed; that is, completely filled with water. By use of foot valve, pump can be filled from city water service, from an overhead tank, by means of pails or by separate small pump. Where steam is available an ejector forms a very simple means of priming and can be used either with foot valve or flap valve (gate valve or check valve). The two illustrations below show clearly the piping required for either case.

If arranged with flap valve (Fig. 43), prime as follows: open valve A, then steam valve B, which will exhaust the air from pump shell allowing water to rise through suction pipe; when water spurts from pipe C, pump is filled; then close first valve A, then valve B and start the pump.

If arranged with foot valve (Fig. 44), proceed as follows: open valve A, then valve B. Water will be drawn up through suction pipe to ejector and delivered into pump; when pump is full, close valves and start.

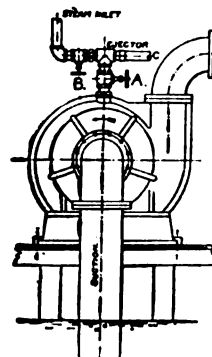


Fig. 43

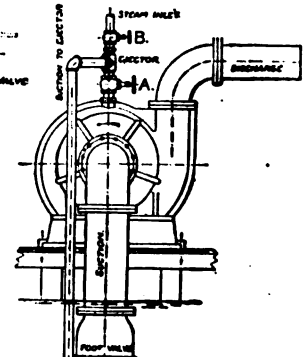


Fig. 44

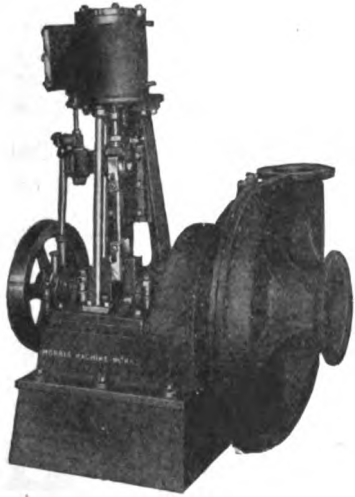
METHODS OF PRIMING CENTRIFUGAL PUMPS

Morris Reciprocating Engine Driven Centrifugal Pumps.

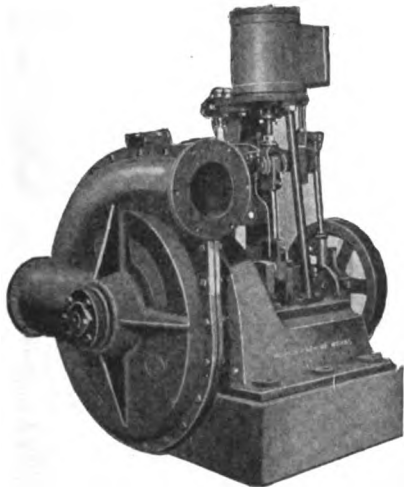
Centrifugal pumps direct connected to steam engines are self-contained, take up but little space and make the most economical pumping unit. This company builds the engines, simple, compound or triple expansion, especially designed for direct connection to centrifugal pumps.

MORRIS MACHINE WORKS have a large variety of patterns for all sizes of pumps, so that for most reasonable heads direct connected pumps can be furnished that will not have to run at excessive speeds.

The side suction pump is intended for general service, and is largely used in pumping out excavations, etc.



STANDARD SIDE SUCTION STEAM PUMP



STANDARD DOUBLE SUCTION STEAM PUMP

Determination of Right- or Left-Hand Pumps.

When standing at the pump and looking over pump shell towards pulley or driver, if the top of shaft revolves from right to left, or anticlockwise, the pump is right hand; and if from left to right, or clockwise it is left hand.

Information Required for Estimates or Ordering.

The following information should be given as com-

DATA, MORRIS STEAM PUMPS

No. pump (diam. dis- charge open- ing), in.	Economical capacity, gals. per min.	Suitable for elevations up to, ft.	Size steam cylinder, in.		Size steam pipe, in.
			Diam.	Stroke	
2	120	25	3	3	1 1/4
2 1/2	180	25	3	3	1 1/4
3	260	25	3	3	1 1/4
4	470	25	4	4	1 1/2
4	470	25	5	5	1 1/2
5	735	25	5	5	1 1/2
6	1050	30	5	5	1 1/2
6	1050	30	6	6	1 1/2
7	1400	25	5	5	1 1/2
8	2000	20	6	6	1 1/2
8	2000	25	7	7	1 1/2
8	2000	30	8	8	1 1/2
10	3000	10	6	6	1 1/2
10	3000	15	7	7	1 1/2
10	3000	20	8	8	1 1/2
10	3000	25	9	9	2
10	3000	30	10	10	2 1/2
10†	3000	40	12	10	2 1/2
12	4200	20	9	9	2
12	4200	25	10	10	2 1/2
12	4200	30	12	10	2 1/2
12†	4200	40	14	12	3
15*	7000	30	14	14	3
15*	7000	22	12	10	2 1/2
18	10000	30	15	16	4
18*	10000	20	12	12	3
20	12000	20	14	14	3

No. pump (diam. dis- charge open- ing), in.	Size exhaust pipe, in.	Weight, side suc- tion, lbs.	Weight, double suction, lbs.	Price extra if brass fitted, side or double suction
2	1	500	560	\$18.00
2 1/2	1	510	585	22.00
3	1	545	550	25.00
4	1	925	1070	40.00
4	1 1/4	1150	1275	40.00
5	1 1/4	1175	1325	60.00
6	1 1/4	1325	1525	90.00
6	1 1/2	1480	1675	90.00
7	1 1/4	1400	1600	85.00
8	1 1/2	2150	2360	130.00
8	2	2450	2660	130.00
8	2 1/2	2650	2875	130.00
10	1 1/2	2800	3440	165.00
10	2	3000	3640	165.00
10	2 1/2	3100	3760	165.00
10	3	4475	5100	165.00
10	3	4650	5290	165.00
10†	3	7200	8700	.....
12	3	4600	5500	275.00
12	3	5750	6650	275.00
12	3	6300	7200	275.00
12†	3 1/2	9000	10000	.....
15	4	13100	14600	.....
15*	3	6700	7500	.....
18	5	15000	16600	.....
18*	3 1/2	8500	9500	.....
20	4	12800	14300	.....

*Low lift pumps. †Special high lift pumps. Quotations on larger sizes or on special combinations on application. Any steam pump with compound engines directly connected can be furnished. Prices for double and side suction iron pumps on application.

pletely as possible, to enable this company to promptly make recommendations and submit estimates:

- (1) Number of pumps required.
- (2) Capacity of pump in gallons per minute.
- (3) Kind of liquid to be handled.
- (4) What is total pumping head, including suction and discharge?
- (5) What is suction head?
- (6) What is discharge head?
- (7) What is length of suction and discharge piping, and size (if determined); also number and degree of elbows?
- (8) Is vertical or horizontal type of pump desired?
- (9) How will the pump be driven? Give full description of driver.
- (10) State position of suction and discharge preferred, and direction of rotation.

NOVO ENGINE COMPANY

C. E. BEMENT, VICE-PRESIDENT AND GENERAL MANAGER

Gasoline and Kerosene Engines and Pumping Machinery

NEW YORK OFFICE
1617-19 Woolworth Building

10 Porter Street
LANSING, MICH.

CHICAGO OFFICE
800 Old Colony Building

Products.

GASOLINE and KEROSENE ENGINES, DIAPHRAGM PUMPING OUTFITS, MEDIUM and HIGH PRESSURE PUMPING OUTFITS, CENTRIFUGAL PUMPING OUTFITS.

For Novo Hoisting Outfits, see page 75;
for Novo Air Compressor Outfits and Saw Rigs, see page 50.

Novo Gasoline and Kerosene Engines.

The Novo engine has won a world-wide reputation for reliability.

Light weight and compact, self-contained design especially adapt it to use in combination with portable or stationary power machinery.

The fuel is stored in the base, and the cooling water in the frostproof jacket over and around the cylinder. No tanks, fans, pipes or circulating pumps are required for cooling. The written guarantee with every engine covers the frost-proof feature.

Jump spark ignition is used, because it is simplest and most dependable.

Hit and miss governor is used, because it means economy of fuel consumption. At the same time, it insures absolute reliability.

The Novo kerosene engine is started on gasoline and automatic-



TRADE-MARK

ally changes to kerosene. It is as simple and reliable as the Novo gasoline engine. The Novo kerosene engine operates on either kerosene or gasoline. A gas mixer for burning natural or artificial gas can also be furnished for Novo engines at an extra cost.

Novo Trench or Diaphragm Pumping Outfit.

These outfits consist of single or double diaphragm pump, 3-in. or 4-in., driven by Novo engine, used by contractors for draining trenches and excavations. A rubber diaphragm, containing a valve, takes the place of a piston, so that the pump is not greatly affected by sand and gravel in the water.

The double diaphragm or trench pump is used for handling extra large quantities of water.

The single diaphragm or trench outfits are furnished on steel skids or on hand trucks, as ordered. The double diaphragm trench outfits are furnished on trucks only.

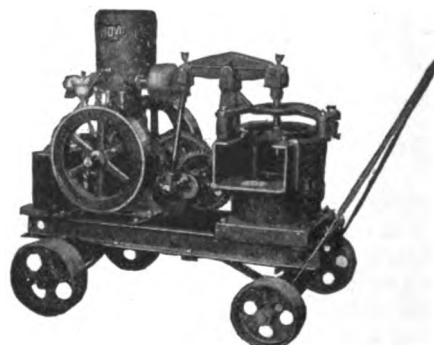


FIG. 403. NOVO TYPE N DIAPHRAGM PUMPING OUTFIT
Truck mounted

DATA, NOVO TYPE N DIAPHRAGM PUMPING OUTFITS

Outfit Number	Engine h. p.	Rated cap., gals. per hour	Size suc. pipe, in.	Bare weight, lbs.	Ship. weight, lbs.	Code word
WITH SINGLE PUMP (FIG. 403) TRUCK MOUNTED						
207	1½	3,500	3	450	600	Northway
208	2	4,000	3	550	700	Northwest
227	3	4,500	3	650	850	Norgo
228	2	2-10,000	4	600	750	Norka
229	3	10-12,000	4	700	900	Norode
WITH DOUBLE PUMP (FIG. 427) TRUCK MOUNTED						
230	2	8,000	two 3	1100	1350	Norque
231	3	9,000	two 3	1200	1450	Norse
232	3	20-24,000	two 4	1300	1550	Norvi
233	4	20-24,000	two 4	1400	1650	Norwa

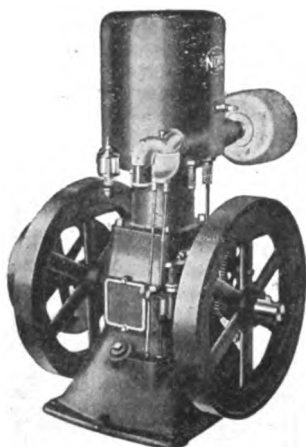


FIG. 255. 8 H. P. AND 10 H. P. NOVO ENGINE

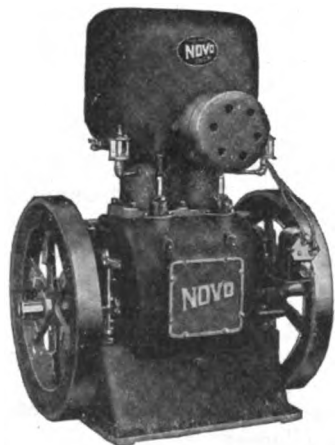


FIG. 401. 15 H. P. NOVO ENGINE
(TWO-CYLINDER)

DATA, NOVO ENGINES

Size of engine.....	1½ h. p.	2 h. p.	3 h. p.	4 h. p.	6 h. p.	8 h. p.	10 h. p.	15 h. p.
Speed, r.p.m.....	600-675	600-675	525-600	475-525	450-500	425-475	400-450	400-450
Diam. flywheel, in.....	15	15	18	20	24	27	29	30
Flywheel face, in.....	1½	1½	2½	2½	2½	3	3½	3½
Diam. crank shaft, in.....	1½	1½	1½	1½	2	2½	2½	2½
In. between anchor bolt holes.....	11½x10½	11x15	11x15	12x17	14½x20½	18x22½	20½x24½	27½x26½
Diam. pulley, in.....	4	6	6	8	14	16	18	20
Face pulley, in.....	3	4	4	5	6	6	8	8
Height, in.....	28½	31½	34½	37½	43½	50½	56½	56
Fuel tank cap., gals.....	1½	2½	2½	3½	6	9	11	15½
Bare weight, lbs.....	240	285	370	500	725	990	1375	1900
Ship. weight, lbs.....	300	360	470	630	875	1150	1600	2100
Code word.....	Nobby	Nob	Nook	Noc-turnal	Nodose	Nodule	Noon-time	North-land



FIG. 427. NOVO TYPE N DOUBLE DIAPHRAGM PUMPING OUTFIT
Truck mounted

Novo Centrifugal Pumping Outfits.

Made in two types—automobile chain drive and direct connected. Capacity from 40 to 650 gals. of water per minute. Total head from 10 to 60 ft.

The pump is of the single suction type. The impeller is cast iron. The shaft is open hearth, high carbon steel. Bearings are lubricated by grease cups.

Used by contractors for draining excavations; also used for irrigation and any pumping where a large volume of water must be handled against a moderate head.

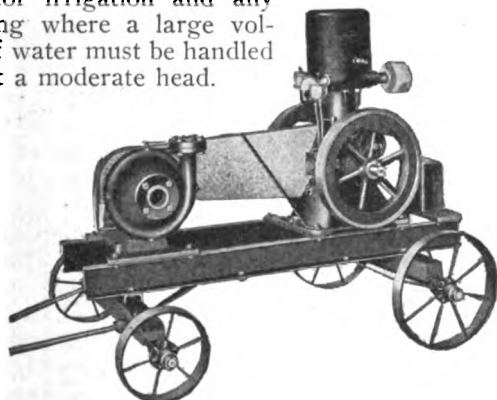


FIG. 265. NOVO CHAIN DRIVEN CENTRIFUGAL PUMPING OUTFITS
Mounted on truck

DATA, FIG. 265

Outfit Number	Engine h. p.	*Total head, ft.	Cap., gals. per minute	Size dis. pipe, in.	Size suc. pipe, in.	Bare weight, lbs.	Code word without truck
30	3	10-25	120-40	2	2 1/4	700	Nice
31	4	10-35	200-60	2	2 1/4	850	Niche
32	4	10-40	300-60	2 1/2	3	875	Nick
33	6	15-60	360-60	2 1/2	3	1100	Nickle
34	4	10-30	340-60	3	4	1000	Niece
35	6	10-40	400-100	3	4	1125	Nigh
36	6	10-30	450-150	4	6	1225	Night
37	10	10-55	650-150	4	6	2150	Nightfall

If truck is wanted add word "truck" to code word, thus "Nicetruck."

Novo Triplex Pumping Outfits.

The Triplex pumping outfits, shown in Fig. 1446, are good for 150 to 200 lbs. pressure. The pump proper on these outfits embodies the principle of the three-throw crank shaft, so that the strokes follow and overlap one another. This gives a continuous and uniform flow of fluid.

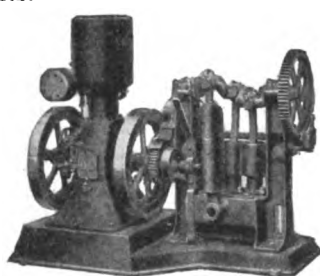


FIG. 1446. NOVO TRIPLEX PUMPING OUTFIT

DATA, FIG. 1446

Outfit Number	Engine h. p.	Pump No.	Size of pump		*Total head, ft.	Pressure, lbs.	Size suc. and dis. pipe, in.	Cap., gals. per hour	Bare weight, lbs.	Ship. weight, lbs.	Code word
			Cyl. diam., in.	Stroke, in.							
52	1 1/2	1696	2	3	350	150	1 1/4	540	800	950	Negal
53	3	1696	2 1/2	4	350	150	1 1/2	1080	1050	1250	Negar
53A	3	1157	2 1/2	4	575	250	1 1/2	720	1075	1275	Necti
98	4	1696	3 1/2	4	350	150	2	1500	1200	1400	Nedi
98A	4	1157	3 1/2	4	575	250	2	1080	1225	1425	Nette
154	6	1696	3 1/2	4	350	150	2	2400	1750	1975	Negaf
154A	6	1157	3 1/2	4	575	250	2	1500	1700	1925	Negab
196	8	1696	4	6	350	150	2	3600	2700	2950	Negaf
196A	8	1672	3 1/2	6	460	200	2	3600	2650	2900	Negah
97A	10	1672	5	6	460	200	2	7500	4600	4900	Nehig
100	15	1696	5	8	350	150	4	7500	5300	5700	Neite
100A	15	1672	5	8	460	200	4	4800	5350	5750	Nemo

*These outfits furnished with clutch on pump.

*Total head means vertical distance from source of water supply to point of discharge, including friction of water through pipe line. Pump must not be more than 20 ft. above water supply.

Novo Pyramid Force Pumping Outfits for Medium Pressure.

Cylinder of pump has removable brass lining. Valves and valve seats are of brass, and easily accessible. Piston rod of brass to prevent corrosion.

Outfits, as shown in Fig. 268, are suitable for general water supply and are especially suited for pneumatic water systems.

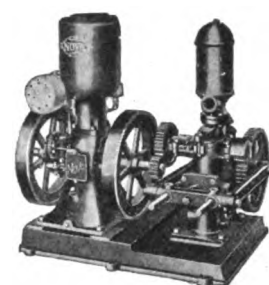


FIG. 268. NOVO FORCE PUMPING OUTFIT
Medium pressure

DATA, FIG. 268

Outfit Number	Engine h. p.	Size of pump		No. strokes per minute	Size suc. and dis. pipe, in.	Cap., gals. per hour	*Total head, ft.	Pressure, lbs.	Bare weight, lbs.	Code word
		Cyl. diam., in.	Stroke, in.							
10	1 1/2	3	5	43	1 1/4	790	175	75	600	Nostril
11	3	3	5	50	1 1/2	900	175	75	725	Nought
12	1 1/2	4	5	43	2	1400	150	43	620	Nourish
13	3	4	5	50	2	1630	175	43	775	Novel
13 1/2	4	4	5	60	2	1950	175	75	825	Novelette
14	4	4	5	40	2 1/4	2040	175	43	840	Novice
15	6	4	5	50	2 1/2	2550	175	43	930	Nozzle
45	4	6	5	40	3	3500	150	52	1235	Nativity
50	6	6	5	50	3	4300	175	52	1265	Native
116	8	6	12	40	4	6600	175	..	2200	Natively

Novo Type U Outfits for High Pressure Pumping.

These are strong, heavily built outfits for long distance pumping, high vertical lifts, high pressures, severe conditions, where the suction lift is not greater than 25 ft.

Note the simple, compact, rigid, all-iron construction of this outfit. It can not get out of alignment. It will stand up under the hardest kind of work and operate continuously and successfully.

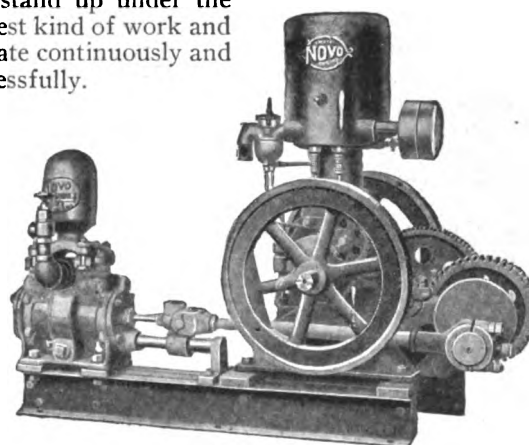


FIG. 14139. NOVO TYPE U PUMPING OUTFITS
High pressure

DATA, FIG. 14139

Outfit Number	Engine h. p.	Size of pump		Size suc. and dis. pipe, in.	Cap., gals. per hour	*Total head, ft.	Pressure, lbs.	Bare weight, lbs.	Ship. weight, lbs.	Code word
		Cyl. diam., in.	Stroke, in.							
63	1 1/2	3	5	2	900	240	100	425	525	Ultima
64	3	3	5	2	900	400	175	590	700	Ultimate
65	3	4	5	2	1630	200	85	640	750	Ultimo
66	4	4	5	2	1500	415	180	925	1050	Umbel
67	4	5	5	2	2200	265	115	940	1150	Umbol
68	6	5	5	2	2200	390	170	1240	1500	Umber
90	4	3	5	2	900	690	300	790	915	Umcor
91	6	4	5	2	1500	690	300	1240	1500	Umcan
92	6	3	5	2	825	1150	500	1290	1550	Umcul

RUMSEY PUMP COMPANY, LTD.

109 Johnson Street
SENECA FALLS, N. Y.

Products.

POWER PUMPS for every pumping service, driven by belt, chain, gear or direct drive, including HYDRAULIC PRESSURE PUMPS; SINGLE and DOUBLE ACTING TRIPLEX PUMPS; ELECTRIC TRIPLEX PUMPS; DOUBLE ACTING POWER PUMPS; CENTRIFUGAL PUMPS; ROTARY POWER PUMPS; DEEP WELL PUMPING OUTFITS and WATER WORKS MACHINERY.

Also manufacturers of Trench Pumps, Hydraulic Rams, Hand Pumps of all kinds, Diaphragm Pumps, House Pumps, Hand and Windmill Well Pumps, Spray Pumps, etc.; Pneumatic Water Systems, Hydrants, Foot and Check Valves, Cylinders and Pump Accessories.

Complete electric, gas or gasoline pumping units may be furnished.

Catalogues.

General catalogue of Hand and Power Pumps, 57th edition, a complete reference book of pumping machinery; Catalogue A, Pneumatic Water Systems; Catalogue B, Triplex Power Pump; Catalogue C, Selected Hand Pumps; Catalogue DC, Rotary Pumps. Booklets on Centrifugal, Spray and Deep Well Pumps.

Triplex Pumps.

The design is simple and compact, with all working parts accessible for inspection or adjustment. All parts are made from the best materials. Only skilled workmen are employed for founding, machining and assembling. All pumps are rated at conservative speeds. The result is an article suitable for durable, practical service. These pumps are offered in a wide range of styles and sizes for any pumping application: For general water supply and fire protection; municipal water works; boiler feeding, circulating, mine pumping; hydraulic elevators; exerting pressures; pumping special liquids, chemicals, etc. Construction details necessarily vary according to the service for which pumps are rated or special conditions under which they are to operate. Detailed specifications of any pump will be sent on request.

Cranks are of the best cast or forged steel, of proper weight to take the heaviest strain to which they are subject. Bearings are of ample size, of bronze or lined with best babbitt scraped to a true surface. Gearing is machine cut from solid. Waterways are large and direct. Valve areas are correctly proportioned. Glands are arranged to keep the plunger packing tight with a very slight pressure on the studs, preventing undue friction. All pumps are equipped with suitable oiling devices and drips.



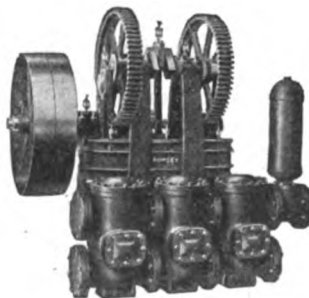
STANDARD SIZES AND CAPACITIES, MODERATE PRESSURE, SINGLE ACTING TRIPLEX PLUNGER PUMPS

Capacity per minute at moderate speed, gals.	Working pressure, lbs.	Figure No.	Plungers diameter x stroke, in.	Displacement per rev., gals.	Pipes, in. Suc. in. Dis. in.	Standard pulleys, in.	Cipher
1.5	150	681	1 1/4 x 2	0.03	1 3/4	12x 1 1/2	Cabbage
1.5	200	684	1 1/4 x 2	0.03	1 3/4	12x 1 1/2	Conclave
3.5	200	684	1 1/2 x 3	0.07	1 1/2	12x 2	Conclude
4.5	150	681	1 1/2 x 3	0.09	1 1/2	12x 2	Cab
6	130	681	2 x 3	0.12	1 1/4	12x 2	Cabajal
8	200	684	2 x 4	0.16	1 1/4	12x 2 1/2	Concoct
10	150	681	2 1/4 x 4	0.20	1 1/4	12x 2 1/2	Cabal
13	150	681	2 1/2 x 4	0.25	1 1/4	12x 2 1/2	Cabaret
14	200	684	2 1/2 x 4 1/2	0.28	1 1/2	15x 2 1/2	Concord
20	150	681	3 x 4 1/2	0.41	1 1/2	15x 2 1/2	Cabin
25	150	681	3 1/4 x 4 1/2	0.50	1 1/2	15x 2 1/2	Cablot
25	200	684	3 x 5	0.46	1 1/2	20x 3	Concur
30	150	681	3 1/2 x 5	0.62	2	20x 3	Cabob
35	200	684	3 1/2 x 6	0.75	2	20x 4	Concuss
50	150	681	4 x 6	1.00	2 1/2	20x 4	Caboos
60	120	681	4 1/2 x 6	1.24	3	20x 4	Caboosoon
75	150	681	5 x 6	1.53	3	24x 5	Cabotage
90	120	681	5 1/2 x 6	1.85	3	24x 5	Caburn
100	85	692	5 x 8	2.00	3 1/2	24x 4	Coping
100	150	691	5 x 8	2.00	3 1/2	30x 5	Communism
100	200	698	5 x 8	2.00	3 1/2	30x 6	Coterie
125	65	692	5 1/2 x 8	2.46	3 1/2	24x 4	Copse
125	125	691	5 1/2 x 8	2.46	3 1/2	30x 5	Comet
125	165	698	5 1/2 x 8	2.46	3 1/2	30x 6	Cotgare
150	55	692	6 x 8	2.93	4	24x 4	Coquette
150	100	691	6 x 8	2.93	4	30x 5	Commuter
150	140	698	6 x 8	2.93	4	30x 6	Cotia
175	43	692	6 1/2 x 8	3.44	4	24x 4	Coquina
175	85	691	6 1/2 x 8	3.44	4	30x 5	Comose
175	120	698	6 1/2 x 8	3.44	4	30x 6	Cotoin
215	85	692	6 1/2 x 10	4.30	5	30x 6	Cordovan
215	150	691	6 1/2 x 10	4.30	5	36x 6	Compact
215	200	698	6 1/2 x 10	4.30	5	42x 6	Cotswold
250	195	690	7 x 10	5.00	5	42x 6	Comprint
270	75	692	7 1/4 x 10	5.35	6	30x 6	Comorant
270	125	691	7 1/4 x 10	5.35	6	36x 6	Combing
270	160	698	7 1/4 x 10	5.35	6	42x 6	Cotta
325	55	692	8 x 10	6.50	6	30x 6	Coronet
325	100	691	8 x 10	6.50	6	36x 6	Combative
325	130	698	8 x 10	6.50	6	42x 6	Cottage
345	150	690	8 1/4 x 10	6.94	6	42x 6	Compart
415	125	690	9 x 10	8.26	7	44x 6	Compass
415	150	690	9 x 10	8.26	7	42x 10*	Compeer
445	185	690	9 x 12	9.91	8	48x 10*	Compile
510	100	690	10 x 10	10.20	8	44x 6	Complex
510	150	690	10 x 10	10.20	8	42x 10*	Compose
550	150	690	10 x 12	12.24	8	48x 10*	Compress
560	85	690	10 1/2 x 10	11.25	8	44x 6	Compotal
560	135	690	10 1/2 x 10	11.25	8	42x 10*	Compotete
570	215	788	10 x 14	14.28	8	60x 14†	Corrigent
605	135	690	10 1/2 x 12	13.50	8	48x 10*	Compret
690	90	789	11 x 14	17.28	12	60x 10*	Corpossee
690	175	788	11 x 14	17.28	12	60x 14†	Corrifon
820	75	789	12 x 14	20.56	12	60x 10*	Corposant
820	150	788	12 x 14	20.56	12	60x 14†	Corral
965	65	789	13 x 14	24.12	12	60x 10*	Corpulent
965	130	788	13 x 14	24.12	12	60x 14†	Correlate
1,120	55	789	14 x 14	27.98	12	60x 10*	Corpuscle
1,120	110	788	14 x 14	27.98	12	60x 14†	Corridor
1,120	200	798	14 x 16	32.00	12	72x 20†	Corvette
1,460	150	798	16 x 16	41.77	14	72x 20†	Corvine
1,650	130	798	17 x 16	47.16	14	72x 20†	Corylus
1,850	110	798	18 x 16	52.85	14	72x 20†	Corymb

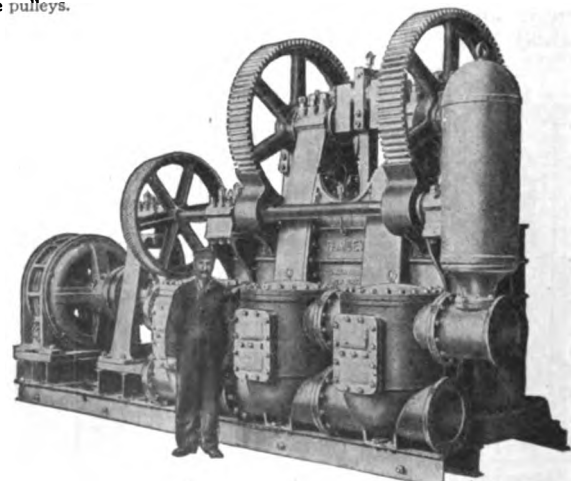
*Single pulley. †Single pulley for double belt. Other sizes have tight and loose pulleys.



SINGLE GEARED TRIPLEX PUMP, SMALL SIZES, LIGHT SERVICE



DOUBLE GEARED TRIPLEX PUMP, STANDARD TYPE, 500-GAL. GENERAL SERVICE PUMP



ELECTRIC TRIPLEX PUMP WITH GEAR DRIVE
Type of water works pump—2,000,000-gal. unit

Each Rumsey triplex pump is carefully tested to its maximum working service before shipment and is fully guaranteed.

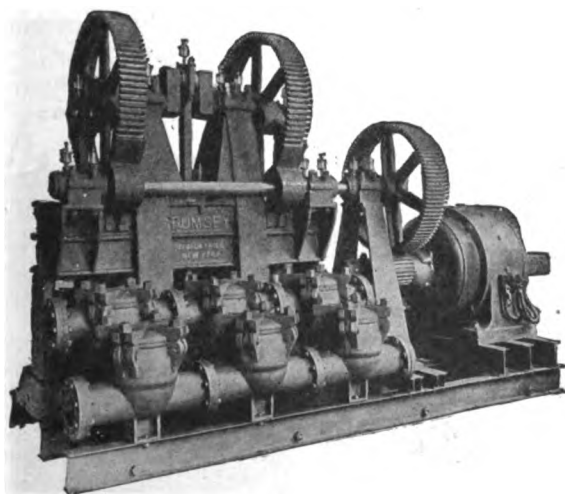
The design of our triplex pumps permits of considerable alteration from standard construction to meet special service or working conditions. Pumps are regularly fitted for handling cold water, but will be equipped for hot water without extra charge. For other alterations a slight margin above cost will be added.

Any pump may be furnished with vacuum chamber, rawhide pinion, by-pass, etc., or arranged on bed plate or foundation for connection to driving power.

Single acting triplex pumps may be brass fitted to order when not regularly so equipped, and when construction limits permit, with brass covered or bronze plungers, brass lined or bronze glands and bronze bushed cylinders. Double acting triplex pumps may be brass fitted to order, with removable brass lined iron cylinders or removable bronze cylinders, iron pistons with brass followers or bronze pistons, or bronze piston rods.

Directions for Inquiries—It will facilitate correspondence if clients, in asking for recommendations and prices, will furnish the following information:

- (1) For what purpose the pump is to be used.
 - (2) Quantity of liquid to be pumped per minute.
 - (3) Whether service is constant or intermittent, and the average number of hours per day pump will run.
 - (4) Height to which liquid is to be raised by suction, and diameter and length of suction pipe.
 - (5) Height in feet or pressure in pounds against which liquid has to be forced, also diameter and length of discharge pipe.
 - (6) Nature of liquid to be pumped, whether hot or cold, salt or fresh, acid, clear or gritty.
 - (7) Power available for driving pump.
- If a deep well pump is required, give information covered by items 1, 2, 3, 6 and 7 above. Also:
- (8) Total elevation between surface of the water and discharge point; and diameter and length of discharge pipe.
 - (9) Diameter and depth of well or pit, and distance from surface of ground to low water level.
 - (10) Vertical distance that the cylinder will be placed above low water level if not actually submerged at all times.



ELECTRIC TRIPLEX PUMP FOR HEAVY DUTY
This stationary mine pump replaced three relays of centrifugals



HYDRAULIC PRESSURE PUMP WITH SPRING ALLEVIATOR

(11) A sketch showing relative position of supply, pump and discharge point, with dimensions, and giving length, size and turns or bends of pipe lines, will be a great aid to a thorough understanding of conditions under which pump is to operate.

Double Acting Power Pumps.

Reliable pumps for tank pumping and general use where an inexpensive outfit is desired. Made with brass lined cylinder, leather packed piston, metal valves, large air chamber and back gearing.

These pumps are offered in capacities of from 4 to 65 gals. per minute. Illustration shows a 2 x 3-in. pump; larger sizes differ in design.

Geared or belted electric outfits can be furnished complete with, or ready to receive, electric motor.

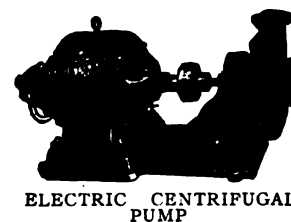
Geared engine outfits complete with engine are offered in several sizes.



DOUBLE ACTING PUMP

Low Lift Centrifugal Pumps.

Rumsey centrifugals are offered in both horizontal and vertical types and in sizes from 1 to 10 in., capacities 10 to 2400 gals. per minute for heads not more than 50 ft. Pumps for contractors, industrial plants, mines and quarries, for circulating, handling thick liquids and chemicals and many special applications. Direct connected electric sump pumps and horizontal pumps, and direct connected and geared gasoline pumping sets can be supplied.



ELECTRIC CENTRIFUGAL PUMP

Rotary Power Pumps.

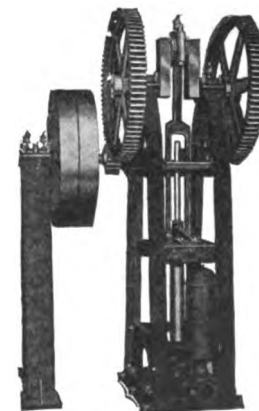
Rotaries are used with economy by thousands of manufacturers for handling liquids such as oils, acids and other chemicals. For water supply, they are popular because of their low cost and large capacity. For fire protection, rotaries are most dependable, throwing a continuous stream with a uniform strain on pump and driving power. Built in capacities to discharge up to four standard fire streams and arranged for hose or for piping to hydrants or sprinkler system.



SMALL TYPE OF ROTARY POWER PUMP

Deep Well Pumping Sets.

The selection of equipment for raising water from deep wells is most important. Strength in the machine must be combined with accessibility of working parts; as the strain is severe and adjustments and repairs are expensive and difficult. Rumsey deep well working heads are correctly designed to give dependable, lasting service. Offered in a range of styles suitable for wells of any depth for operating Rumsey single or double acting cylinders.



DEEP WELL WORKING HEAD
Style for deep artesian wells

TABER PUMP COMPANY

295 Elm Street
BUFFALO, N. Y.

Products.

PUMPS: Centrifugal, Sump, and Rotary.

Taber Centrifugal Pumps, Type SV.

These pumps are made up in single-stage units only. They are of the double suction volute type. Bronze fitted throughout; all parts are interchangeable.

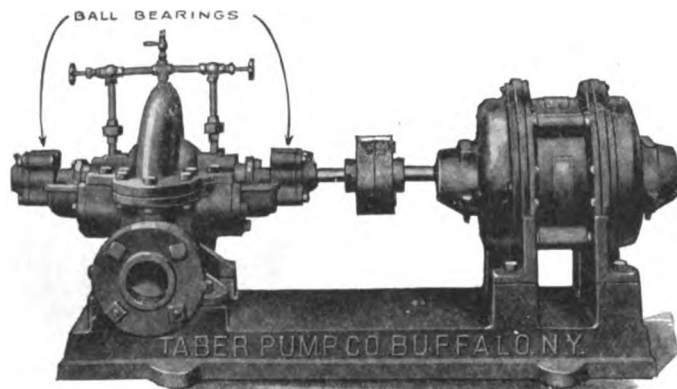
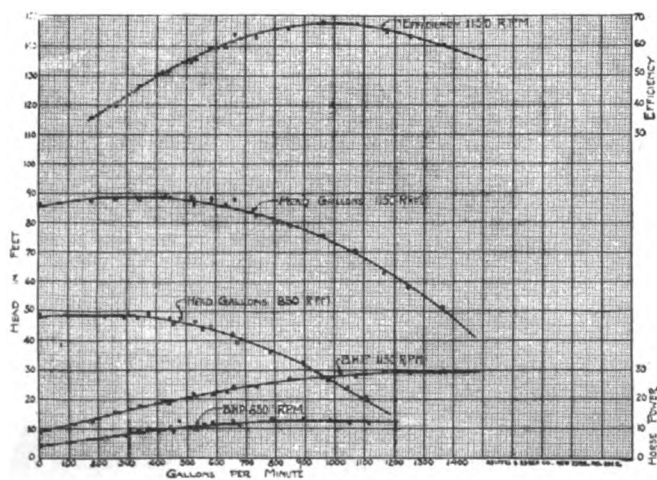


FIG. 191. TYPE SV CENTRIFUGAL PUMP

Type SV pumps can be furnished for either belt or motor drive, in capacities ranging from 100 to 1200 gals. per minute.

Send for Bulletin 30.



EFFICIENCY CURVE, TYPE SV PUMP

Taber Centrifugal Pumps, Type V.

Type V centrifugal pumps are carefully designed single suction open impeller type pumps. While they are usually demanded for belt drive, they can be fitted to any prime mover—the most popular arrangement being the electric motor driven centrifugal pumping unit.

These pumps are extensively used for circulating water and other fluids. When constructed of bronze, they are particularly adapted for circulating corrosive liquids, such as tanning liquors and brine for refrigeration purposes. Fully described in Bulletin 20.

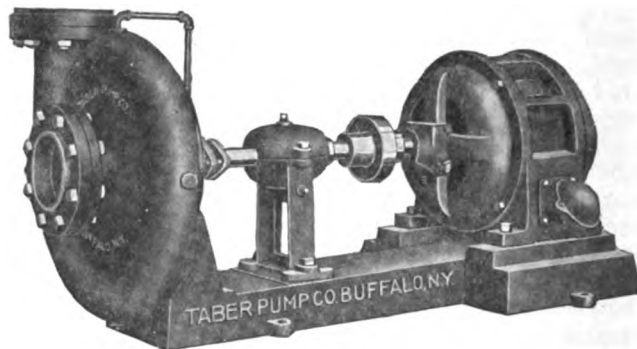


FIG. 190. TYPE V CENTRIFUGAL PUMP FOR MOTOR DRIVE

DATA, TABER TYPE V PUMPS

Pump No.	Suction, in.	Discharge, in.	Nominal cap., gals.	H. p. per ft. head	Head in feet									
					10	20	30	40	50	60	70	80	90	100
V-1	1 1/4	1	30 G.	.035	1425	1800	2075	2300	2490					
V-2	1 1/2	1 1/4	50 G.	.040	1200	1450	1640	1800	1990	2140	2260	2375		
V-3	2	1 1/2	100	.075	905	1175	1360	1535	1680	1810	1950	2075	2175	2275
V-4	2 1/2	2	150	.085	800	990	1135	1255	1400	1490	1600	1715	1800	1880
V-5	3	2 1/2	200	.105	730	900	1050	1200	1275	1410	1500	1600	1675	1760
V-6	4	3	300	.140	550	725	850	940	1040	1135	1210	1300	1360	1435
V-7	5	4	600	.280	560	680	800	880	965	1040	1120	1175	1240	1300
V-8	6	5	900	.460	570	675	810	860	925	1000	1070	1125	1190	1250
V-9	8	6	1200	.550	510	615	680	780	860	925	995	1050	1120	1165

MOST EFFICIENT HEADS, SPEEDS AND CAPACITIES

Pump No.	Suction, in.	Discharge, in.	Cap. and speeds	Head in feet									
				10	20	30	40	50	60	70	80	90	100
V-1	1 1/4	1	G. p. m. 17	24	29	33	37						
			R. p. m. 1150	1680	2050	2340	2600						
V-2	1 1/2	1 1/4	G. p. m. 23	32	40	46	50	55	60	65			
			R. p. m. 875	1240	1500	1775	2000	2200	2325	2440			
V-3	2	1 1/2	G. p. m. 55	75	92	108	122	132	140	155			
			R. p. m. 800	1100	1350	1600	1750	1940	2080	2220			
V-4	2 1/2	2	G. p. m. 88	120	150	170	190	210	225	240	255	270	
			R. p. m. 700	940	1150	1300	1450	1565	1740	1790	1910	2025	
V-5	3	2 1/2	G. p. m. 125	158	183	205	220	240	250	265	275	290	
			R. p. m. 625	790	1050	1210	1325	1450	1550	1660	1750	1830	
V-6	4	3	G. p. m. 170	225	270	305	350	380	410	435	460	485	
			R. p. m. 475	670	840	960	1055	1160	1265	1345	1420	1500	
V-7	5	4	G. p. m. 350	450	520	575	620	665	700	735	770	800	
			R. p. m. 450	640	770	875	970	1060	1145	1200	1295	1370	
V-8	6	5	G. p. m. 475	650	775	890	975	1050	1150	1200	1250	1350	
			R. p. m. 450	615	745	860	955	1025	1100	1175	1250	1320	
V-9	8	6	G. p. m. 800	1025	1200	1350	1475	1600	1700	1800	1875	1950	
			R. p. m. 440	575	680	800	885	980	1055	1140	1190	1225	



FIG. 192. TYPE V CENTRIFUGAL PUMP FOR BELT DRIVE

Taber Sump Pumps.

Fig. 194 illustrates the Taber high grade sump pump. These pumps are fitted with ball bearing thrust. Can be supplied with automatic starting and stopping device. Ratings are the same as those of Type V pumps listed on the preceding page.

Fully described in Bulletin 20.

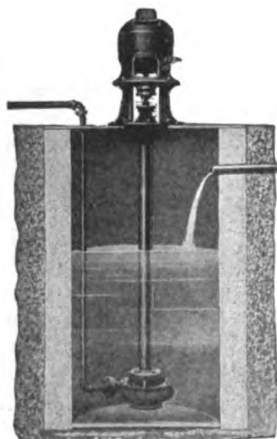


FIG. 194. SUMP PUMP

Taber Rotary Pumps, Type T.

These pumps are particularly adapted for handling viscous materials, such as soap stock, asphalt, paints, molasses or any other products of this nature, there being a design for each specific requirement.

Made for belt, motor or engine drive. Constructed of iron or bronze.

Fully described in Bulletin 22.

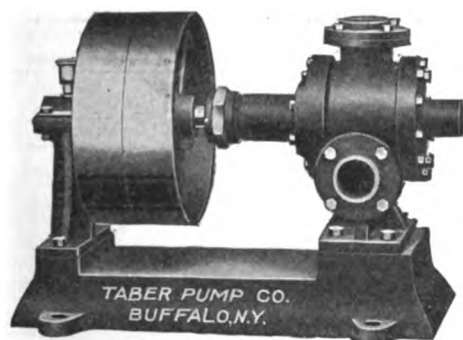


FIG. 146. TYPE T BELT DRIVEN CIRCULATING PUMP

Taber Rotary Pumps, Type G.

These pumps are built in several sizes for belt drive or for motor drive (Fig. 179).

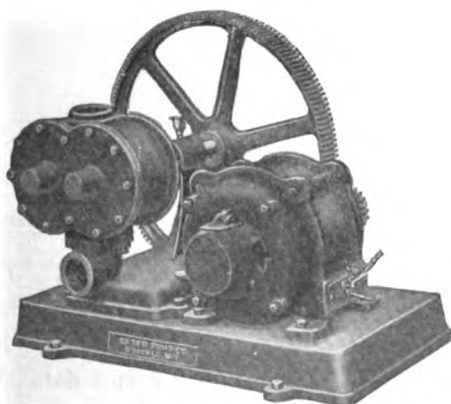


FIG. 179. TYPE G MOTOR DRIVEN ROTARY GEAR PUMP

They are carefully machined and gears are finished over all. Accessibility to inlet and outlet connections is a desirable feature.

These pumps are adapted for handling various kinds of liquids including oils, chemical solutions and water, and are made in iron and bronze.

Fully described in Bulletin 25.

DATA, TABER TYPE G PUMPS

R. p. m.	Capacity, gals. per min.			
	No. 1	No. 2	No. 3	No. 4
100	4	14	32	40
150	7.25	22	52	64
200	13	32	67	84
250	16	45	86	104
Suction, in.	1	1½	2	2½
Discharge, in.	1	1½	2	2½
Pulleys, in.	8 by 2½	10 by 2½	12 by 3½	17½ by 3½
Weight, lbs.	55	75	140	210

Taber Rotary Pumps, Type S.

These pumps are made particularly for handling gasoline and oils. They are very close fitted and are of the 4-bucket type.

The distinctive advantage of this type of pump for handling light liquids is that the buckets are hydraulically balanced and self-compensating, a new patented feature.

Pumps operate smoothly, and have wonderful suction properties, delivering efficiently against a 100-ft. head.

These pumps are of special interest to oil refineries. They are made for either belt, gasoline engine or electric motor drive, and where conditions require air chamber and low pressure relief valve, these can be furnished.

Fully described in Bulletin 31.

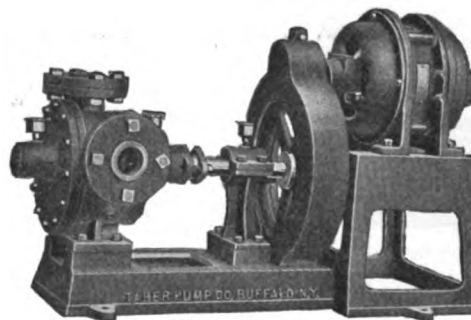


FIG. 300A. TYPE S MOTOR DRIVEN ROTARY PUMP

DATA, TYPE S ROTARY PUMPS*

Suction, in.	Discharge, in.	R. p. m.	Capacity, gals. per min.	Head, ft.	H. p.	Pulleys, tight and loose, in.	Key No.	H. p. motor	Approx. floor space, in.		Approx. shipping weight, lbs.	
									Belt	Motor	Belt	Motor
1	1	350	10	15 25	¼ ½	6 x 1½	98	½ and ¾	8 x 15	14 x 25	50	55
1¼	1¼	250	20	10 50 30	½ 1¼ 1	8 x 2¼	41	1 and 1½	9 x 20	14 x 28	75	125
1½	1½	250	50	30 50	1½ 2	10 x 2¼	47	2 and 3	10 x 24	19 x 36	125	185
2	2	200	75	35 60	3 5	12 x 3¼	99	3 and 5	18 x 30	20 x 39	275	360
3	3	200	100	50	5	18 x 4½	91	5 and 7½	18 x 38	24 x 48	460	540
4	4	200	200	75	10	24 x 6	112	7½ and 10	24 x 48	24 x 56	825	750

*Above ratings are normal and practically cover average conditions. It is recommended that the details of specific problems be referred to this company so that the best equipment can be recommended for specific requirements.

ESTABLISHED 1883

THE TRANE COMPANY

Electric Pumping Equipment and Heating Specialties

GENERAL OFFICE AND FACTORY

 202-216 Cameron Avenue
 LA CROSSE, WIS.

 CHICAGO, ILL., 175 West Jackson Boulevard
 PHILADELPHIA, PA., 20 South 7th Street
 SALT LAKE CITY, UTAH, 407 Dooly Building

 BOSTON, MASS., 110 State Street
 NEW YORK, N. Y., 11 John Street
 WASHINGTON, D. C., 510 Bond Building

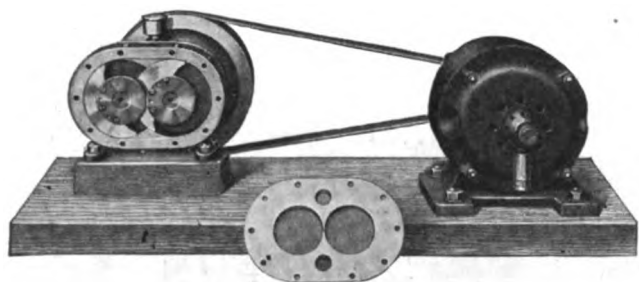
Products.

PUMPING EQUIPMENT: Trane Air Line Vacuum Pumps, Automatic Electric Condensation Pumps, Boiler Feed Pumps, Circulating Pumps, Return Line Systems.

Also manufacturers of Heating Specialties: Trane Thermal Traps, Graduated Radiator Valves, Direct Return Traps, Quick Vent Valves, Float Vent Traps, Vapor Regulators, Receivers, Vapor Gages, Trane System of Vapor Heating, Vacuum Heating Systems, etc.

Air Line Vacuum Pump.

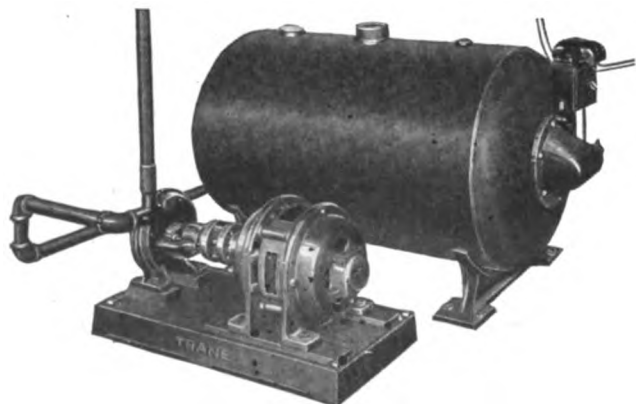
A rotary piston pump, simple in construction, positive in action. Made in 2 sizes: No. 1, capacity, 5000 sq. ft. of radiation; No. 2, 15,000 sq. ft. of radiation. For complete information, measurements and prices, ask for Bulletin No. 5.



NO. 1 TRANE AIR LINE VACUUM PUMP

Automatic Electric Condensation Pumps.

Trane condensation pumps are electrically driven and automatically controlled. They are regularly furnished in capacities from 2,000 to 30,000 sq. ft. of radiation, and for operation against boiler pressures up to 60 lbs. Pumps of larger capacity and for higher pressures can be furnished on special order.



"1000" SERIES, TRANE CONDENSATION PUMP



To Select a Pump.

In selecting a pump, the two things to consider are the amount of radiation to be drained and the boiler pressure against which the pump is to operate. In the following table Trane condensation pumps are so arranged as to make it extremely easy to select a unit exactly suited to the needs:

CAPACITIES, TRANE CONDENSATION PUMPS

Number	Maximum boiler pressure, lbs.	Motor horsepower	Suction and discharge, in.	Shipping weight, lbs.
"200" SERIES—CAPACITY 2000 Sq. Ft. RADIATION				
205	5	$\frac{1}{4}$	$\frac{3}{4}$	250
210	10	$\frac{1}{4}$	1	250
220	20	$\frac{1}{4}$	1	250
240	40	$\frac{1}{2}$	1	250
260	60	$\frac{1}{2}$	1	270
"400" SERIES—CAPACITY 4000 Sq. Ft. RADIATION				
405	5	$\frac{1}{4}$	$\frac{3}{4}$	250
410	10	$\frac{1}{4}$	1	250
420	20	$\frac{1}{4}$	1	250
440	40	$\frac{1}{2}$	1	270
460	60	$\frac{1}{2}$	1	300
"600" SERIES—CAPACITY 6000 Sq. Ft. RADIATION				
610	10	$\frac{1}{4}$	$1\frac{1}{4}$	350
620	20	$\frac{1}{2}$	$1\frac{1}{4}$	400
640	40	$\frac{3}{4}$	$1\frac{1}{4}$	420
660	60	1	$1\frac{1}{4}$	440
"800" SERIES—CAPACITY 8000 Sq. Ft. RADIATION				
810	10	$\frac{3}{4}$	$1\frac{1}{4}$	400
820	20	$\frac{3}{4}$	$1\frac{1}{4}$	420
840	40	$1\frac{1}{2}$	$1\frac{1}{4}$	440
860	60	$1\frac{1}{2}$	$1\frac{1}{4}$	470
"1000" SERIES—CAPACITY 10000 Sq. Ft. RADIATION				
1010	10	1	$1\frac{1}{2}$	425
1020	20	1	$1\frac{1}{2}$	440
1040	40	$1\frac{1}{2}$	$1\frac{1}{2}$	470
1060	60	2	$1\frac{1}{2}$	500
"1500" SERIES—CAPACITY 15000 Sq. Ft. RADIATION				
1510	10	1	2	440
1520	20	1	2	440
1540	40	2	2	450
1560	60	3	2	460
"2000" SERIES—CAPACITY 20000 Sq. Ft. RADIATION				
2010	10	1	2	440
2020	20	2	2	450
2040	40	3	2	460
2060	60	5	2	500
"2500" SERIES—CAPACITY 25000 Sq. Ft. RADIATION				
2510	10	1	$2\frac{1}{4}$	440
2520	20	2	$2\frac{1}{4}$	450
2540	40	3	$2\frac{1}{4}$	460
2560	60	5	$2\frac{1}{4}$	500
"3000" SERIES—CAPACITY 30000 Sq. Ft. RADIATION				
3010	10	2	$2\frac{1}{4}$	450
3020	20	3	$2\frac{1}{4}$	460
3040	40	5	$2\frac{1}{4}$	500
3060	60	$7\frac{1}{2}$	$2\frac{1}{4}$	525

Trane Bulletins.

Special bulletins, blue prints and data sheets describing and illustrating other Trane specialties and Trane heating systems will be sent on request.

TRIMOUNT ROTARY POWER CO.

Manufacturers of Rotary Pumps

19 Heath Street

BOSTON, MASS.

FACTORY: 290 Whiting Avenue, EAST DEDHAM, MASS.

Products.

TRIMOUNT ROTARY PUMPS: Hand, Bilge, Power, Motor Driven, High Vacuum.

Also manufacturers of Air Compressors, Motor Boat (friction driven) Whistle Outfits.

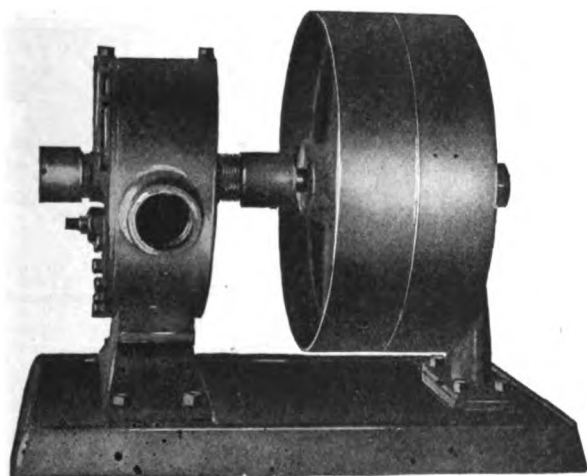
Trimount Rotary Pumps.

Owing to the unique construction of Trimount rotary pumps, the parts are few, thus reducing friction and wear to a minimum. There are no springs or weak parts to break or get out of order. When wear occurs, it is readily taken up by means of an adjusting screw.

Trimount rotary pumps require absolutely *no priming*. As no packing is used, they can be utilized for pumping any fluid of any density, and at any temperature. All the pumps, except high vacuum pumps and air compressors, are made entirely of bronze, giving them long life.

A strong feature of Trimount pumps is their high suction lift of from 6 to 25 ft., depending on the fluid pumped. Candy manufacturers and dealers in heavy oils, greases and liquids of similar viscosity, have found these pumps especially suitable for their needs.

The Trimount will pump anything that flows, no matter how heavy and sluggish that flow may be.



NO. 5 TRIMOUNT ROTARY PUMP WITH TIGHT AND LOOSE PULLEYS, MOUNTED ON BED PLATE

DATA, BRONZE POWER PUMPS

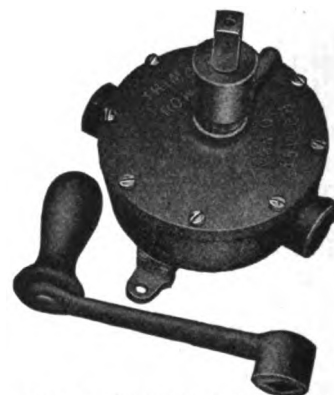
No.	Gals. per min.	R. p. m.	H. p.	Inlet, ins.	Outlet, ins.
2	1 3/4	300	1 1/2	1 1/4	1 1/4
3	3 3/4	250	1 3/4	1 3/4	1 3/4
4	7	200	2 1/4	1 3/4	1 3/4
5	11	175	2 3/4	1 3/4	1 3/4
6	14	150	3 1/4	1 3/4	1 3/4
7	25	140	4 1/4	1 3/4	1 3/4
8	43	130	6 1/4	2	2
9	85	100	10 1/4	2 1/2	2 1/2

Trimount Hand Pump.

This hand pump has small lugs on back to fasten to wall or partition (as for bilge purposes, or gasoline pumping in private garages).

If desired, these pumps are made with 5-in. pedestal to screw to flooring.

Three sizes of Trimount hand pumps are made.



NO. 0 TRIMOUNT HAND PUMP

DATA, TRIMOUNT HAND PUMPS

No.	Gals. per min.	R. p. m.	Guaranteed suction, ft.
0	6	85	6
1	10	85	15
2	20	85	20

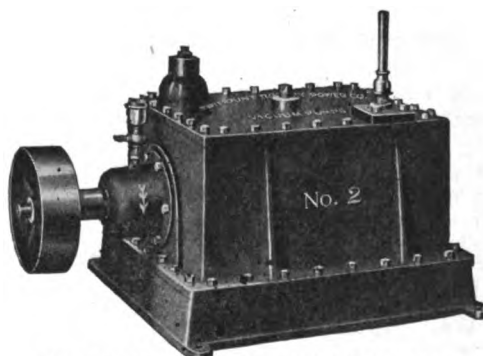
High Vacuum Pump.

Designed for high pressure vacuum purposes such as exhausting incandescent lamp bulbs, vapor lamps, mercury arc rectifiers, X-ray tubes, thermos bottles, etc.

Immersed in oil in airtight case, driving shaft provided with oil-sealed bearing to prevent air from entering case.

It is intended that this pump be supported by a pump giving a vacuum within a few millimeters of the barometric height, and it is recommended that pump No. 1 be used for this purpose. A single No. 1 pump will serve for a number of the No. 2 pumps.

Special vacuum pump catalogue sent on request.



NO. 2 TRIMOUNT HIGH VACUUM PUMP

No.	Vacuum obtained	Height, ins.	Width, ins.	Length, ins.	Weight, lbs.	R. p. m.
1	.5 MM or 1-50 in.	12	11 1/2	16	77	300
1 1/2	.00015 MM or 6 in.	17	15	18 1/2	134	300
2	.000025 MM or 1 in.	14	17	24	190	300

WORTHINGTON PUMP AND MACHINERY CORPORATION

115 Broadway
NEW YORK, N. Y.

BRANCH OFFICES

ATLANTA, GA., 435 Trust Company of Georgia Building
BIRMINGHAM, ALA., American Trust & Savings Bank Building
BOSTON, MASS., 465 John Hancock Building
BUFFALO, N. Y., 707 Iroquois Building
CHICAGO, ILL., 820 Old Colony Building
CINCINNATI, OHIO, 1503 First National Bank Building
CLEVELAND, OHIO, 304 Rockefeller Building
DENVER, COLO., 435 Seventeenth Street
DETROIT, MICH., 839 Majestic Building
EL PASO, TEX., 510 Mills Building
HOUSTON, TEX., 425 Southern Pacific Building
KANSAS CITY, MO., 825 Scarritt Building

LOS ANGELES, CAL., 209-210 Higgins Building
MEXICO CITY, MEX., P. O. Box 5260
NEW ORLEANS, LA., 533 Baronne Street
PARIS, FRANCE, 1 Rue des Italiens
PHILADELPHIA, PA., 1516 North American Building
PITTSBURGH, PA., 407 Oliver Building
ST. LOUIS, MO., 701 Laclede Gas Building
ST. PAUL, MINN., 613 Merchants' National Bank Building
SALT LAKE CITY, UTAH, 113 W. Second South Street
SAN FRANCISCO, CAL., 306 Sharon Building
SEATTLE, WASH., 203 Maynard Building
TULSA, OKLA., 123 West First Street
WASHINGTON, D. C., 426 Homer Building

LONDON, ENG., Queen's House, Kingsway

Products.

PUMPS and PUMPING EQUIPMENT:
all types for every conceivable service, including Steam Pumps; Steam, Oil Engine, Gas Engine, Belt, Motor and Turbine Driven Centrifugal Pumps. High Economy Pumping Engines of every type (flywheel, centrifugal or direct acting) for waterworks, sewage, irrigation or other service requiring the economical pumping of large quantities of water by steam, electricity, gas or oil.

CONDENSERS: Surface, Jet, Barometric and Ejector.

FEED WATER HEATERS.

METERS: Water, Oil and Gasoline.

COMPRESSORS: Air, Gas and Ammonia.

VACUUM PUMPS.

ENGINES: Heavy Oil, Kerosene, Diesel and Gas.

HYDRAULIC TURBINES and WATER WHEELS.

FILTER and TANKAGE PRESSES.

MINING and CEMENT MACHINERY: Gyratory and Jaw Crushers; Ball, Tube, Rod and Stamp Mills; Rolls; Jigs; Screens; Log Washers; Elevators and Conveyors; Converters and Blast Furnaces.

Also Sand Riddlers, Core Wire Straighteners, Steam Accumulators, Oil Mill Machinery, Oil Burner Pumping Units.

Catalogues.

Catalogues describing any of the equipment listed herein will be sent on application.

Facilities and Services.

The facilities of nine factories, each specializing in its particular group of products and the accumulated experience of over 81 years of successful manufacturing are at the disposal of Worthington clients. These factories are:

Worthington Works, Harrison, N. J.
Blake & Knowles Works, East Cambridge, Mass.
Deane Works, Holyoke, Mass.
Power & Mining Machinery Works, Cudahy, Wis.
Laidlaw Works, Cincinnati, Ohio
Snow-Holly Works, Buffalo, N. Y.
Hazleton Works, Hazleton, Pa.
Gas Engine Works, Cudahy, Wis.
Epping-Carpenter Works, Pittsburgh, Pa.

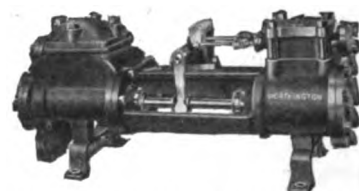
Located in the principal manufacturing districts of the United States, they afford unusual facilities for the prompt shipment of pumping machinery and power auxiliaries. The Worthington policy—that of manufacturing every type in each of its lines of power equipment—enables the purchaser to choose from a wide range of equipment just the right type to suit the particular conditions of his installation.

Duplex Packed Piston Pumps.

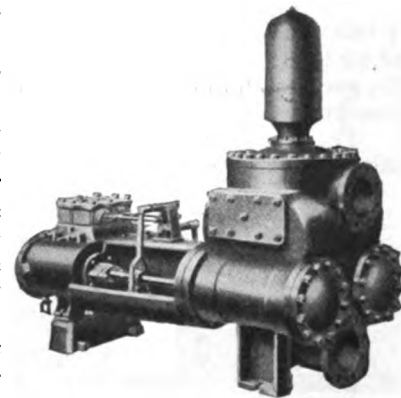
Standard for all ordinary services where the water pressures

are not in excess of 200 lbs. per sq. in.

These pumps are suitable for boiler feeding, tank supply, hydraulic elevators, small water works service and general water supply purposes. They are accessible in every part, and are fitted for pumping hot or cold, thick or thin, heavy or light, acid or alkaline liquids as may be required. Where high steam economy is of paramount importance, they are supplied with compound steam cylinders.



CAP AND VALVE PLATE PATTERN
DUPLEX PACKED PISTON PUMP



TURRET TOP PATTERN DUPLEX
PACKED PISTON PUMP

DATA, DUPLEX PACKED PISTON PUMPS

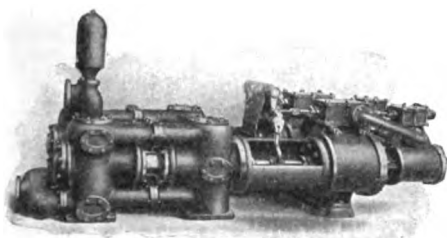
Maximum working pressure; steam ends, 150 lbs.; water ends, up to 10 x 6 x 10, 200 lbs.; larger size water ends, 150 lbs.

Size, in.			Gals. per stroke each piston	Normal operating capacity per min.			Diam. pipes, in.				Floor space, in.
Diam. steam cylinders	Diam. water cylinders	Stroke		No. single strokes	Feet piston speed	Gals.	Steam	Exhaust	Suction	Discharge	
3	2	3	.041	110	28	9	1 1/2	1 1/2	1 1/2	1	24 x 9
3 1/2	2 1/2	4	.069	100	33	14	1 1/2	1 1/2	1 1/2	1 1/2	28 x 9
4 1/2	2 3/4	4	.103	100	33	21	1 1/2	1 1/2	1 1/2	1 1/2	33 x 13
5 1/2	3 1/2	5	.208	90	38	37	1 1/2	1 1/2	2 1/2	1 1/2	38 x 16
6	4	6	.326	80	40	52	1 1/2	1 1/2	3	2	44 x 17
7 1/2	5	6	.51	80	40	82	1 1/2	2	4	3	45 x 22
7 1/2	4 1/2	10	.69	70	58	97	1 1/2	2	4	3	59 x 22
9	5 1/2	10	.94	70	58	131	2	2 1/2	4	3	61 x 23
10	6	10	1.22	70	58	171	2	2 1/2	5	4	62 x 26
10	7	10	1.67	70	58	234	2	2 1/2	6	5	60 x 26
12	7	12	2.00	60	60	240	2	2 1/2	6	6	76 x 31
14	7	12	2.00	60	60	240	2 1/2	3	6	6	78 x 33
12	8 1/2	12	2.95	60	60	354	2	2 1/2	6	6	76 x 31
14	8 1/2	12	2.95	60	60	354	2 1/2	3	6	6	78 x 33
16	8 1/2	12	2.95	60	60	354	2 1/2	3	6	6	79 x 40
14	10 1/2	12	4.29	60	60	515	2 1/2	3	8	7	82 x 37
16	10 1/2	12	4.29	60	60	515	2 1/2	3	8	7	82 x 40

Outside Packed Plunger Pumps.

Designed for rough and heavy service, for working pressures of 140 to 250 lbs. per sq. in.

They are completely accessible and can be furnished to handle up to 5650 gals. per minute.

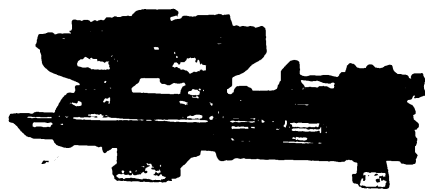


COMPOUND PACKED PRESSURE PUMP
Scranton pattern; 250 lbs. pressure

Pot Valve Pressure Pumps.

Designed for high pressure boiler feeding and other services requiring high water pressure. Pumps of this type are furnished for pressures up to 2000 lbs. per sq. in., suitable for steel and rolling mills in connection with hydraulic presses and for high-lift elevator work.

Where economy of power is important, compound steam cylinders are employed.

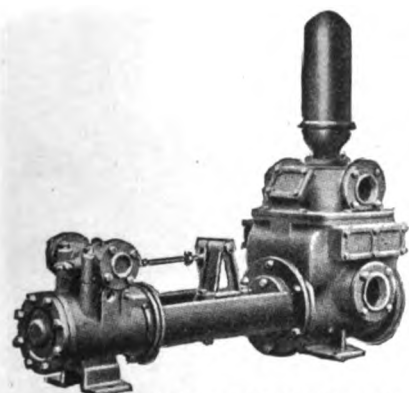


PRESSURE PATTERN BOILER FEED PUMP

Simplex Pumps.

Worthington offers a full line of horizontal and vertical steam pumps equipped with the well-known Blake-Knowles simplex style "A" valve gear.

Single Horizontal Piston Pattern Tank or Light Service Pumps—For pumping water or other liquids to limited heights, these pumps combine large pumping



SINGLE HORIZONTAL PISTON PATTERN TANK OR LIGHT SERVICE PUMP

DATA, PISTON PATTERN TANK OR LIGHT SERVICE PUMPS
Maximum working pressure: steam end, 250 lbs.; water end, 8 in. and under in diam., 100 lbs.; larger sizes, 75 lbs.

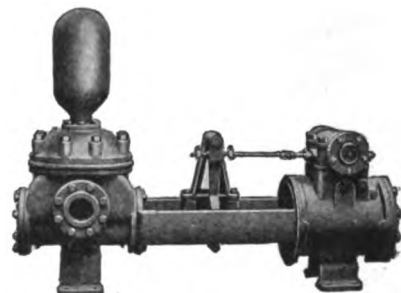
Size, in.			Normal operating capacity per min.			Diam. pipes, in.				
Diam. steam cylinder	Diam. water cylinder	Stroke	Gals. per stroke	No. single strokes	Feet piston speed	Gals.	Steam	Exhaust	Suction	Discharge
3 1/2	2 1/4	4	.069	100	33	17	3 1/2	1 1/2	1 1/2	28 x 10
4 1/2	2 3/4	6	.15	80	40	28	4 1/2	2 1/2	2 1/2	46 x 14
5 1/2	3 1/4	7	.25	75	44	54	5 1/2	3 1/2	3 1/2	46 x 14
6 1/2	4 1/4	8	.46	70	47	32	6 1/2	4 1/2	4 1/2	66 x 15
7 1/2	4 3/4	10	.69	70	58	48	7 1/2	5 1/2	5 1/2	66 x 15
8	5	12	1.02	60	60	61	8	6 1/2	6 1/2	54 x 16
10	6	12	1.47	60	60	88	10	8 1/2	8 1/2	54 x 16
12	7	12	2.00	60	60	120	12	10 1/2	10 1/2	74 x 22
14	8	12	2.61	60	60	157	14	12 1/2	12 1/2	74 x 22
16	10	18	6.12	60	90	367	16	15 1/2	15 1/2	89 x 19
10	12	12	5.87	60	60	352	10	12 1/2	12 1/2	74 x 22
10	12	18	8.81	60	90	528	10	15 1/2	15 1/2	99 x 25
12	12	12	5.87	60	60	352	12	12 1/2	12 1/2	74 x 22
12	12	18	8.81	60	90	528	12	15 1/2	15 1/2	99 x 25
14	14	18	12.00	60	90	720	14	18 1/2	18 1/2	101 x 31
14	16	18	15.66	60	90	940	14	20 1/2	20 1/2	101 x 31
16	16	18	15.66	60	90	940	16	20 1/2	20 1/2	101 x 31
18	18	24	26.44	50	100	1322	18	24 1/2	24 1/2	120 x 40
18	20	24	32.64	50	100	1632	18	26 1/2	26 1/2	120 x 40

capacity with small expenditure of steam, the steam cylinders in proportion to the pump cylinders being smaller in diameter than with the regular pressure pumps.

Worthington has patterns for intermediate and larger sizes and can furnish pumps with different combinations of steam and water cylinders adapted exactly to individual conditions.

Single Horizontal Piston Pattern Boiler Feed or Pressure Pumps

—Simple, compact, accessible and durable machines, having large direct water passages and full valve areas, which reduce water friction to a minimum and particularly adapt the pumps to boiler feeding. All parts are interchangeable.



SINGLE HORIZONTAL BOILER FEED OR PRESSURE PISTON PUMP

DATA, PISTON PATTERN BOILER FEED OR PRESSURE PUMPS
Maximum working pressure: steam end, 250 lbs.; water end, 250 lbs.

Size, in.			Normal operating capacity per min.			Diam. pipes, in.				
Diam. steam cylinder	Diam. water cylinder	Stroke	Gals. per stroke	No. single strokes	Feet piston speed	Gals.	H. p. boiler (at 35-lb. evap.) pump will feed at 65% normal sp.	Steam	Exhaust	Suction
3 1/2	2 1/4	4	.069	100	33	7	64	3 1/2	1 1/2	1 1/2
4 1/2	2 3/4	6	.15	80	40	12	110	4 1/2	2 1/2	2 1/2
5 1/2	3 1/4	7	.25	75	44	19	175	5 1/2	3 1/2	3 1/2
6 1/2	4 1/4	8	.46	70	47	32	300	6 1/2	4 1/2	4 1/2
7 1/2	4 3/4	10	.69	70	58	48	450	7 1/2	5 1/2	5 1/2
8	5	12	1.02	60	60	61	570	8	6 1/2	6 1/2
10	6	12	1.47	60	60	88	820	10	8 1/2	8 1/2
12	7	12	2.00	60	60	120	1115	12	10 1/2	10 1/2
14	8	12	2.61	60	60	157	1450	14	12 1/2	12 1/2
16	10	18	6.12	60	90	367	3400	16	15 1/2	15 1/2
								2 1/2	3	8
								3	8	6
								8	6	6
								29 x 8	39 x 11	44 x 11
								50 x 13	59 x 15	67 x 15
								70 x 15	72 x 15	73 x 18
								98 x 22		

Vertical Simplex Piston Pumps

—Made with single or double steam and water cylinders in a large range of sizes and capacities suitable for boiler feeding, general pressure or tank service. They are especially adapted for use where floor space is restricted, a valuable feature in marine service.

Volute Centrifugal Pumps.

Because of the wide range of designs, Worthington is enabled to meet the preference of any customer and to furnish a pump best suited for his conditions of service. Following are indicated a few of the main types of volute pumps, the line of which runs from the 1-in. Class "C" volute to the 72-in. double suction volute.

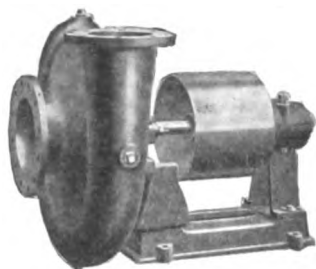
These pumps may be used for a variety of purposes: for waterworks service; sewage pumping plants; dry dock pumps; irrigation and drainage service; circulating water for condensers; paper mills; sugar factories; pumping brine, light oils, mine water, acidulous water, slimes, etc.

They can be arranged for direct drive from steam turbines and engines, oil engines and electric motors, also for belt drive.



VERTICAL SIMPLEX PISTON PUMP VALVE POT TYPE

Class "C" Volute Pumps—For all around service where small and medium quantities of water are to be pumped against heads not exceeding 80 ft. Handle gritty and sandy water, and are especially adapted for building contractors' work, also in connection with water supply from driven wells. These are standard pumps for all temporary and intermittent service, as first cost of installation will be lower than with any other pumping outfit.

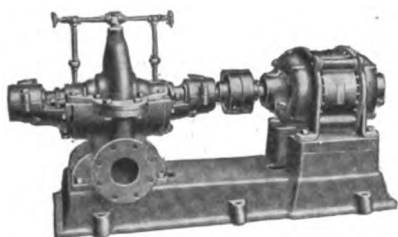


CLASS "C" VOLUTE PUMP FOR BELT DRIVE

DATA, CLASS "C" VOLUTE PUMPS

Size, in.	Gals. per min.	Approximate h. p. required	Maximum head, ft.
1	10 to 42	.5 to 2.5	40
1½	20 to 82	.75 to 4.5	50
2	38 to 185	1.0 to 11.0	60
2½	53 to 258	1.0 to 17.5	80
3	75 to 362	1.0 to 18.0	80
4	125 to 585	1.5 to 30.0	80
5	224 to 1020	2.0 to 44.0	80
6	332 to 1820	3.0 to 75.0	80
8	434 to 2860	3.5 to 110.0	80
10	780 to 4400	5.5 to 148.0	80

Type "OS" Volute Pumps—For handling large quantities of water at maximum efficiency where head does not exceed 100 ft. Any tendency to end thrust has been eliminated by making impeller of double suction type. Horizontally split casing permits of ready inspection of internal parts. This type is designed for electric motor or steam turbine drive.

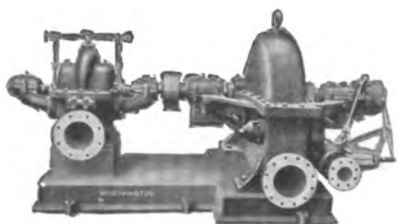


TYPE "OS" VOLUTE PUMP DIRECT CONNECTED TO ELECTRIC MOTOR

DATA, TYPE "OS" VOLUTE PUMPS
Maximum head, 100 ft.

Size, in.	Discharge diam., in.	Suction diam., in.	Gals. per min.	Approximate h. p. required	Approximate over all dimensions of motor driven unit, in.		
					Length	Width	Height
2	2	2½	40 to 260	.50 to 15.2	62½	20	25½
3	3	3	100 to 400	.86 to 19.5	62½	22	26½
4	4	4	150 to 600	1.2 to 26.6	62½	23	30
5	5	5	230 to 1000	1.7 to 42.7	68	26	31½
6	6	6	360 to 1600	2.5 to 63.0	68	28	33½
8	8	8	600 to 2600	4.0 to 100.0	87	32½	35
10	10	10	1000 to 4500	6.7 to 173.0	87	38	41
12	12	12	1600 to 6000	10.0 to 219.0	95½	40	45

Type "BS" Volute Pumps—Similar to Type "OS" but for more severe service and for heads up to 200 ft. In addition to the double suction type of impeller, a special by-pass connecting the pressure chambers is provided, thereby insuring a absolute hydraulic balance when working against high pressures. Standard split bush ring-oiled type of bearing. Volute suction head contributes to make these pumps especially efficient.

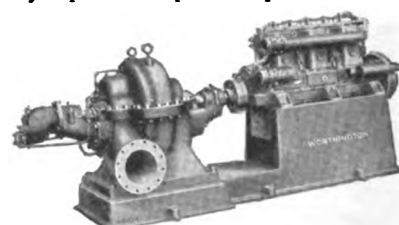


TYPE "BS" VOLUTE PUMP DIRECT CONNECTED TO STEAM TURBINE

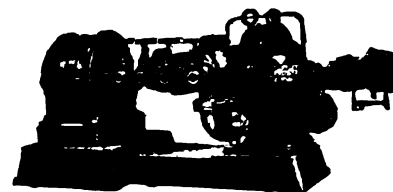
DATA, TYPE "BS" VOLUTE PUMPS
Maximum head, 200 ft.

Size, in.	Discharge diam., in.	Suction diam., in.	Gals. per min.	Approximate h. p. required	Approximate over all dimensions of motor driven unit, in.		
					Length	Width	Height
3	3	5	125 to 600	1.2 to 53.5	62	26½	31
4	4	6	200 to 900	1.6 to 72.0	62	28	33
5	5	8	360 to 1800	2.6 to 144.0	86½	31½	35
6	6	8	500 to 2200	3.5 to 161.0	86½	33	36½
8	8	10	800 to 3500	5.2 to 248.0	90½	39	44½
10	10	12	1200 to 5000	7.6 to 341.0	100	43½	46
12	12	16	2300 to 6500	14.3 to 432.0	100	44	48

Class "SD" Volute Pumps—For regular all around factory and industrial high pressure service. Built in 2 stages for heads up to 360 ft. and in 4 stages for heads up to 720 ft. The sump casing is of the double volute type, horizontally split. Impellers placed back to back in order to hydraulically balance end thrust. Bearings are of dustproof, ring oiled removable shell type. The small number of parts makes the "SD" pump especially desirable where water contains sand or grit. This type has been approved by the National Board of Fire Underwriters and can be furnished equipped with all necessary fittings for fire service.



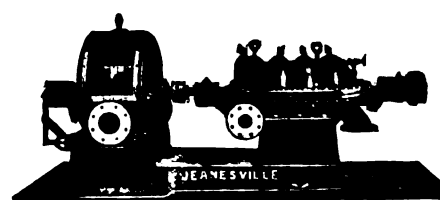
TWO-STAGE "SD" VOLUTE PUMP DIRECT CONNECTED TO GASOLINE ENGINE



1000-GAL. UNDERWRITERS' FIRE PUMP

Multistage Centrifugal Pumps.

For service in connection with water works, hydraulic elevators, mine drainage, boiler feeding, high pressure fire service, house service, etc.



WORTHINGTON DOUBLE SUCTION BOILER FEED PUMP

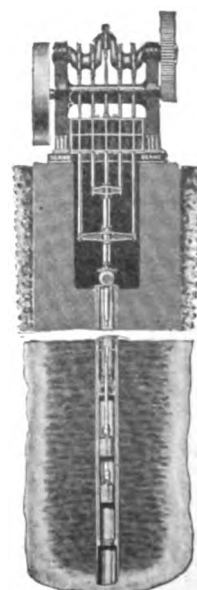
The single suction turbine type in 2, 3, and 4 stages will deliver against a head of 180 ft. per stage.

The double suction turbine type, built in 1, 2, 3 and 4 stages, is especially recommended for boiler feeding on direct turbine drive and for all heads over 160 ft. or 70 lbs. Its design automatically assures perfect hydraulic balance and freedom from end thrust. Sizes range from 4- to 10-in. capacities up to 3500 gals. per minute.

Other types of multistage centrifugal pumps are stocked to meet the conditions of any pumping service.

Deep Well Pumps.

Glendora pumps are unexcelled for deep well pumping in connection with municipal supply, irrigation,



GLENDRORA DEEP WELL PUMP

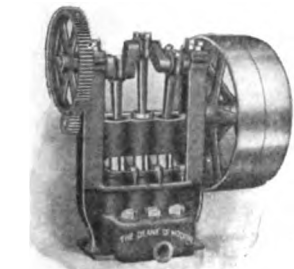
railroad tank service, office and factory buildings, paper mills, ice making plants and packing houses. They are adaptable to wells 8 in. and above in diameter, and are particularly applicable where the service is severe and continuous.

Briefly their advantages are: larger capacity from a given well than any other reciprocating pump; high mechanical efficiency; uniform, continuous flow of water in riser pipe; uniform load on prime mover; small engine or motor required to operate; absolute reliability; low operating cost; low maintenance cost; ability to discharge directly into mains; accessibility; heavy substantial construction.

Many other types of deep well pumps are built, from centrifugal to steam driven plunger, single or duplex.

Power Pumps.

Power pumps of every type in a complete range of sizes are built at the Deane and Blake-Knowles Works for every variety of purpose. The designs are such that maximum strength, rigidity, durability and efficiency are obtained with minimum wear.



VERTICAL TRIPLEX SINGLE ACTING POWER PUMP

Condensing Equipment.

Worthington can furnish steam condensing apparatus to meet the requirements of any set of operating conditions that may exist. The line includes every type of jet condensing equipment, spirojector, ejector and barometric types as well as surface condensers from the very smallest sizes to the largest units ever built in the United States.

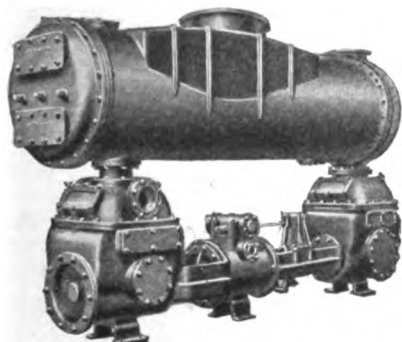
Being pump manufacturers on such a large scale



WORTHINGTON COUNTER CURRENT BAROMETRIC CONDENSER



SINGLE HORIZONTAL AIR PUMP WITH ADJUSTABLE CONE JET CONDENSER



WORTHINGTON STANDARD SURFACE CONDENSER MOUNTED OVER COMBINED AIR AND CIRCULATING PUMP



WORTHINGTON SPIROJECTOR CONDENSER

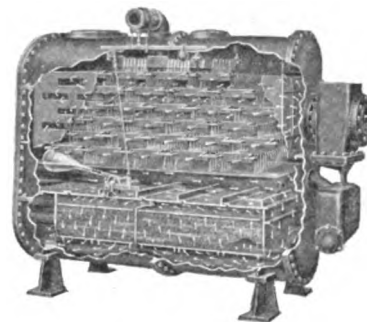
enables Worthington to supply auxiliaries best suited to the needs of the particular condenser selected.

Feed Water Heaters.

Stilwell feed water heaters are built by Worthington in several types and sizes up to 1000 h.p. for use with engines or pumps exhausting free to the atmosphere, and up to 20,000 h.p. for condensing plants.

The Stilwell heater combines in one unit a feed water heater, a feed water purifier, a condensation and a feed water softener.

In a non-condensing plant, it will save at least 16% of the coal bill and will add to the boiler one-sixth more steam producing capacity. In a plant operating condensing, the exhaust steam, after having been condensed, is passed through the heater, thereby raising the temperature by utilizing the heat in the exhaust from auxiliaries.



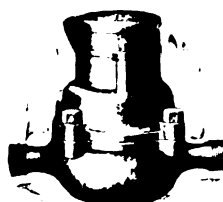
HORIZONTAL TYPE STILWELL FEED WATER HEATER

Meters for Hot and Cold Water, Gasoline, Oil, etc.

The Worthington line of meters permits the selection from among its various types and sizes of a meter to meet particular conditions as to quantity and rate of flow.

Model "G" Flat Disc Meter—Embodies in one meter: full size disc and measuring chamber; largest capacity of any meter; low frictional resistance; fewest individual parts; low weight; extreme accuracy; insurance against chemical troubles and freezing, and an intermediate train which will outwear any other form or make of train gearing hitherto manufactured.

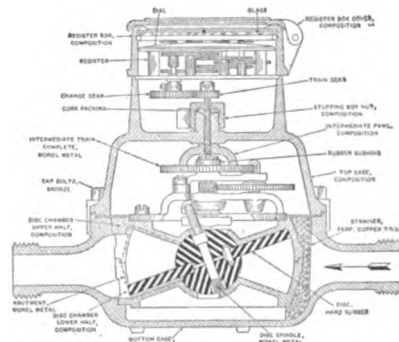
Turbine Meters—Designed primarily to handle large volumes of water with minimum loss of pressure.



MODEL G, WORTHINGTON METER

DATA, TURBINE METERS

Sizes, in.	Gals. per min.	
	Normal capacity	Maximum capacity
2	150	240
3	330	540
4	600	960
6	1300	2100
8	2350	4000
10	3700	6000
12	5300	7500



VELOCITY TURBINE PATTERN

Compound Meters—Combine the characteristics and capacities of the disc and turbine meters in that they will register over a wider range of flows than either of the above types, and are, therefore, especially adapted where the flow of water is subject to considerable variation.



WORTHINGTON DUPLEX
PISTON METER

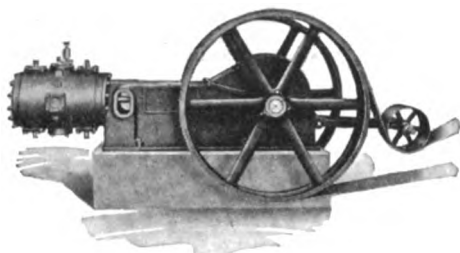
Duplex Piston Meters

—For measuring crude oil, petroleum, etc., and recording amount used in connection with oil burning apparatus. This type of meter, because of its absolute accuracy, is essential to the proper testing of the boiler plant.

Hot Water Meters—

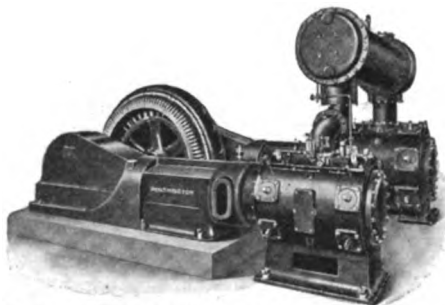
For boiler testing and boiler feed lines. Made in a variety of types and sizes.

Air, Gas and Ammonia "Feather" (Reg. U. S. Pat. Off.) Valve Air Compressors.



SINGLE-STAGE, BELT DRIVEN AIR COMPRESSOR

SINGLE BELT DRIVEN						SINGLE STEAM DRIVEN					
Cylinder diam., in.	Stroke, in.	R. p. m.	Displacement, cu. ft. per min.	Air pressure, lbs.	Motor h. p.	Size			R. p. m.	Displacement, cu. ft. per min.	Air pressure, lbs.
						Steam cylinder, in.	Air cylinder, in.	Stroke, in.			
7 1/2	6	350	106	80-100	15-17	7	7 1/2	6	350	106	80-100
8 1/2	9	300	170	80-100	25-28	8	8 1/2	9	300	170	80-100
10	10	285	258	80-100	37-42	9	10	10	275	245	80-100
11	12	270	350	80-100	51-58	10	11	12	260	338	80-100
13	14	245	522	80-100	75-84	12	13	14	235	500	80-100
15	16	220	710	80-100	98-118	14	15	16	210	680	80-100
11	10	285	312	40-55	35-43	9	11	10	275	300	40-60
13	12	270	495	40-55	55-65	10	13	12	260	475	40-60
15	14	245	695	40-55	76-92	12	15	14	235	665	40-60
18	16	220	1030	40-55	112-136	14	18	16	210	981	40-60
12	9	300	335	20-30	28-35	8	12	9	300	335	30
13	10	285	435	20-30	35-45	9	13	10	275	418	30
15	12	270	660	20-30	54-69	10	15	12	260	632	30
18	14	245	1000	20-30	78-98	12	18	14	235	961	30
22	16	220	1340	20-30	116-146	14	22	16	210	1470	30



TWO-STAGE DIRECT CONNECTED MOTOR DRIVEN "FEATHER"
VALVE COMPRESSOR

Size, in.	Displacement, cu. ft. per min.	R. p. m.	Air pressure, lbs.	Motor h. p.
13 and 8 by 10	455	300	80-100	72-81
15 and 9 1/2 by 12	670	277	80-100	108-121
18 and 11 by 14	1050	257	80-100	166-186
22 and 13 by 16	1570	225	80-100	235-265
24 and 14 by 18	1860	200	80-100	292-326
27 and 16 1/2 by 18	2350	200	80-100	347-390
27 and 16 1/2 by 21	2470	180	80-100	380-420
30 and 18 by 21	3050	180	80-100	475-530
27 and 16 1/2 by 24	2575	164	80-100	390-435
30 and 18 by 24	3200	164	80-100	500-560

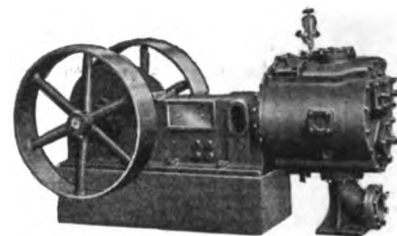
Worthington carries in stock a full line of sizes and types of "Feather" valve compressors from the small vertical belt driven compressor suitable for the shop requiring small quantities of air to the large duplex 2-stage direct motor or steam driven units.

All compressors are equipped with "Feather" (Reg. U. S. Pat. Off.) valves, unquestionably the most efficient and durable valves yet designed for compressor service. These extremely simple valves insure efficient, quiet and safe operation at high rotative speeds, minimum air friction, low maintenance cost and ease of access.

Only a few of the many sizes and types are indicated.

Vacuum Pumps.

Equipped with the same "Feather" (Reg. U. S. Pat. Off.) valves that have made Worthington air compressors so universally successful. Carried in stock in many sizes, arranged for belt, steam and direct drives.



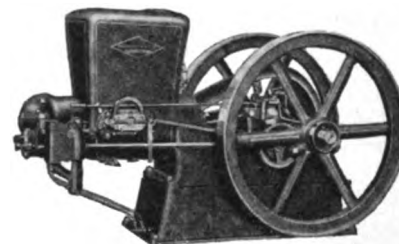
SINGLE BELT DRIVEN "FEATHER"
VALVE DRY VACUUM PUMP

Kerosene Engines.

For general service, electric storage battery work, factories, foundries, feed mills, elevator shops and farms.

Sizes, 1 1/2, 2 1/2, 4, 6, 8, 10, 15, 20 and 25 h.p. The 20- and 25-h.p. engines are cooled by running water or thermo-syphon cooling tank; other sizes are hopper cooled as shown in illustration.

All sizes equipped with throttling governor.

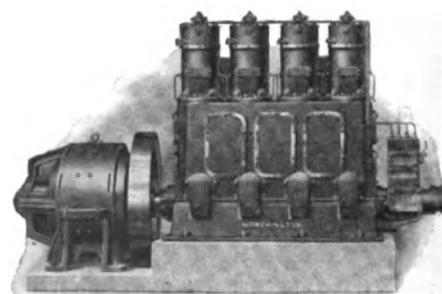


WORTHINGTON KEROSENE ENGINE
Kerosene-oil-distillate-gasoline throttling governor

Heavy Oil Engines.

Of the vertical, 2-stroke cycle, solid injection, cross-head type with ignition occurring from temperature of combustion.

These engines are adapted to any stationary power purpose on land or shipboard within their range of sizes,



WORTHINGTON HEAVY OIL ENGINE

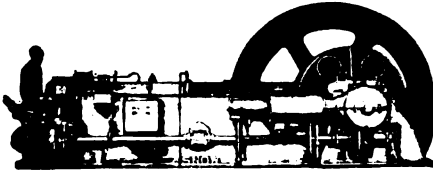
such as driving generators, pumps, hoists, line shafts, etc. Even in extremely cold weather, starting takes but 15 seconds with special Worthington igniter.

Burn all the cheaper grades of oil.

Built in 1, 2 and 4 cylinders delivering 25, 40, 50, 60, 80, 100, 120, 160 and 240 h.p.

Snow Oil Engines.

Of the horizontal, full Diesel type. The operation shows economies that greatly exceed those obtained by gas engines, steam engines or any other type of prime mover.



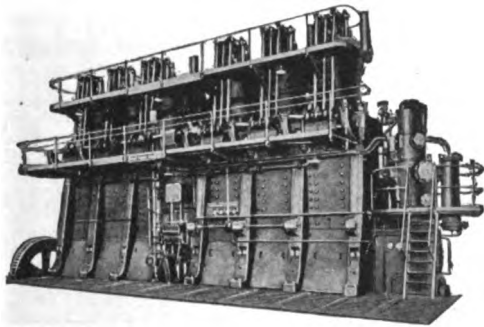
150 H.P. SINGLE CYLINDER SNOW OIL ENGINE

The heaviest and cheapest oils can be used for fuel.

Built in 1, 2 and 3 cylinders in sizes from 65 to 600 b.h.p.

Large Vertical Oil Engines.

Of the 4-stroke cycle full Diesel stationary or marine type in sizes up to 2400 h.p. They are especially desirable for heavy duty continuous operation service in connection with electric light and power plants, pumping stations, mining and cement industries and industrial plants of all kinds. The engines are entirely American designed and built and have incorporated in them the best features of modern Diesel engine practice.



WORTHINGTON 2400 H.P. VERTICAL OIL ENGINE

Hydraulic Turbines and Water Wheels.

For utilizing to the greatest advantage the potential power in any available water shed, Worthington manufactures hydraulic turbines of the well-known Francis reaction type. For low head service from 10 to 50 ft.



WORTHINGTON HYDRAULIC TURBINE RUNNERS

the line includes vertical and horizontal standard wheels of the open flume as well as enclosed casing type, ranging in output from 32 to 6400 b.h.p., and in speed from 385 to 275 r.p.m. For medium head service from 50 to 300 ft. the sizes run from 50 to 5000 b.h.p. and in speed from 900 to 240 r.p.m.

For high head service,

up to 1000 ft., where a multitude of varying conditions must be met, special designs will be submitted to meet the existing conditions.

Filter Presses.

Are manufactured in two types and several capacities. The Smith-Vaile vertical and horizontal styles are

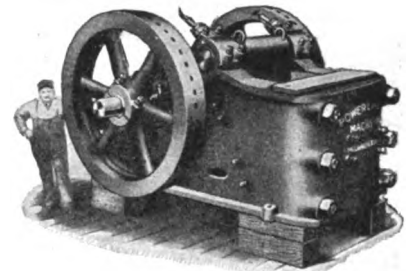
designed for oil mills and chemical plants where the demand is for a press of medium capacity.

The fields of application for the Worthington filter press are practically unlimited. A few of the more prominent uses are for sugar factories, both cane and beet; packing houses, for edible and inedible beef and hog tannage; oleomargarine, blood, etc.; mining industries for the treatment of slimes; sewage and sludge disposal plants, and a great variety of uses in the chemical industry.

Mining and Cement Machinery.

Jaw Crushers

—Superior type, made in sizes from 7 by 10 to 84 by 66 in., with either cast steel or semisteel frame reinforced with forged steel rods.

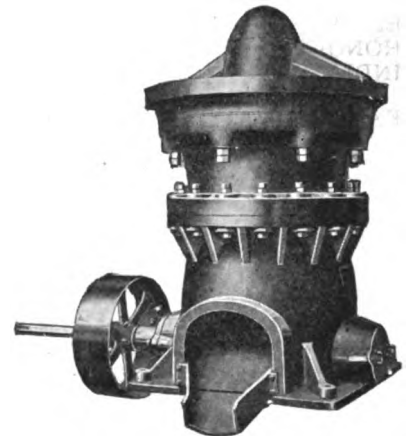


SUPERIOR JAW CRUSHER

Gyratory Crushers

—Made in superior McCully (patented) type with feed openings from 8 to 72 in. Lubrication is force feed to eccentric bearing and gearing. Capacities, $4\frac{1}{2}$ to 1500 tons per hour, depending on size of crusher and ring size of material.

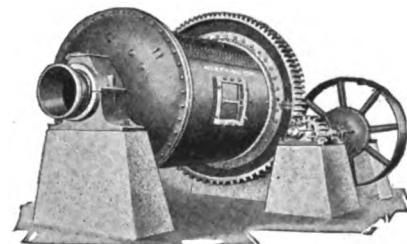
Standard McCully gyratory crusher made in sizes from No. 1 to No. 11, inclusive.



36-IN. SUPERIOR McCULLY CRUSHER

Cylindrical Mills

—Worthington makes ball mills in all diameters and lengths, with any type of lining or drive. Tube mills of the same characteristics, also rod mills in diameters and lengths to suit conditions.



CYLINDRICAL BALL MILL WITH CLUTCH PULLEY DRIVE

Rolls—Made in Garfield, Superior and Simplex types in diameters from 12 to 78 in., with various widths of face, according to conditions, and with pulleys either of the flywheel or standard type.

Jigs—Of the Woodbury type with iron hutches. Made with any desired number of compartments, also a full line of Hartz jigs, with either wood or iron hutches.

Other Equipment—In addition to the above line, Worthington makes a large line of screens both for dry and wet screening; stamp mills; sampling devices; log washers; upright, horizontal and Pierce-Smith type converters together with a complete line of converter accessories, such as slag cars, matte and slag ladles, ladle bails, pots, straight line casting machines, round or rectangular water jacketed blast furnaces for either silver, lead or copper.

YEOMANS BROTHERS COMPANY

Sewage Ejectors and Pumping Machinery

1420 Dayton Street
CHICAGO, ILL.

REPRESENTATIVES

ATLANTA, GA., BURFORD, HALL & SMITH, Third National Bank Building
BIRMINGHAM, ALA., E. N. CUNNINGHAM, Brown-Marx Building
BOSTON, MASS., POWER EQUIPMENT Co., 131 State Street
BUENOS AIRES, ARGENTINA, BUXTON, GUILAYN & Co.
BUTTE, MONT., C. H. COBB, Daly Bank Building
CHARLOTTE, N. C., J. R. PURSER, Commercial Bank Building
CINCINNATI, OHIO, O. J. ALLONIER, Provident Bank Building
CLEVELAND, OHIO, CLEVELAND PUMP & SUPPLY Co., Rockefeller Building
DALLAS, TEX., JOHN H. VAN ZANDT, Southwestern Life Insurance Building
DAVENPORT, IOWA, D. C. MURPHY, Security Building
DAYTON, OHIO, CHAS. M. KELSO Co., Reibold Building
DETROIT, MICH., POWER PLANT SPECIALTY Co., Penobscot Building
EL PASO, TEX., GEO. W. HERLIN, 619 Noble Street
HONOLULU, T. H., HONOLULU IRON WORKS
INDIANAPOLIS, IND., WEINSHANK & FENSTERMAKER, Hume-Mansur Building
KANSAS CITY, MO., McCULLEY-WIDENER & WRIGHT, 303 East 10th Street

LOS ANGELES, CAL., F. C. MILLARD Co., Marsh-Strong Building
MILWAUKEE, WIS., CHAS. W. MILLER, 209 Grand Avenue
MINNEAPOLIS, MINN., HEALY-RUFF Co., Plymouth Building
MONTREAL, TORONTO, WINNIPEG, CANADA, DARLING Bros., LTD.
NEW ORLEANS, LA., BRIAN & POWERS, Canal Bank Building
NEW YORK, N. Y., E. A. JULIE, 51 East 42d Street
OMAHA, NEBR., McCULLEY-WIDENER & WRIGHT, W. O. W. Building
PHILADELPHIA, PA., CHAS. C. ENDERLE, Commercial Trust Building
PITTSBURGH, PA., CARL D. BUSHNELL, Park Building
PORTLAND, ORE., GORDON & FINKBEINER, 224 Pine Street
ROCHESTER, N. Y., J. F. BRIGHTMAN, Mercantile Building
SALT LAKE CITY, UTAH, HAWLEY-RICHARDSON-WILLIAMS Co., Dooly Building
SAN FRANCISCO, CAL., CALIFORNIA HYDRAULIC ENGINEERING & SUPPLY Co., 70 Fremont Street
SEATTLE, WASH., A. H. COX & Co., 307 First Avenue, South
UTICA, N. Y., CHAS. M. KELSO Co., City National Bank Building
VANCOUVER, B. C., FRANK DARLING & Co., 1142 Homer Street
WASHINGTON, D. C., JAS. P. NEWSHAW, 710-14th Street, N. W.

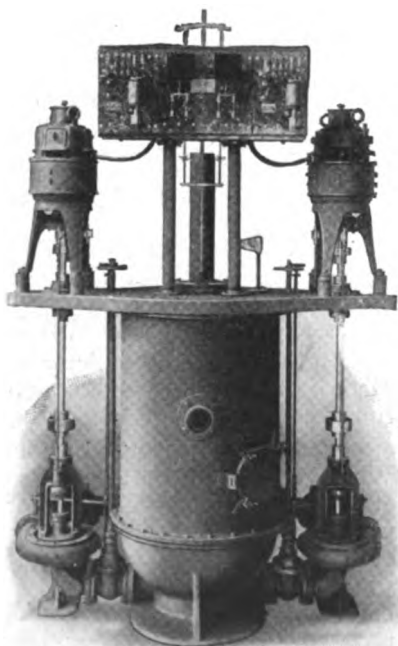
Products.

YEOMANS FORM "A" DUPLEX CENTRIFUGAL ELECTRIC SEWAGE EJECTORS; SHONE PNEUMATIC SEWAGE EJECTORS; YEOMANS SINGLE and DUPLEX ELECTRIC BILGE or SUMP PUMPS; YEOMANS HOUSE PUMPS; CONDENSATION RETURN PUMPS.

Also manufacturers of Pumping Machinery for all purposes.

Yeomans Form "A" Sewage Ejector.

A duplex equipment consisting of two special vertical centrifugal pumps operating in dry pit, connected to cast iron sewage receiver and driven by direct connected vertical motors mounted on receiver cover, equipped with automatic controllers, high water alarm, pit drainage connections, cast iron bar screen of large area, gate and flush back check valves. Pumps arranged so that top plate can be raised without disturbing shafting, bearings or impellers. No accumulation of solids in receiver; minimum space requirements; high efficiency; noiseless; sanitary and reliable.



FORM "A" DUPLEX EJECTOR

DATA, FORM "A" DUPLEX SEWAGE EJECTORS

No.	3	4	5	6
G. p. m. each unit.....	100-125	150-200	250-350	400-500
Pit diameter, ft.....	8	8	8	10
Depth of pit below inlet, ft.....	4	4	4	5

Shone Pneumatic Sewage Ejector.

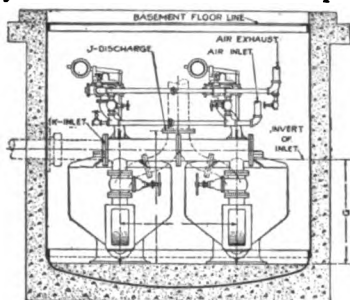
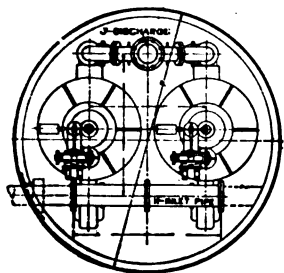
The Shone ejector has been in successful service in all parts of the world for over 35 years. First installation in this country in 1888 is still in service. At the World's Fair in Chicago in 1893, 52 Shone ejectors handled all sewage.

Unequalled for substantial design, durability, economy and reliability in operation. No screens required; bottom discharge and no accumulation of solids; special non-clogging check valves; no airtight floats; bronze, pressure operated, quick acting piston type automatic



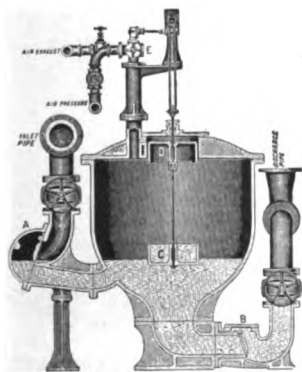
250-GALLON SHONE DUPLEX EJECTOR

air valves. Furnished with either motor or steam driven air compressors. Compressors can be located at any desired distance from ejectors. Ejectors can be operated from air supply maintained for general purposes in industrial plants. Especially recommended for municipal work.



DIMENSION DIAGRAM OF SHONE DUPLEX EJECTOR

G. p. m. each unit	G	SINGLE EJECTORS			DUPLEX EJECTORS	
		F	J	K	F	J and K
50	3'-1"	6'	4"	6"	8'	6"
100	3'-7"	7'	5"	6"	9'	8"
150	4'-5"	7'	5"	6"	9'	8"
200	5'-10"	8'	6"	8"	11'	8"
250	6'-5"	8'	6"	8"	11'	8"
300	7'-0"	8'	6"	8"	11'	8"
400	7'-3"	13'	12"	12"	14'	12"
500	8'-0"	13'	12"	12"	14'	12"
600	8'-9"	13'	12"	12"	14'	12"
750	8'-0"	14'	14"	14"	16'	14"
1000	9'-0"	14'	16"	16"	16'	16"



SHONE EJECTOR, SECTIONAL VIEW

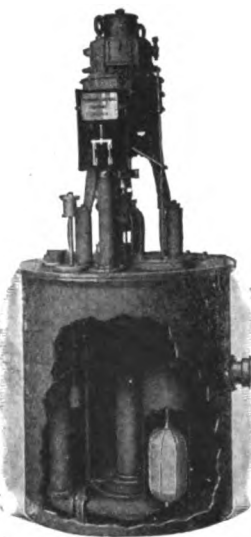
Yeomans Bilge Pumps.

Single Electric—Automatic, self-contained, heavily constructed, slow speed machines, with submerged centrifugal pumps, vertical direct connected motors and automatic controllers for handling waste water and sewage.

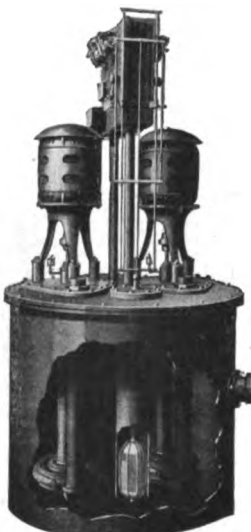
Built in two grades: Grade 1, pumps operating at slow speeds and equipped with high water alarm, pipe casing for float, force feed lubricated bearings, etc. Grade 2, moderate speed.

DATA, SINGLE ELECTRIC BILGE PUMPS

No. 1/2	15-25	g.p.m.	24-in.	diam.	basin
No. 1	35-50	g.p.m.	36-in.	diam.	basin
No. 2	50-75	g.p.m.	36-in.	diam.	basin
No. 3	100-125	g.p.m.	36-in.	diam.	basin
No. 4	150-200	g.p.m.	36-in.	diam.	basin
No. 5	250-350	g.p.m.	48-in.	diam.	basin
No. 6	400-500	g.p.m.	48-in.	diam.	basin



GRADE 1 BILGE PUMP



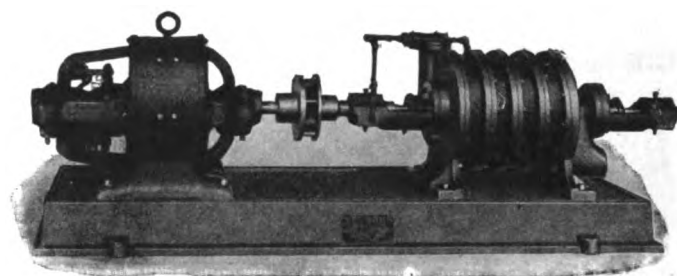
YEOMANS DUPLEX ELECTRIC BILGE PUMP

Duplex Electric Bilge Pumps or Submerged Sewage Ejectors—Construction similar to single bilge pumps; units arranged so that one can be removed without disturbing the other. Capacities per unit same as single bilge pumps.

Basin diameters: Nos. 1 and 2, 36 in.; No. 3, 48 in.; Nos. 4 and 5, 60 in.

Yeomans Centrifugal House Pumps.

Most improved type, single and multistage, high efficiency, quiet running pumps with ring oiled, water cooled external shaft bearings, perfectly balanced rotors, flexible couplings. Special attention given to noiseless pumps for high class apartment buildings, residences and hotels. Complete automatic equipments furnished for either roof tank or compression tank service, any capacity.



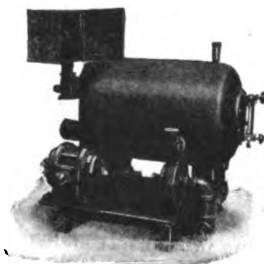
YEOMANS MULTISTAGE CENTRIFUGAL HOUSE PUMP

Yeomans Condensation Return Pumps.

High grade equipments consisting of cast iron receiver with water glass, direct connected centrifugal pump and motor, all on one base, enclosed quick break butt contact automatic switch, seamless copper float and protective devices.

Type "H" Pumps—For returns above basement floor level.

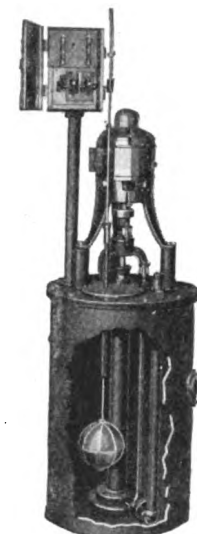
Type "V" Pumps—For returns close to or below basement floor.



TYPE "H" CONDENSATION RETURN PUMP

DATA, TYPES "H" AND "V" CONDENSATION RETURN PUMPS

No.	G. p. m.	Maximum sq. ft. direct radiator.
1	5	1,000
2	10	3,000
3	15	6,000
4	20	10,000
5	30	15,000
6	60	30,000



TYPE "V" CONDENSATION RETURN PUMP

References.

Yeomans pumps and Shone ejectors have been in service in important city buildings, industrial plants and municipalities for many years. Installations can be referred to in all parts of the world.

FOUNDED 1867

THE GRISCOM-RUSSELL CO.

Manufacturers of Power Plant and Marine Auxiliaries

CABLE ADDRESS:
"GRISPEN, NEW YORK"

91 West Street
NEW YORK, N. Y.

WORKS:
MASSILLON, OHIO

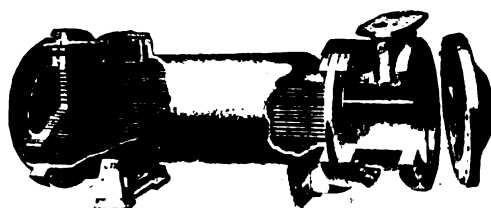
Products.

INSTANTANEOUS and STORAGE WATER HEATERS; FEED WATER HEATERS; EVAPORATORS for Boiler Feed Makeup; OIL COOLERS; SUBCOOLING CONDENSERS; OIL HEATERS; OIL and WATER STRAINERS; FEED WATER FILTERS; STEAM, OIL and AIR SEPARATORS.

Also manufacturers of Grease Extractors.

G-R Instantaneous Heater.

For heating boiler feed water or for supplying hot water for general service. Steam is the heating medium. Shell of cast iron; heating surface of straight

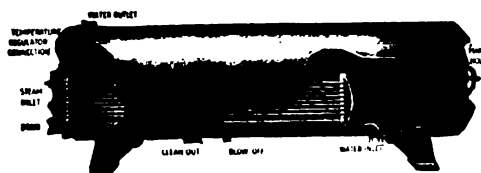


G-R INSTANTANEOUS HEATER

seamless drawn brass tubing. Floating head construction permits expansion and contraction of tubes without strain on tube joints.

Russell Storage Heater.

To supply hot water in hotels, apartment houses, laundries, dye houses, etc. Water in shell; steam in

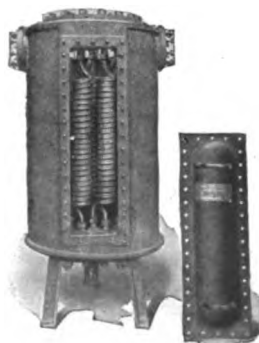


RUSSELL STORAGE HEATER

tubes. A storage capacity of hot water is assured at all times. Shell is of steel and heating surface of seamless drawn brass tubing.

Reilly Heater.

This is a closed type heater for either marine or stationary power plants for boiler feed or other purposes. Steam is the heating medium. Shell of cast iron; heating surface seamless drawn copper tubing. Built in any required size.



REILLY HEATER

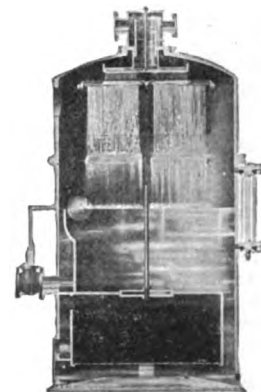


TRADE-MARK

Massillon Open Heater.

For the purification and heating of boiler feed water by direct contact of steam with water. Shell and trays of cast iron.

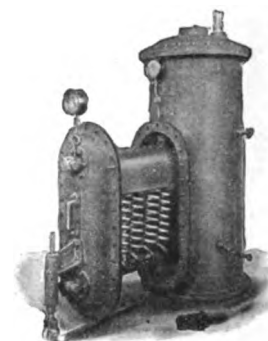
A Stratton Jr. Oil Separator can be supplied, if required, for the removal of oil from exhaust steam before it enters heater.



MASSILLON OPEN HEATER

Reilly Evaporator, Self-Scaling.

The up-to-date method of purifying boiler feed water is by the use of Reilly Evaporators, Self-Scaling. This system provides absolutely pure water, eliminates scale and boiler blowdown, decreases maintenance and repairs, permits operation at heavy overloads, reduces coal and labor costs, and pays for itself in from 12 to 18 months operating time.



REILLY EVAPORATOR

Multiwhirl Cooler.

For cooling lubricating oil used in turbine bearings, reduction gears, etc., and for quenching oils used in heat treatment of steel.

Practically standard in the United States Navy and merchant marine.



MULTIWHIRL COOLER

Over 1600 in daily operation throughout the world. The particular feature is the patented helical baffle which directs oil in its passage through cooler without causing appreciable pressure loss.

Multiwhirl Subcooling Condenser.

For the condensing and subcooling of gasoline, kerosene, or any other vapors used in oil refinery work. Vapors enter tubes at top and are condensed and cooled in their passage through the tubes, distillate being taken off at the bottom. Condensing and cooling water enters shell at bottom and travels upward through the helical path and leaves condenser at top.

Has many distinct advantages not possessed by any other condenser now used in the oil refining field.

Excellent adapted to gasoline recovery plants for the efficient condensation of gasoline vapors and for condensing various vapors in solvent recovery systems.

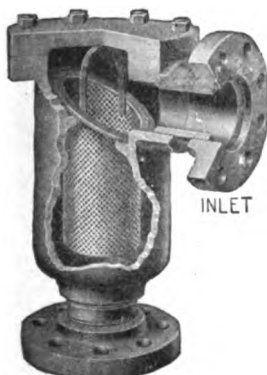
MULTIWHIRL
SUBCOOLING
CONDENSERREILLY OIL
HEATER**Reilly Oil Heater.**

For the preheating of fuel oil before it is fed to the burners of boilers, furnaces or cupolas. Oil passes through coils of seamless drawn steel tubing, and high pressure steam is supplied to shell. Steam condensation is usually returned to boilers.

Construction of the Reilly Oil Heater prevents any contamination of condensed steam by oil, as all oil joints are outside of steam space.

G-R Oil Heater.

Another design of heater for preheating fuel oil. Shell of wrought steel, cast iron heads; tube plates of steel plate, and tubes of seamless drawn steel expanded into tube sheets.

G-R OIL
HEATER

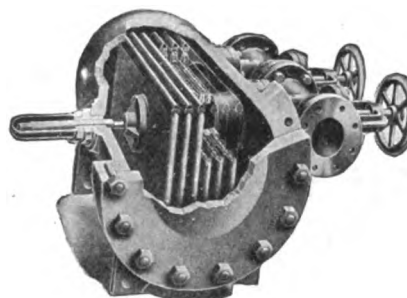
G-R STRAINER

G-R Strainer.

For removal of foreign matter in suspension from suction and discharge lines of lubricating or fuel oil systems. Also for removal of sticks, weeds, etc., from river water. Made in sizes 1 to 6 in. inclusive. Can be arranged in pairs, so that one strainer can be cleaned while the other remains in service.

G-R Multiscreen Filter.

Designed for the removal of oil from returned condensed steam from engines, heating systems, etc. Protects boiler against damage due to oil in feed water.



G-R MULTISCREEN FILTER

New Stratton Separator.

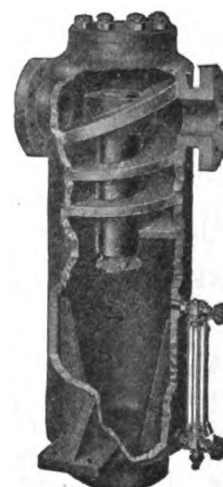
The New Stratton Separator is a re-design of the famous Stratton Separator, thousands of which are in use throughout the world.

Effectively removes water from steam before it enters engine or turbine.

Effectively removes water from compressed air before it enters air tools, sand blast machines, etc.

Built of either cast iron or cast steel, depending upon the service.

Made in various types of inlet and outlet to suit pipe connections.

NEW STRATTON
SEPARATOR**Bundy Oil Separator.**

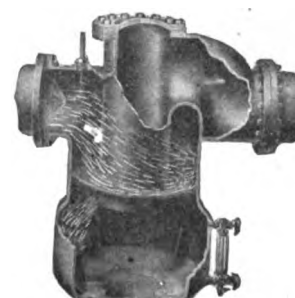
For the effective removal of oil from exhaust steam to prevent contamination of heating systems or boilers. Removable multiple baffle plate construction permits easy cleaning.

Stratton Jr. Oil Separator.

For removal of oil from exhaust steam. A water spray at the inlet condenses any vaporized oil.

The steam and condensed oil pass through a helical path which causes a swirling motion of the entire mass. The heavier oil is thrown out of the steam current and the dry steam rises up through center pipe and out into steam line.

Built of cast iron. Made in various types of inlet and outlet to suit pipe connections.

BUNDY OIL
SEPARATORSTRATTON JR. OIL
SEPARATOR

THE NATIONAL PIPE BENDING CO.

Manufacturers of "The National" Feed Water Heaters and Oil Separators
Coilers of Pipe and Tubing

131 Lloyd Street
NEW HAVEN, CONN.

BRANCH OFFICES AND AGENCIES

BOSTON, MASS.
CHICAGO, ILL.
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PHILADELPHIA, PA.
WASHINGTON, D. C.
BUFFALO, N. Y.

JACKSONVILLE, FLA.
PITTSBURGH, PA.
NEW YORK, N. Y.
ST. LOUIS, MO.

Products.

FEED WATER HEATERS, including: Coil Type; Inside Manifold Type; Direct Contact Open Type.

SERVICE WATER HEATERS, including: Storage and Non-storage Heaters.

OIL SEPARATORS.

Also manufacturers of Refrigerating Coils; Fuel Oil Heaters; Converters for Forced Circulation Heating Systems; Coils and Bends of Iron, Brass and Copper Pipe.

National Coil Type Feed Water Heater.

Water passes through drawn copper tubing guaranteed to withstand 600 lbs. pressure. This tubing is securely fixed in the cast iron or steel plate shell which is completely filled with the exhaust steam. The water does not come in contact with the steam or the shell.

Particularly adapted for use where water supply is free from oil or those substances which form scale or cause corrosion.



NATIONAL COIL TYPE FEED WATER HEATER

DATA. NATIONAL COIL TYPE FEED WATER HEATER

Type	Diameter shell, in.	Length shell, in.	Capacity, lbs. water per hour	Weight, lbs.
R-3 ₈	8	24 to 38	300 to 1,300	150 to 200
P-1 ₂	10	31 ₂ to 41 ₂	500 to 2,000	275 to 325
L-1 ₂	12	27 ₂ to 36 ₂	600 to 2,200	325 to 375
L-3 ₄	12	30 ₂ to 45 ₂	800 to 3,600	350 to 450
L-1	12	40 ₂ to 57 ₂	1,200 to 4,400	450 to 575
J-1 ₄	14 ₄	42 ₂ to 57 ₂	1,000 to 7,000	625 to 750
H-1 ₂	18	47 ₂ to 63 ₂	3,000 to 11,000	975 to 1,225
G-2	21	49 to 70	4,000 to 17,000	1,275 to 1,675
F-2 ₂	26	52 to 71	7,000 to 26,000	1,850 to 2,335
A-3	29	72 to 91	10,000 to 35,000	2,950 to 3,300
B-3	35	72 ₂ to 91 ₂	10,000 to 35,000	3,800 to 4,250
B-4	35	91 ₂ to 152 ₂	15,000 to 75,000	4,650 to 6,400
D-4	48	73 to 109	25,000 to 80,000	6,100 to 7,600
B-5	35 ₈	115 ₂ to 177 ₂	25,000 to 70,000	5,600 to 7,300
D-5	48	77 to 131	20,000 to 110,000	6,600 to 9,000
E-5	57 ₂	74 to 104	30,000 to 110,000	8,900 to 11,000
D-6	48	109 to 190	35,000 to 145,000	8,000 to 11,700
E-6	57 ₂	84 to 138	35,000 to 145,000	9,800 to 13,300

The capacities in this condensed table are based on raising the temperature of the water from 40° to 200°.

National Storage Heater.

Constantly and intermittently supplies large quantities of hot water for washing in mills, factories, hotels, apartments, etc.

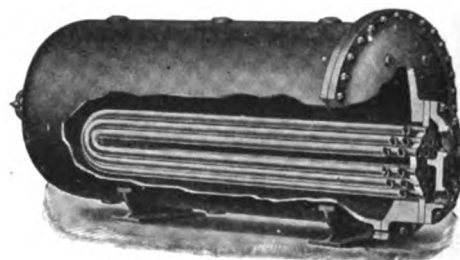
Uses exhaust steam, thereby saving coal, or live steam if there is not sufficient exhaust.

Consists of a shell or tank containing a heating ele-

ment made up of a set of removable U-bends of copper tubing.

Heating element is removable for inspection, repairs or substitution of a larger or smaller element. It is placed in the lower part of the shell where the entering water will come in contact with it, resulting in maximum efficiency in the transfer of heat.

The area through the tubes is sufficient for unrestricted flow of steam and condensation.

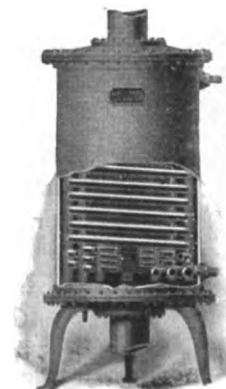


NATIONAL STORAGE HEATER

Capacities of National Storage Heaters—The range of the storage capacity of these heaters is from 20 gals. and up; the temperature range, usually 40° to 80° Fahr., with steam at atmospheric pressure. They can be made to satisfy the conditions of installations, and within wide limits, any selection of storage capacity and gallons per hour heating capacity can be taken.

National Inside Manifold Type Feed Water Heater.

This heater is made up of a coil of seamless drawn brass or copper tubing within a vertical containing shell. The ends of the coils are brazed into gunmetal manifolds, making the coils perfectly tight.

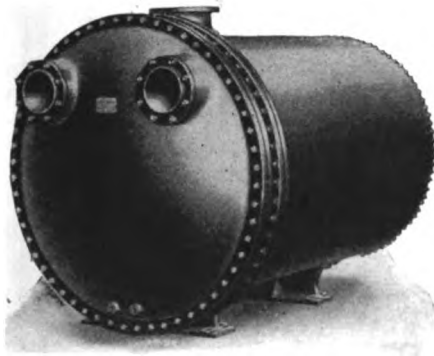


NATIONAL INSIDE MANIFOLD TYPE FEED WATER HEATER

To handle a large quantity of water and yet have the heater of relatively small size, coils up to 14 in number are contained in the shell. This multiplicity of coils divides the water into many streams, so that a large quantity of water heats quickly. To insure an even flow through all the coils a manifold fitting brings the ends of the coils into a common header. The coils are tested to 600 lbs. per square in. water pressure, to insure safety even with the highest boiler pressures carried in the most up-to-date power plants.

Instantaneous Generators.

The National U-bend heaters, shown here, provide enormous heating service in a relatively small space. This makes them extremely desirable when space is valuable. The capacity and temperature range of these heaters are limited only by the operating conditions.



NATIONAL U-BEND HEATER

National Horizontal Oil Separator.

Insures complete separation of oil and exhaust steam, yet allows steam to pass through freely without friction. Oil is taken out of the current of steam by gravity, impact and change of direction, and baffle plates prevent it from being picked up again and carried along



NATIONAL OIL SEPARATOR

in the current. At the bottom a large drip opening leads from the storage chamber for draining the separator to the sewer.

These separators are made in two pieces to allow inspection and test of baffle plates. Joint is machined and guaranteed perfectly tight.

The steam, when condensed, is perfectly suitable for boiler feed, laundry or dyehouse service, ice making or any other similar purpose.

National Direct Contact Feed Water Heater.

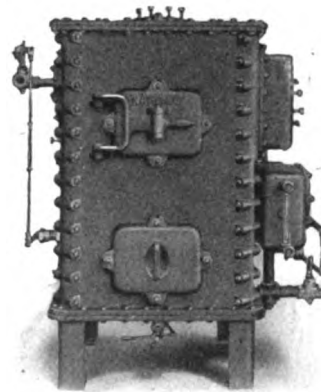
Heater consists of a cast iron shell within which are the contact pipes, trays, filter bed, etc.

Shell is either vertical, rectangular or horizontal cylindrical, according to conditions.



SECTION THROUGH NATIONAL DIRECT CONTACT FEED WATER HEATER

The principles of operation and construction details are fully covered in our catalogue which will be sent on request. The accompanying illustration shows the general type of heater and the highly efficient method of transmitting the heat of the steam to the water.



NATIONAL DIRECT CONTACT HEATER, RECTANGULAR VERTICAL TYPE

DATA, NATIONAL DIRECT CONTACT OPEN TYPE HEATERS AND PURIFIERS

VERTICAL RECTANGULAR TYPE					HORIZONTAL CYLINDRICAL TYPE				
Size No.	Heating capacity, lbs.	Dimensions, in.		Shipping weight, lbs.	Size No.	Heating capacity, lbs. per hour	Dimensions, in.		Shipping weight, lbs.
		Height	Base				Diam.	Length	
22	6900	70 1/2	31 x 31	3000	58 1/2	29325	63 1/2	73 1/2	8900
22 1/2	8625	70 1/2	31 x 36	3250	510	34500	63 1/2	82 1/2	9500
23	10350	70 1/2	31 x 41	3500	512	43125	63 1/2	97	10500
34	13900	70	41 x 31	4450	515	51750	63 1/2	110	11250
35	17250	70	41 x 36	4600	517	60375	63 1/2	125	12100
46	20700	70	47 x 39	5200	520	69000	63 1/2	140 1/4	13100
47	24150	70	47 x 45	5500	525	86250	63 1/2	167 1/4	15000
48 1/2	29325	70	47 x 53	5800	720	69000	78 3/4	99 3/4	16000
410	34500	78	53 x 47	7000	725	86250	78 3/4	116 3/4	18000
412	43125	78	53 x 53	7400	730	103500	78 3/4	134 3/4	19500
415	51750	78	53 x 59	8250	740	138000	78 3/4	170 3/4	23000
517	60375	84	59 x 59	9500	750	172500	78 3/4	207 3/4	26500
520	69000	84	59 x 65	10000	950	172500	103	133 3/4	32000
525	86250	84	59 x 80	12500	960	207000	103	154 3/4	35000
					975	258750	103	185 1/4	40900
					990	341550	103	215 3/4	45000
					9110	379500	103	216 3/4	45000

ROSS HEATER & MFG. CO., INC.

1407-1411 West Avenue
BUFFALO, N. Y.

Products.

CROSSHEAD-GUIDED EXPANSION JOINTS
BOILER FEED WATER HEATERS
HOT WATER SERVICE HEATERS
HOT WATER HEATING SYSTEM HEATERS
SUGAR JUICE HEATERS
LOW HEAD JET CONDENSERS
BAROMETRIC CONDENSERS
SURFACE CONDENSERS
WATER COOLERS

OIL HEATERS
AIRJECTOR PUMPS
CHEMICAL HEATERS

Also:

Oil Coolers

Distilling Condensers

The Ross Crosshead-guided Expansion Joint.

Relieves pipe of all strains due to expansion or contraction. Made in all pipe sizes for traverse of 4 to 16 in., and with or without anchor in the following types: low pressure cast iron for 125 lbs. steam, water, air or gas; high pressure cast iron for 250 lbs. saturated steam, water, air or gas; high pressure cast steel for 300 lbs. steam and 350° Fahr. superheat.

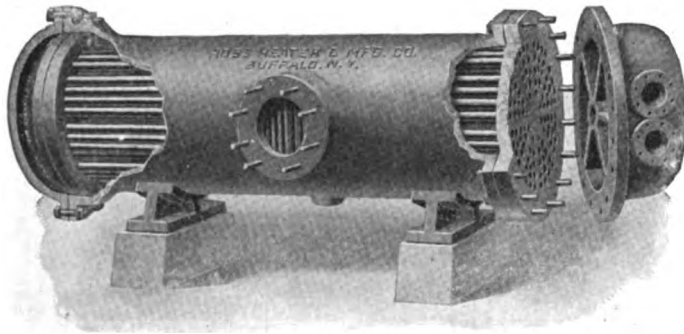
Oil fittings for temperature of 1000° Fahr.

Write for special Catalogue.

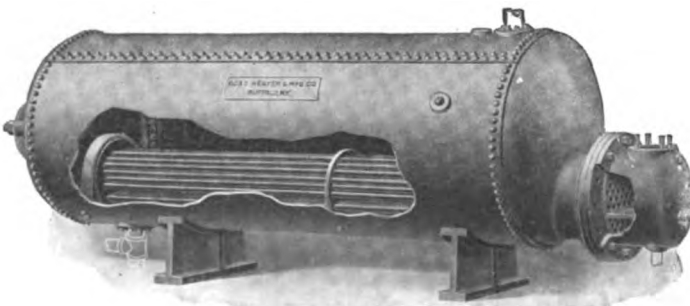
Ross Instantaneous and Storage Heaters.

Have straight, seamless, copper or brass tubes expanded into both tube heads, one of which is of the floating type to compensate for expansion or contraction. These heaters are built for heating water, oil, cane juice, chemicals and liquids of all kinds. The following are a few of the types:

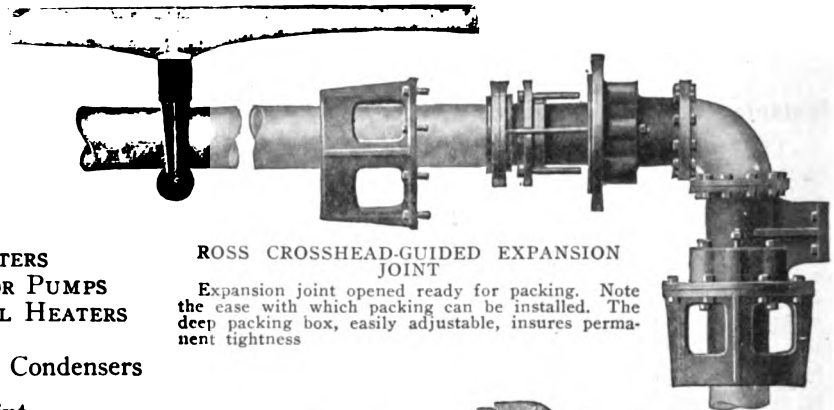
Service heaters for supplying hot water to hotels, hospitals, factories, schools, apartment buildings, etc.



ROSS INSTANTANEOUS HEATER

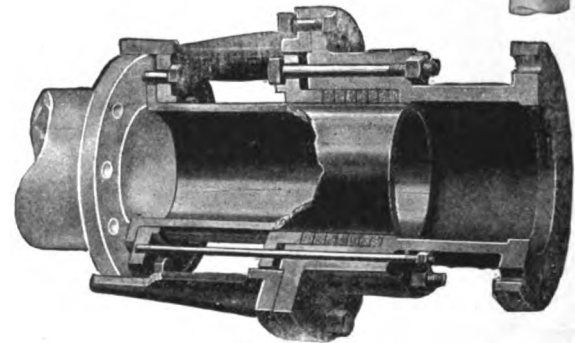


ROSS STORAGE TYPE HEATER, LARGE STORAGE CAPACITY FOR SUDDEN DEMANDS



ROSS CROSSHEAD-GUIDED EXPANSION JOINT

Expansion joint opened ready for packing. Note the ease with which packing can be installed. The deep packing box, easily adjustable, insures permanent tightness



SECTIONAL VIEW, SINGLE EXPANSION JOINT

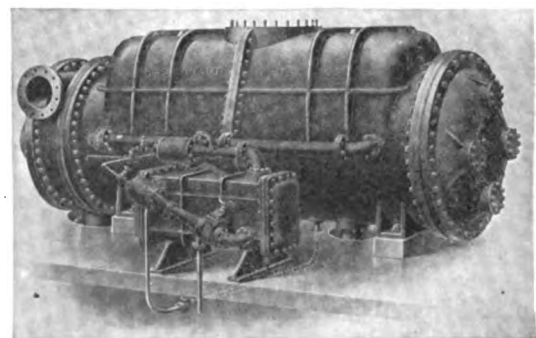
Heating system heaters for supplying hot water for either forced or gravity circulation.

Write for special heater catalogue.

Ross Surface Condensers.

Ross surface condensers, barometric condensers and low head jet condensers can be supplied in any size. They will produce the highest vacuum that the temperature of the condensing water will permit. In the manufacture of Ross condensers, the same care, good materials and liberal ratings are used as in all other Ross products.

The Airjector pump for removing the air and non-condensable vapors from condensers is shown in the illustration below. It is of the steam jet type in



ROSS SURFACE CONDENSER WITH AIRJECTOR PUMP

which two steam ejectors operate in series and with an interposed condenser-cooler. The highest possible vacuum is produced and its simplicity reduces the maintenance and operating costs to a minimum.

Write us if you are having air pump troubles.

ESTABLISHED 1894

INCORPORATED 1912

STACK HEATER COMPANY

Manufacturers and Designers of Water Heaters and Allied Specialties

33 Sudbury Street
BOSTON, MASS.

Products.

STACK AUTOMATIC HOT WATER STORAGE SYSTEMS (Steam and Gas); STACK INSTANTANEOUS WATER HEATERS (Steam and Gas); SAFETY RELIEF VALVES.

Also manufacturers of Stack Feed Water Heaters, Stack Tank Heaters (Steam and Gas), Thermostats, Non-by-pass Tees.

Service.

Stack expert engineering department wishes to co-operate with engineers. This service is free, and is guaranteed to meet any requirements when recommendations are followed. Stack experience is at the command of engineers whether or not Stack appliances are used.

Construction.

Stack heaters are made of small seamless drawn copper tubes. The ratio of heating surface to volume of water is 3 times that of any other heater.

All waterways are of copper, bronze, or brass. No expansion joints are used, as each tube can expand and contract without stress or strain.

All coils are tested on 600 lbs. water pressure before assembling.

Advantages.

Speed in heating water, and free circulation; efficiency and economy.

Safety—no Stack system has ever blown up or exploded. Built under the same supervision for 25 years.

Tests.

All makes of heaters exhibited at the International Exposition were given a series of actual service tests. Stack heaters showed the greatest speed and efficiency in each test.

A copy of these tests is on file at the executive office, and will be shown architects and engineers interested.

Stack Instantaneous Steam Water Heater with Temperator.

Steam does not mix with water.

Suitable on either exhaust or high pressure steam.

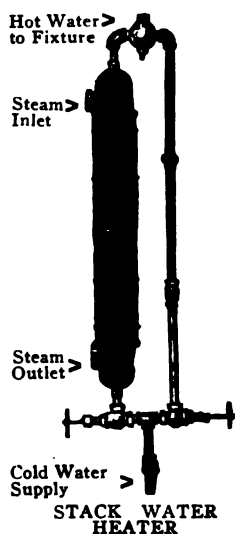
Water at desired temperature.

Steam used only while water is being drawn.

No moving parts or expansion joints.

Particularly adapted for wash-up sinks, first aid rooms, hospitals, restaurants, commercial requirements and factory use.

Made in all capacities.

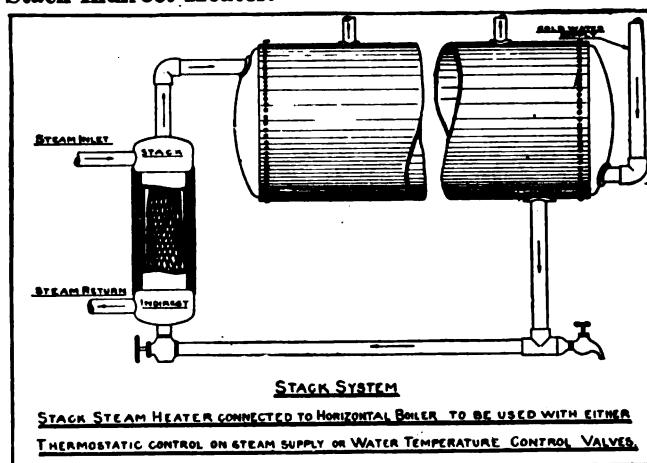


DATA. STACK INSTANTANEOUS STEAM WATER HEATERS

No. of heater	Connections, in.		Gals. min., 5 to 10 lbs. steam	Gals. min., 30 lbs. steam	Length, ft.	Diam., in.	Weight, lbs.
	Water	Steam					
IS-12-24	1/2	1	3	4	4	4	40
IS-12-48	1/2	1	6	8	6	4	60
IS-37-24	1/2	1 1/4	9	12	4	5	80
IS-37-36	1/2	1 1/4	12	16	5	5	100
IS-50-36	1/2	1 1/4	15	20	5	7	120
IS-50-48	1/2	2	20	25	6	7	150
IS-50-60	1	2	25	35	7	7	170
IS-100-36	1	*2 1/4	30	45	6	12	200
IS-100-48	1	*2 1/4	40	60	7	12	240
IS-100-60	1 1/2	*2 1/4	50	75	8	12	280
IS-100-72	1 1/2	*2 1/4	60	90	9	12	320
IS-150-72	2	*2 1/4	100	150	9	16	550
IS-150-144	2	*2 1/4	150	225	14	16	700

*Or larger, if required.
Larger sizes on application.

Stack Indirect Heater.



STACK INDIRECT HEATER

No. of heater	Connections, in.		Suitable for storage tank, gals.	Length, in.	Diam., in.	Weight, lbs.
	Water	Steam				
D-6-13	1/2	1	5 to 30	24	3 1/4	13
D-6-24	1/2	1	30- 40	36	3 3/4	20
D-12-24	1	1	40- 60	36	4	30
D-24-24	1	1 1/4	50- 80	36	5	40
D-37-24	1 1/2	1 1/4	60- 120	36	6	60
D-50-36	1 1/2	1 1/4	100- 300	44	7	95
D-100-36	2	2 1/4	200- 500	44	12	160
D-150-60	2 1/2	3	1000-1500	72	16	400

Larger sizes on application.

Stack Safety Relief Valve.

A combination faucet and relief valve, which insures, through constant use, that seats are free, and that the boiler pressure reaches the valve.

Can not be tampered with.

Order valves set at least 25 lbs. higher than water pressure at outlet.



STACK SAFETY RELIEF VALVE

Stack Gas Water Heater and Storage Systems.

Data and description of systems designed for residences, apartment houses, hotels, etc., is given in SWEET'S ARCHITECTURAL CATALOGUE, Fifteenth Edition, pages 1214-15.

ESTABLISHED 1888

WARREN WEBSTER & COMPANY

Steam Heating Systems, Feed Water Heaters and Steam Specialties

MAIN OFFICE AND WORKS

CAMDEN, N. J.

OFFICES AND REPRESENTATIVES IN PRINCIPAL CITIES OF UNITED STATES AND CANADA

Products.

SPECIALTIES for WEBSTER SYSTEMS of STEAM HEATING, FEED WATER HEATERS, STEAM and OIL SEPARATORS, and EXPANSION JOINTS.



Webster Vacuum System of Steam Heating.

A method of circulating exhaust or low pressure live steam, or a combination of the two with minimum initial or back pressure, and with entire freedom from waterhammer, air pockets, leaky air valves, and all of the other annoyances which are common with ordinary steam heating systems.

Described in Bulletin No. B-500.

Webster Modulation System of Steam Heating.

A highly efficient modern type of low pressure steam heating system suitable where live steam only is used for heating, either direct from heating boilers or with steam supply furnished from outside source.

Described in Bulletin No. B-600.

Webster Heating Systems for Industrial Plants.

Experience in installation of heating systems in thousands of prominent industrial plants, and the wide adaptability of Webster systems, enables this company to meet any industrial requirements.

The remodeling of old heating systems in industrial plants, to avoid the discomforts, inefficiencies and extravagances that exist where the latest methods and devices are not in use, has also been specialized.

Webster systems for industrial plants are fully described in Bulletin B-501.

Webster Feed Water Heaters.

Thirty-two years of progressive development as the pioneer builders of the "no thoroughfare" type of open-feed water heaters has made this company the recognized leader in this line, and as to be expected, they build many special types and designs desirable to get greatest benefits under any given plant conditions. Webster heaters will heat the water to within 2° to 5° of the temperature of the exhaust steam.

Webster heaters are built both for power plant service and for heating system requirements.



TYPE EB WEBSTER
FEED WATER HEATER

SWEET'S CATALOGUE

They are built in all types and sizes for any conditions of service, space, headroom, etc. They can be furnished either Standard Type—induction principle with oil separator attached to heater shell; or Preference Type—the most improved form of cut-out heater, using a gate valve in connection with an oil separator, of ample size to purify all steam passing through the exhaust main to both the feed water heater and to a heating or drying system, or to low pressure turbines.

Inasmuch as the selection of a feed water heater is a matter of careful judgment, the Webster engineering staff is always ready to co-operate with reliable advice to prospective customers.



WEBSTER STEAM
SEPARATOR
Vertical for 200 lbs.
pressure

Webster Steam Separators.

Webster steam separators deliver dry clean steam. Their use permits smaller piping to carry given quantity and flow of steam, avoids excessive condensation and economy losses and dangers to cylinder heads, and permits sliding surfaces to work with less lubrication. Plain and receiver types are made in all desirable sizes up to 12 in.

Described in Bulletin No. B-300.

Webster Oil Separators.

Webster oil separators for purifying exhaust steam are made for horizontal or ascending or descending vertical currents and in sizes up to 24-in. plain and receiver types. The Webster oil separator baffles have been demonstrated to be highly efficient in separation with minimum pressure drop in the flow of steam.

Described in Bulletin No. B-400.



WEBSTER OIL
SEPARATOR,
RECEIVER TYPE
Sizes, 8 to 24 in.

Webster Expansion Joints.

Webster expansion joints are made in single and double slip sliding sleeve types for high and low pressure and with an anchor footing, the use of which avoids strains of pipe sag with their consequent leakage and adjustment annoyances. Types for the higher pressures are provided with limit bolts. Sizes 2 to 24 in.; pressures up to 200 lbs. per sq. in.

Described in Bulletin No. B-1100.



WEBSTER EXPANSION
JOINT

THE WHITLOCK COIL PIPE COMPANY

Manufacturers of Standard Feed Water Heaters and Hot Water Service Heaters
HARTFORD, CONN.

NEW YORK OFFICE, Singer Building, 149 Broadway
SOUTHERN OFFICE, Charlotte, N. C.
BUFFALO OFFICE, Ellicott Square Building

CHICAGO OFFICE, Fisher Building, 343 S. Dearborn Street
PHILADELPHIA OFFICE, 527 Commercial Trust Building
BOSTON OFFICE, 50 Congress Street

Products.

AMERICAN STANDARD FEED WATER HEATERS; AMERICAN BERRYMAN FEED WATER HEATERS; AMERICAN STRAIGHT TUBE FEED WATER HEATERS; WHITLOCK AMERICAN INSTANTANEOUS HEATERS for hot water service; WHITLOCK AMERICAN STORAGE HEATERS; WHITLOCK AMERICAN HOT WATER CONVERTORS; SPECIAL HEATERS.

Also, Pipe Bends; Flanged Piping and Headers for high pressure power plant piping; Coils and Bends of iron, steel, copper and brass pipe and tubing of all descriptions.

Feed Water Heaters.

The necessity for, and the economy of, feed water heaters is so generally acknowledged that a discussion of this feature would be out of place here, and only the description of the distinctive features of the American standard feed water heater will be given.

DURABILITY OF CONSTRUCTION—The American standard feed water heater is particularly adapted to standing up under the severe service to which a closed feed water heater is subjected, when working under full boiler pressure and receiving the impact of each stroke of the feed pumps, by the following outstanding features:

(1) Seamless copper tubing, superior to brass, mechanically, in conductance of heat and in resistance to corrosion and electrolytic action.

(2) All joints brazed, eliminating possibility of leaks; there being no screwed or



flanged joints subject to boiler pressure. See construction of terminal connections of type "A" heaters Figs. 104 and 105, and type "B" heaters Figs. 25A and 25B.

(3) Coils firmly held but allowed to expand and contract freely by means of steel braces and patented swiveling malleable iron clamps.

(4) The best of material is used throughout. Nothing but seamless copper tubing and the best grades of gray iron and tank steel enter into the construction of these heaters.

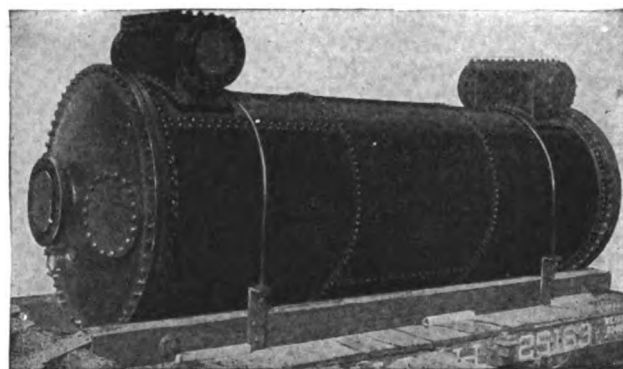


Fig. 204. TYPE "B" AMERICAN STANDARD FEED WATER HEATER, HORIZONTAL PATTERN

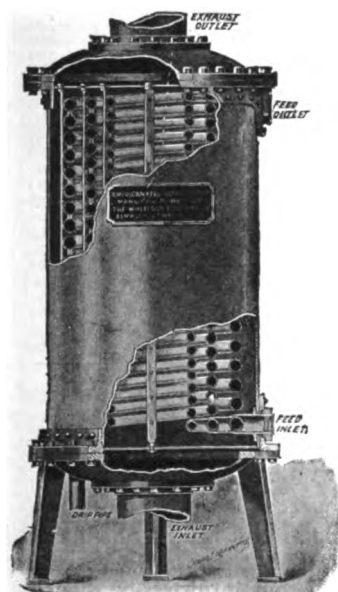


Fig. 18. TYPE "A" AMERICAN STANDARD FEED WATER HEATER

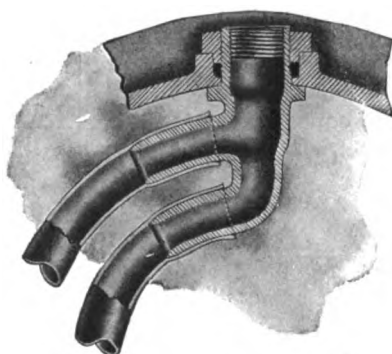


Fig. 104. TYPE "A" MANIFOLD FITTING

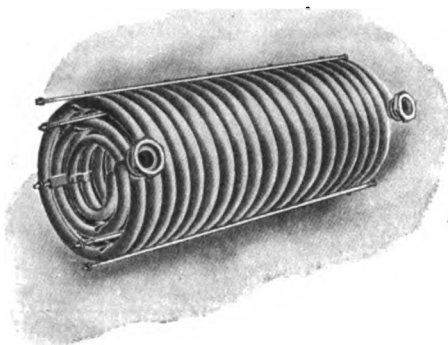


Fig. 105. TYPE "A" COIL ASSEMBLY

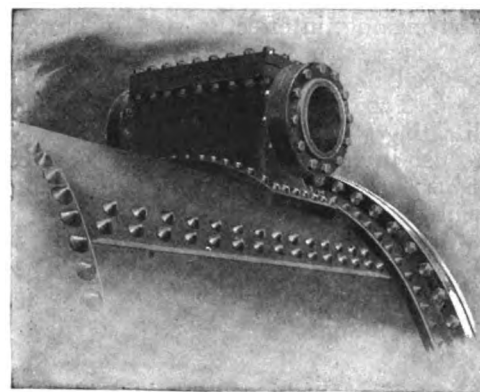


Fig. 25A. TYPE "B" HEADER (PATENTED)

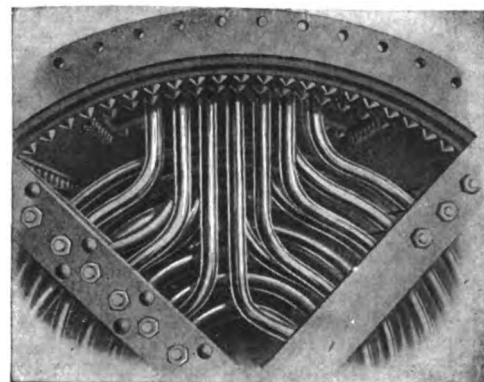


Fig. 25B. TYPE "B" COIL ASSEMBLY

HIGH FEED TEMPERATURE—Particular attention is called to the fact that all of the American standard feed water heaters are guaranteed to heat the rated amount of water (based on 30 lbs. per hour per boiler horsepower) to within 2° of the steam temperature, or to 210° when supplied with sufficient steam at atmospheric pressure. This result is achieved by furnishing a liberal amount of heating surface per rated horsepower, designed and constructed so as to secure the maximum efficiency in heat transmission.

These heaters are therefore not to be considered as "competition" heaters and are not in the same class with the ordinary commercial closed feed heater, which does not heat the water to within less than 7° to 8°, and frequently not to within less than 12° to 13° of the steam temperature. This point is more fully discussed in Bulletin No. 13, a copy of which will be sent on request.

Hot Water Service Heaters.

Under this heading are generally included all heaters for furnishing hot water for toilet service, bath, showers, manufacturing purposes, etc., in fact for every purpose except boiler feed. They may be broadly divided into two classes: instantaneous heaters and storage heaters.

INSTANTANEOUS HEATERS—In this class the water is heated instantaneously as it passes through the heater, no hot water being held in storage. Used wherever the demand for hot water is fairly uniform or where the steam supply is large and flexible compared with the demand for hot water. They are frequently used in combination with storage tanks, the combination making, in effect, a storage heater.

There are 3 principal styles of this class: the copper coil, Type "AC" (Fig. 15A); the U-bend or Berryman, Type "R" (Fig. 151); and the Straight Tube, Floating Head Type "S" (Fig. 152). The proper type to use in any given case depends, of course, on conditions; and advice and recommendations on this point will be gladly given.

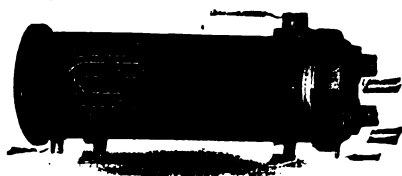


FIG. 151. TYPE "R" BERRYMAN HEATER

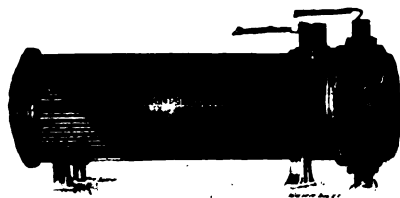


FIG. 152. TYPE "S" STRAIGHT TUBE FLOATING HEAD HEATER

STORAGE HEATERS—In this class a large body of hot water is always held in storage to answer sudden demands; the heating of the water proceeds uniformly

at all times whether hot water is being drawn or not. Used where the demand for hot water is intermittent and the steam supply is not flexible (as exhaust steam) or is limited in amount compared with the demand for hot water.

This company builds so many types of storage heaters that there is no room here for even a short description of the various designs; therefore only the most important, the Type "K," is shown.

Type "K" Service Heaters—These heaters are designed for use in hotels, office buildings, hospitals, laundries, factories, or wherever a large supply of hot water is required to provide for periods of heavy "peak" loads. The hot water builds up gradually between drafts, and is held in storage for sudden demands.

The features of construction are as follows:

- (1) Heating surface placed low in the shell—surrounded by the coldest water—insuring maximum efficiency and full value of storage capacity.
- (2) Individual tubes practically all the same length, preventing "short circuiting" of the steam and producing even distribution of steam.
- (3) Tubes of U-bend construction, minimizing stresses due to expansion and contraction.
- (4) Ends of tubes expanded and beaded over into a heavy cast iron tube sheet, making a perfect joint.
- (5) Heating section easily removable for inspection and cleaning.

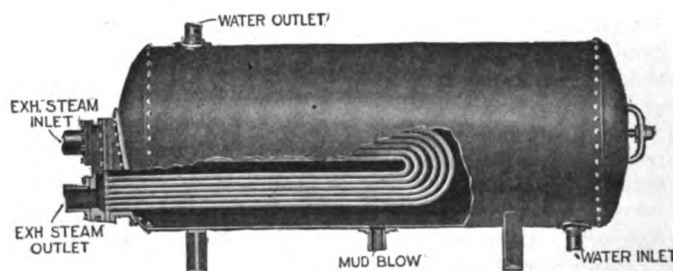


FIG. 14. TYPE "K" WHITLOCK SERVICE HEATER

DIMENSIONS AND CAPACITIES

No.	Diam. of shell, in.	Length of shell, in.	Size water connections, in.	Max. size steam connections, in.	Gals. one filling	Gals. per hour
1	18	60	2	2 1/2	65	150
2	18	72	2	2 1/2	80	200
3	24	60	2	2 1/2	118	250
4	24	72	2	2 1/2	141	300
5	24	84	2	2 1/2	164	350
6	30	60	3	2 1/2	185	400
7	30	72	3	3	220	500
8	30	84	3	3	255	550
9	30	96	3	3	290	600
10	36	84	3	3	365	750
11	36	96	3	4	420	800
12	36	108	3	4	475	900
13	36	120	3	4	525	1000
14	42	96	4	5	575	1250
15	42	120	4	5	720	1500
16	42	144	4	5	860	1750
17	42	168	4	6	1000	2000
18	48	120	4	6	950	2000
19	48	144	4	6	1140	2400
20	48	192	4	8	1480	2800
21	60	120	4	8	1420	2800
22	60	144	4	8	1660	3200
23	60	192	4	8	2250	3600

Manhole, 11 by 15 in.

Capacities given are based on heating the water from 40° to 180° Fahr. and using exhaust steam at atmospheric pressure. For other temperature ranges and steam pressures see Bulletin 27. Cradles are furnished when required at no extra expense. Companion flanges for steam connections when 3 in. or larger.

Special Heaters.

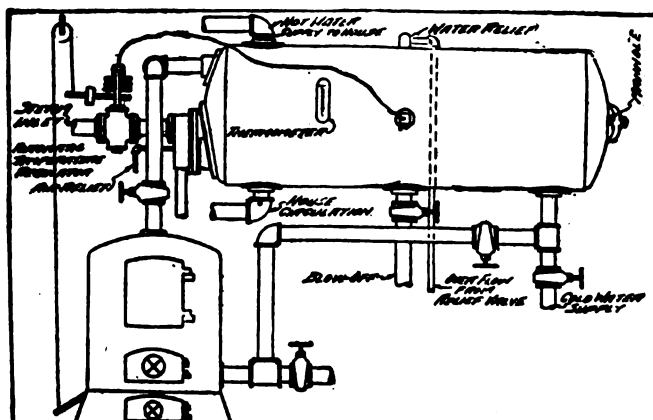
This company also designs and builds all kinds of special steam actuated heaters, such as oil heaters, air heaters, oil coolers, air coolers, evaporators, condensers, etc. Specifications and estimates on such apparatus will be submitted on request.

Continued on next page

This company has developed a number of installation diagrams for piping layouts showing some of the more important types of installations in which Whitlock heaters are used, a few of which are shown on this page.

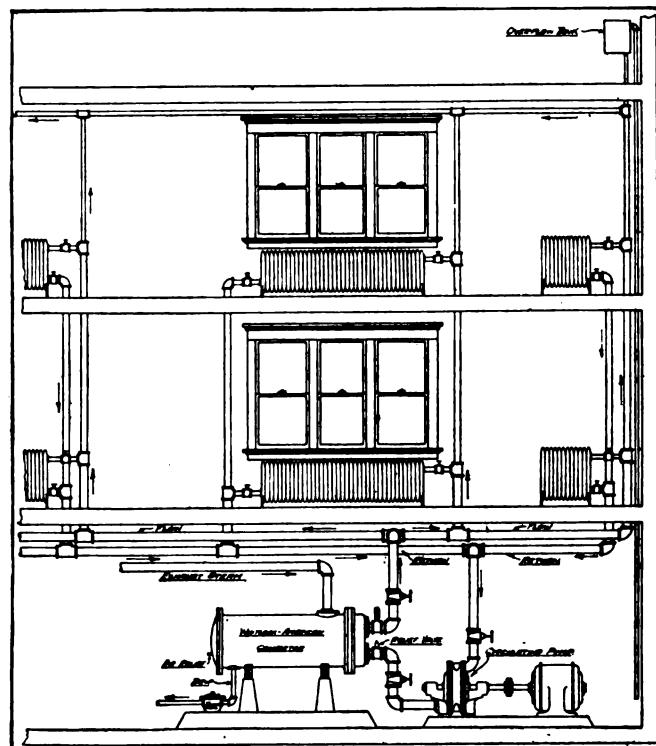
[illegible]

Particularly adapted for laundry service on account of the varying draft of hot water and the fact that the steam condensing power of the heater must be constant in order to thoroughly utilize the exhaust steam from engine.

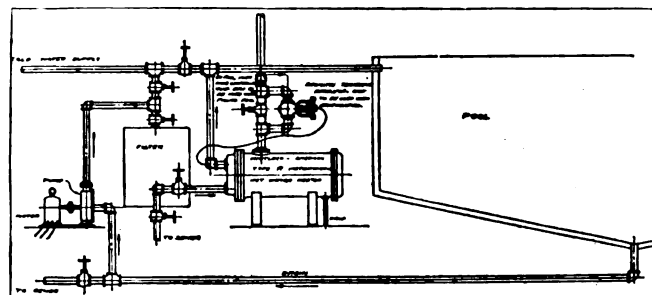


In this type of installation steam is supplied to the Type "K" heater from the main heating boilers during the heating season; and at times when no steam is carried on the main heating boilers, the auxiliary coal burning heater is fired.

This system has a number of advantages over direct steam heating which are too numerous to mention here.
Bulletins on the subject sent on request



This system has a number of advantages over direct steam heating which are too numerous to mention here.
Bulletins on the subject sent on request



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THE BLACKBURN-SMITH CORPORATION

Manufacturers of Feed Water Filter and Grease Extractor

TELEPHONE:
BRYANT 1364

105 West 40th Street
NEW YORK, N. Y.

Products.

The BLACKBURN-SMITH FEED WATER FILTER and GREASE EXTRACTOR.

Also manufacturers of The Blackburn-Smith Sewage Ejector System.

Blackburn-Smith Feed Water Filter and Grease Extractor.

Description—This filter removes oil, grease, etc., from condensed exhaust steam, not removed by line separators or by separators, skimmers, etc., incorporated in open heaters. As it is installed at the last point before water enters the boilers it also removes all dirt, slime, etc., which the feed water receives from any source whatever.

The elimination of floating impurities means clean heating surfaces of the boiler, thus securing efficient heat transmission, and protection against overheating of the boiler. The safe re-use of condensation after filtration saves coal and water, and the clean hot water prevents straining the boilers by excessive expansion and contraction.

Construction and Operating Principle—The filter chest is partitioned into two chambers, water entering through the inlet to the upper or filtering chamber and passing to the lower or outlet chamber through the filtering cartridges set in the partition, and then through the outlet to the feed line. The number of cartridges varies with the size of the unit, and each consists of two concentric perforated brass cylinders covered with terry cloth. The water passes through the cartridges with little friction; but as foreign matter accumulates on the filtering material, resistance shown by the readings of pressure gages indicates cleaning time. The spare set of outer cylinders and cloths is to be substituted for the foul set when the pressure difference reaches a certain maximum.

Construction Advantages—The construction advantages are as follows: two successive and uniform

filtrations through separated cloths which are not bunched in places and stretched thin in others; small easily handled cartridges that involve little cleaning expense and no incentive for neglect; easily installed in existing plants, as valves and by-pass are wholly within the filter and in straight line with the feed pipe.

Twin Unit.

For the filtration of very dirty raw water or condensation in plants operating continuously or with heavy peak load, a twin unit should be used. This consists of two complete filter bodies controlled by a single set of inlet and outlet valves. In this way, one side is kept in service while the other is being cleaned, and no impurities get past during cleaning periods.

Sizes, Capacities and Dimensions.

The capacities given are only approximate. A twin unit may be selected so that either side alone will carry normal load while the other side is being cleaned and both sides thrown in during peak periods to obtain 100% overload capacity.

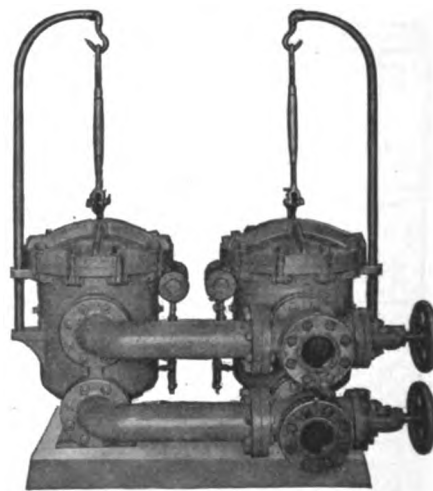
Our free engineering advice, based on information from clients, is desirable for proper selection of the unit needed.

Further Particulars.

Further particulars are given in our book "Feed Water Filtration," which will be sent on request.



Single Unit

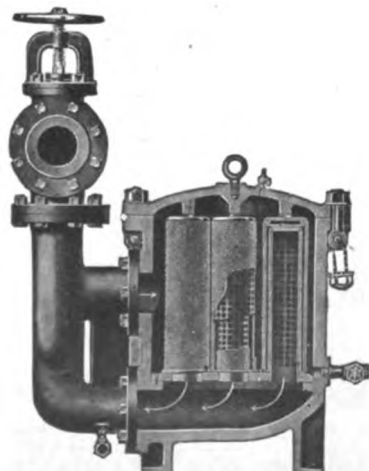


Twin Unit

THE BLACKBURN-SMITH FEED WATER FILTER AND GREASE EXTRACTOR

Size	Capacity, lbs. per hour		Size of inlet and outlet, in.	No. of cartridges in single unit or each side of twin unit	Space occupied					
	Single unit, or one side of twin unit	Both sides of twin unit operating together			Single unit			Twin unit		
					Length, in.	Height, in.	Depth, in.	Length, in.	Height, in.	Depth, in.
No. 1	8,050	.....	1½	*4	14	22	17	.....	.....	.....
No. 2	15,750	.....	2	3	16	30	24	.....	.....	.....
No. 3	21,000	.....	2½	3	20	30	25	.....	.....	.....
No. 4	35,000	70,000	3	6	21	41	31	54	30	30
No. 6	70,000	140,000	4	8	27	48	35	60	36	36
No. 7	100,000	200,000	5	8	30	52	36	66	42	42
No. 8	150,000	300,000	6	11	33	60	42	90	48	48

*Cartridges of No. 1 filter are smaller in diameter than in other sizes.
All units designed for 200 lbs. working pressure, and are subject to a hydrostatic test of 300 lbs. per sq. in.



SECTION OF FILTER BODY

OLEITE CORPORATION

Filters, Oil Extractors and Decolorizing Apparatus

110 William Street
NEW YORK, N. Y.

Products.

The DEOLEIZER, an Apparatus for the Complete Elimination of Oil from Condensed Returns as well as the Removal of all Organic Matter, Discoloration and Solids from domestic, industrial and boiler feed water.

OLEITE, an Oil Removal and Decolorizing Medium.

The Deoleizer and Its Purpose.

The complete elimination of cylinder oil from the emulsified returns from a heating system, or the condensates from a surface condenser, had been generally accepted as a practical impossibility until the introduction of Oleite and the Deoleizer which *removes every trace of oil, organic matter and discoloration* from condensates, pond and stream waters for boiler feed, manufacture of ice, domestic and industrial purposes.

The Deoleizer is not purely a filter in the accepted use of the word and does not depend upon the mechanical straining of oil in passing through voids in granular or fibrous material. It depends on *absorption*, which is the peculiar property of Oleite.

Oleite and Its Purpose.

Oleite is the only known material that will successfully remove emulsified oil from water for industrial purposes. It is a complex, insoluble mineral substance of a microscopically cellular structure having a crystalline base—a non-combustible, anhydrous and absorbent filtering and decolorizing medium having an inherent and powerful affinity for oil and its derivatives.

It is substantially indestructible, hence when saturated, it can be taken out, the oil burned off, the Oleite recovered and used over again indefinitely without losing its properties.

It is superior to animal charcoal and costs less.

Field of Application.

Oleite is especially applicable to the following industries:

Water Purification for General Industrial Purposes—Oleite and Deoleizers bleach pond and stream waters for industrial purposes and will yield pure, clean distilled water from oily and otherwise contaminated returns.

Power Plants—Oleite No. 840, when used in Deoleizers, completely removes all free and emulsified oil, as well as organic matter

and solids from contaminated condensed steam returns.

Sugar Refining—Oleite No. 2060, when used as a medium, efficiently decolorizes raw cane sugar solutions and at the same time eliminates the mineral (ash) contents. It also reduces largely the mineral contained in raw sugar wash and is revived in the same manner and with less loss than bone char.

Edible Oil Refining—Oleite No. 40100 (dust), when used as a bleaching agent in the refining of cotton seed, corn and peanut oils, yields products of higher quality than any other on the market.

Savings Effectuated by the Deoleizer in the Power Plant.

- (1) Saving in feed water by using returns instead of wasting them.
- (2) Saving in coal by saving heat units in returns and by clearing boiler of oil and scale.
- (3) Saving in oil by recovery of free oil from rising head.
- (4) Saving in cost of frequent cleaning.
- (5) Saving in boiler repairs and insurance against explosion.

Types of Deoleizers.

Type D—Designed primarily as a high duty Deoleizer for ice making plants, dye houses, etc., where the degree of purification must be approximately absolute and where there are practically no solids.

Type E—Exactly like Type D in external appearance. It is a clarifying filter and Deoleizer combined and by its use the problem of the treatment of condensates contaminated with algae, organic or other foreign matter is solved. This type should be specified in all cases involving the purification of returns from surface condensers, as well as pond, stream and other waters which may contain mineral solids or organic growths in suspension.

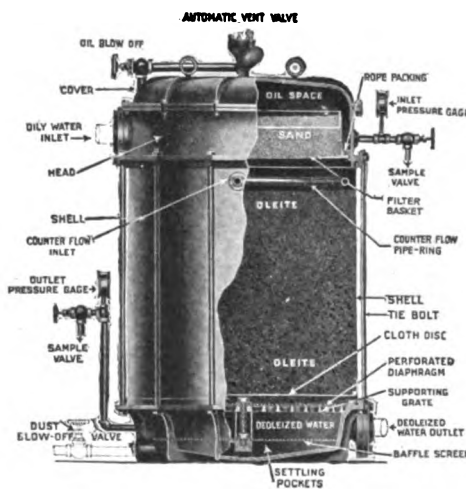
Type G—For large installations, each unit having a capacity of 75,000 lbs. per hour of condensates. It is also a clarifying filter and Deoleizer combined and is very easily loaded and cleaned. It requires but little attention and is very successful in the elimination of all traces of emulsified or free oil and grease, as well as organic matter and solids from boiler feed water.



TRADE-MARKS



TYPE D DEOLEIZER



INTERIOR TYPE E DEOLEIZER

A. W. CADMAN MFG. CO.

Manufacturer of Valves

MAIN OFFICE AND WORKS

PITTSBURGH, PA.

NEW YORK OFFICE, 220 Broadway

DISTRICT SALES OFFICES

PHILADELPHIA, PA.

CHICAGO, ILL., R. D. BLISS

CLEVELAND, OHIO, R. E. BRONSON Co.

Products.

CADMAN INDESTRUCTIBLE BLOW-OFF VALVE; CADMAN GATO PLUG VALVES for Air, Gas, Oil, Water, Steam or Acid under any pressure.

Also Valves for Locomotive Blow-off Service.

Blow-off Valve.

The Cadman Indestructible Blow-off valve is available at all times for all boilers, including those working under superheated steam up to and including 300 lbs. per sq. in. working pressure. The reversible seats and discs are of monel metal, a metal known to resist the destructive action of dirt, scale, hot acids and alkalis, and boiler compounds. Monel metal is also absolutely impervious to superheated steam.

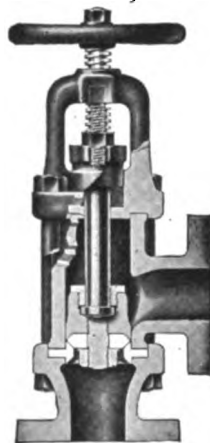
All cast parts are of air furnace semisteel of heavy construction with a factor of safety of 5, suitable for 300 lbs. per sq. in. Stem of special bronze, with high tensile strength and large proportions. Acme thread of coarse pitch is used, which gives more bearing surface than other types of threads, greater strength, and permits slow operation of valve which prevents water hammer.

A peculiar feature of the seat is a projecting flange held between the body and the base within a recess in the base, which makes it impossible for water to leak past, and expansion and contraction have no effect on it whatever.

The whirlpool inlet port used is obtained by a deflector on one side of the port, which prevents water, dirt and scale striking the valve body with full force when blowing, but causes it to take a course around the periphery of the body, causing the dirt, scale, grit and other heavy substances to go down through the center of the valve without coming in contact with the seating portion.

DIMENSIONS AND PRICES,
BLOW-OFF VALVES

Size, in.	1½	2	2½
Face of inlet to center of body, in.	4½	4½	5½
Center of inlet to face of outlet, in.	5½	6½	7½
Diam. flgs., in.	6	6½	7½
Length over all, closed, in.	15½	17½	20½
Length over all, open, in.	17½	20½	24½
Scrd. ends.	\$17.50	23.25	29.00
Flgd. ends.	\$18.00	24.00	30.00



SECTION OF CADMAN INDESTRUCTIBLE BLOW-OFF VALVE
1914 pattern
(Patented)

Cadman Gato Plug Valve.

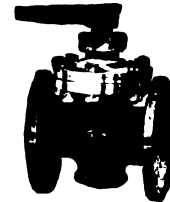
Cadman Gato plug valve has the straightway features of the gate valve; also, the quick opening advantages of the plug cock, though it is different because it closes tight and stays tight. It has adjustment for wear.

The valve is constructed on the wedge and screw principle, so that when closed the plug is expanded in the shell of the body. The plug is moved by a tee head on stem, which fits loosely in a suitable recess in the plug, and results in a slight lost motion between stem and plug.

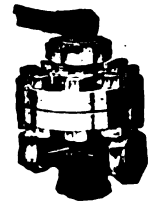
This valve is adapted to various conditions of service, and specifications for requirements are invited.



Bronze Standard
Also made of special acid metal



Bronze Heavy
500 lbs. working pressure



Bronze Hydraulic
3000 lbs. working pressure

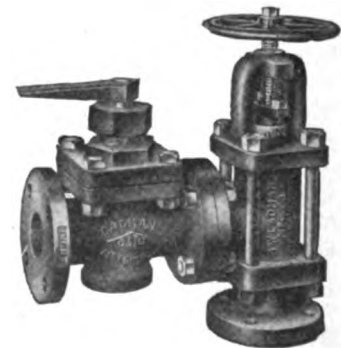
CADMAN GATO VALVES
DIMENSIONS AND PRICES, GATO VALVES

Size of valve, in.	½	¾	1	1¼	1½	2	2½	3	4
BRONZE STANDARD, 250 LBS. WORKING PRESSURE									
F. to F., scrd., in.	3¼	3¾	3½	4¼	4¾	5¾	6¾	7¾	10½
Price.	\$3.43	3.81	5.60	7.60	9.16	14.00	26.30	39.50	85.00
F. to F., flgd., in.	4¾	5½	5½	6½	6½	7½	9¼	10	14
Diam. flgs., in.	4	5	5	6	6	6½	7½	8¼	10
Price.	\$7.50	8.00	8.00	9.90	9.90	19.00	31.00	50.00	95.00
BRONZE HEAVY, 500 LBS. WORKING PRESSURE									
F. to F., scrd., in.	3¼	3¾	3½	4¼	4¾	5¾	6¾	7¾	10½
Price.	\$5.00	6.50	8.75	10.50	13.50	20.00	37.00	60.00	100.00
F. to F., flgd., in.	5½	5½	5½	6½	6½	7½	9¼	11½	14
Diam. flgs., in.	4	5	5	6	6	6½	7½	8¼	10
Price.	\$10.50	14.25	18.00	25.00	25.00	49.00	78.00	125.00	200.00
BRONZE HYDRAULIC, 1500 LBS. WORKING PRESSURE									
F. to F., scrd., in.	3¾	4	4¾	5½	6	6½	7½	8¼	10½
Price.	\$9.75	13.00	20.50	28.00	37.00	60.00	93.00	130.00	200.00
Diam. flgs., in.	5	5	5½	6½	6½	7½	8¼	10	14
Price.	\$19.50	28.00	35.00	49.00	49.00	78.00	125.00	200.00	350.00
BRONZE HYDRAULIC, 3000 LBS. WORKING PRESSURE									
F. to F., scrd., in.	3¾	4	4¾	5½	6	6½	7½	8¼	10½
Price.	\$17.50	23.00	32.00	39.00	46.00	70.00	100.00	150.00	250.00
Diam. flgs., in.	5	5	5½	6½	6½	7½	8¼	10	14
Price.	\$30.00	36.00	50.00	63.00	83.00	130.00	200.00	300.00	500.00
SPECIAL ACID METAL									
Screwed.			\$17.50	22.00	27.00	37.00	on application		
Flanged.			\$34.00	45.00					
SEMISTEEL LIGHT PATTERN, 150 LBS. WORKING PRESSURE (SEMISTEEL BODY AND PLUG, BRONZE MOUNTED)									
F. to F., scrd., in.	3½	4½	4¾	5½	6½				
Price.	\$3.10	5.11	6.62	9.83	12.50				
(SEMISTEEL BODY, BRONZE PLUG AND BRONZE MOUNTED)									
F. to F., scrd., in.	3½	4½	4¾	5½	6½				
Price.	\$5.22	7.25	9.40	13.97	22.04				
SEMISTEEL STANDARD, 300 LBS. WORKING PRESSURE									
F. to F., scrd., in.					6	6½	8	9¼	10½
Price.					\$7.50	11.00	18.00	31.50	45.00
F. to F., flgd., in.					8¼	9	10½	12½	15
Diam. flgs., in.					6	6½	7½	8¼	10
Price.					\$9.00	13.25	23.50	35.00	50.00

Tandem Blow-off Valve.

Consists of the Indestructible Blow-off valve, 1914 pattern, and the Gato plug valve.

It is a great advantage to procure from one manufacturer a blow-off valve and auxiliary valve, both of the highest reputation, suitable for all boilers, including superheat up to and including 300 lbs. working pressure.



TANDEM BLOW-OFF VALVE

Size, in.	1½	2	2½
Scrd.	\$26.80	38.80	55.50
Flgd.	\$28.00	40.50	60.00

THE CENTRAL BRASS MANUFACTURING CO.

Manufacturers of Valves and Faucets

CLEVELAND, OHIO

Products.

SOFT DISC GLOBE and ANGLE VALVES; JENKINS TYPE GLOBE VALVES; GATE VALVES; QUICK-PRESSION FAUCETS; SELF-CLOSING BASIN COCKS.

For Drinking Fountains and Bubblers, see page 458.

Guarantee.

All "Central" products are guaranteed against defects in material and workmanship.

Valves.

J-600 and 601 Soft Disc Globe and Angle Valves—Primarily for water, up to 200 lbs. pressure, but are also suitable and guaranteed for steam up to 85 lbs. They differ from the J-604 principally in that they are lighter, and the disc does not swivel. Sizes, $\frac{3}{8}$ to 1 in. inclusive, screw end only.

J-604 Jenkins Type Globe Valve—Guaranteed for steam pressures up to 150 lbs. Sizes, $\frac{1}{2}$ to 2 in., screw end only.

J-605 Non-rising Stem Gate Valve—Solid, double face wedge type. Guaranteed for steam pressures up to 150 lbs.

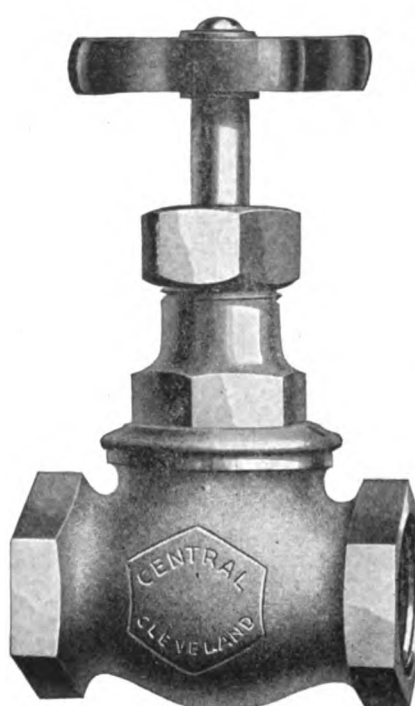


FIG. J-600
SOFT DISC GLOBE VALVE



FIG. J-601
SOFT DISC ANGLE VALVE

Cocks and Bibbs.

J-73 and J-36 Quick-Pression Basin Cocks and Bibbs—Quick-Pression is the name of a patented faucet construction whereby a full flow is



FIG. J-73
QUICK-PRESSION BASIN
COCK

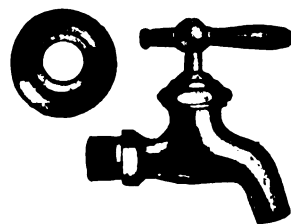


FIG. J-36
QUICK-PRESSION BIBB

obtained with a quarter-turn of the handle. Quick-Pression comes in an assortment of bibbs, basin cocks and bath cocks.

J-211 Ball Bearing Self-closing Basin Cocks—Of the very highest possible quality. Also furnished with brass lever handle or 4-ball indexed handle.



FIG. J-211
BALL BEARING
BASIN COCK

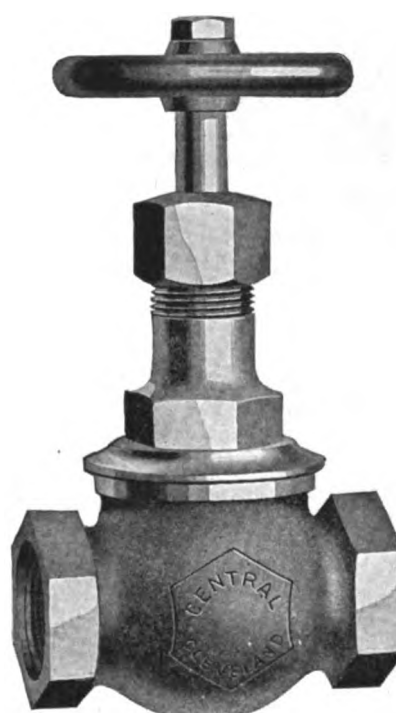


FIG. J-604
JENKINS TYPE GLOBE VALVE

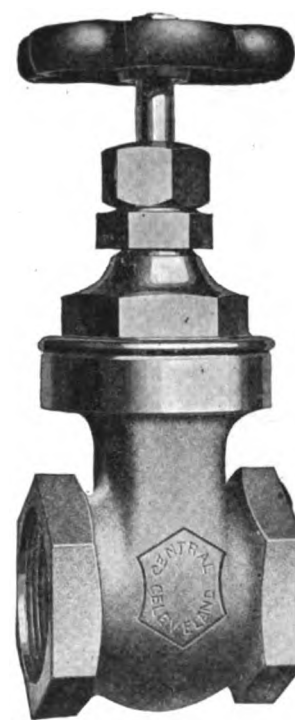


FIG. J-605
NON-RISING STEM GATE
VALVE

THE CHAPMAN VALVE MANUFACTURING CO.

CABLE ADDRESS:
"VALVE, INDIAN ORCHARD"

GENERAL OFFICE AND WORKS
INDIAN ORCHARD, MASS.

BRANCH OFFICES

BOSTON, MASS., 141 High Street
CHICAGO, ILL., Conway Building

NEW YORK, N. Y., 180 Lafayette Street
PHILADELPHIA, PA., 1011 Filbert Street

REPRESENTATIVES

ATLANTA, GA., W. J. NEVILLE, 702 Candler Building
SAN FRANCISCO, CAL., H. L. DICKINSON, First Street corner Market Street

DETROIT, MICH., J. C. RUSH, 207 Shelby Building
CLEVELAND, OHIO, E. P. THOMPSON, 641 Engineers Building

PITTSBURGH, PA., C. F. WEBBER, 703 Peoples Bank Building

Products.

CHAPMAN SOLID WEDGE GATE VALVES; DOUBLE and SINGLE GATE VALVES; CHECK VALVES; DRIP VALVES; HYDRAULIC VALVES.

MECHANISMS for OPERATING VALVES by Hand, by Floor Stand, by Hydraulic Lift, by Electric Motor, by Pneumatic Motor and by Pneumatic Cylinder.

Also manufacturers of Blow-off Valves and Fire Hydrants.

For Sluice Gates, Shear Gates, Tide Flap Valves, Plug Valves, etc., see page 995.

Chapman Valves are Designed for a Wide Variety of Applications.

Made for a variety of services, including low and high pressure steam, water, gas, oil, ammonia, filtration, sewage, fire protection, hydraulic operations, oil refineries, etc., and listed in the following pages according to types and pressures.

The Right Valve for Each Particular Service.

Some general recommendations as to the use of Chapman valves are given below for the convenience of engineers and purchasers when specifying or selecting valves for various purposes:

CHAPMAN BRONZE VALVES

Pressure	Service	List No.
Low	Water or steam	1 and 4
Medium	Water or steam	4
High	Water or steam	11

CHAPMAN IRON BODY VALVES

Low	Water or steam	(2 to 10 ins., solid wedge) 24 (2 to 10 ins., double wedge) 59½ (10 to 84 ins.) 58½
Medium	Water or steam	42
High	Water or steam	42½ and 43

CHAPMAN STEEL GATE VALVES

High	Superheated steam	63½ and 65½
------	-------------------	-------------

Facilities and Quality.

This company is the oldest and largest manufacturer of solid wedge gate valves in the United States. The shops are thoroughly equipped with up-to-date machines for rapidly turning out complete and accurately finished products.

Chapman valves and other products are recognized as standard for excellence of design, material and workmanship, and are not excelled in quality, finish or durability.

SWEET'S CATALOGUE

List 1, Bronze Gate Valves.

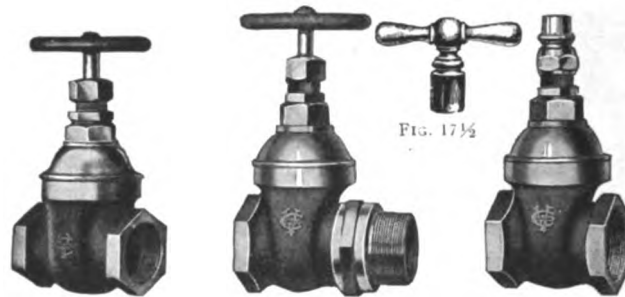


FIG. 1A. Screw End FIG. 2A. Union End FIG. 3A. Screw End, Lock Shield

BRONZE GATE VALVES

125 lbs. working pressure, 300 lbs. test

Size, ins.	¼	⅜	½	¾	1	1¼	1½	2	2½	3
Fig. 1A, end to end, ins.	1¾	2	2¼	2½	2¾	3½	3¾	4	4½	5
Fig. 2A, end to end, including nipple, ins.			3½	3¾	4¼	4¾	5¼	5¾		

List 4, Bronze Gate Valves.



FIG. 1

FIG. 2

FIG. 3

BRONZE GATE VALVES

¾ in. to 2½ in., 175 lbs. working pressure, 350 lbs. test
3 to 4 in., 150 lbs. working pressure, 300 lbs. test

Size, ins.	¾	1	1¼	1½	2	2½	3	3½	4
Fig. 1, end to end, ins.	1¾	2¼	2¾	3	3¾	4¼	4¾	5¼	5¾
Fig. 3, face to face, ins.	2¼	2½	2¾	3	3¾	4¼	4¾	5¼	5¾
Fig. 3, flg. diam., ins.	2½	2¾	3	3½	4	4½	5	5½	6

DATA, BRONZE GATE VALVES, FIGS. 6 AND 7

Size ins.	Fig. 6 end to end, ins.	Fig. 7, end to end, ins.
1¼	1¾	2½
1½	2¼	2¾
1¾	2¾	3
2	3¼	3½
2½	4¼	4¾
3	5¼	5¾

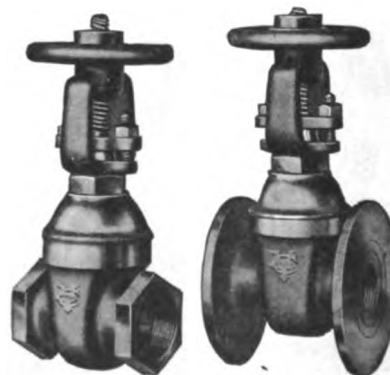


FIG. 6

FIG. 7

BRONZE GATE VALVES

Figs. 6 and 7, 175 lbs. working pressure, 350 lbs. test

Continued on next page

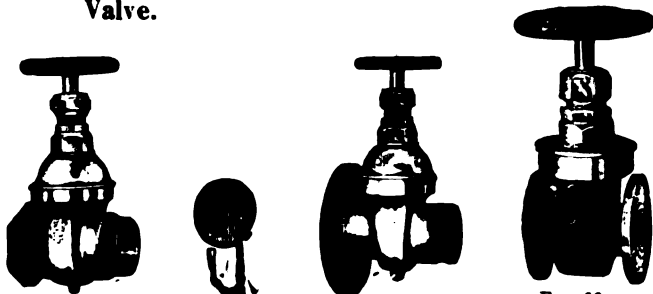
List 7 and 8; Bronze Hose Gate Valves; List 9, Drip Valve.FIG. 18
(List 7)

FIG. 24

FIG. 26
(List 8)FIG. 32
(List 9)**BRONZE HOSE GATE VALVES**

Fig. 18, solid bronze seats, 150 lbs. working pressure, 300 lbs. test. Fig. 26, with babbitt seats, 175 lbs. working pressure, 350 lbs. test

BRONZE AUTO-MATIC DRIP VALVE

150 lbs. working pressure, 300 lbs. test

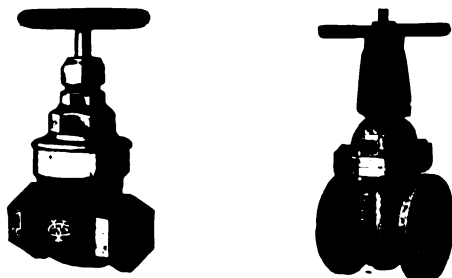
List 11, Extra Heavy Bronze Gate Valves

FIG. 33

FIG. 40

EXTRA HEAVY BRONZE GATE VALVES

300 lbs. working pressure, 600 lbs. test

Size, ins.	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2
Fig. 33, Fig. 35, end to end, ins.	2 3/4	2 3/4	2 1/2	3 5/8	4	4 5/8	5 1/4	6	6 5/8
Fig. 34, Fig. 36, face to face, ins.	2 3/4	2 3/4	2 1/2	4	4 3/4	5 3/8	5 7/8	6 3/4	7 3/4

List 20 and 21, Regrinding Swing Check Valves.FIG. 64
(List 20)FIG. 68B
(List 21)**REGRINDING SWING BRONZE CHECK VALVES, WITH ROTATING DISK**

Fig. 64. (List 20), 150 lbs. working pressure, 350 lbs. test
Fig. 68B (List 21), 300 lbs. working pressure, 600 lbs. test

Chapman regrinding swing check valves are straightway and have area fully equal to that of connecting pipes. All parts machined to jigs and interchangeable, facilitating repairs. Valve can be reground by removing angle plug and cap. A grinding mixture of oil and emery should be applied to seat. Disk can then be revolved on seat until a perfect bearing is formed. Grinding material should then be wiped away to prevent further cutting

DATA, LIST 20

Size, ins.	1/4	3/8	1/2	3/4	1
Fig. 64, end to end, ins.	2 1/4	2 1/2	2 3/4	3	3 3/4
Fig. 65, face to face, ins.	2 1/4	2 1/2	2 3/4	3	4 3/4
Fig. 65, fig. diam., ins.					4

Size, ins.	1 1/4	1 1/2	2	2 1/2	3
Fig. 64, end to end, ins.	3 3/4	4 1/4	5 1/4	6 3/4	7 1/4
Fig. 65, face to face, ins.	5 1/4	5 3/4	6 3/4	8 1/4	9
Fig. 65, fig. diam., ins.	4 1/2	5	6	7	7 1/4

DATA, LIST 21

Size, ins.	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3
End to end, ins.	2 3/4	2 3/4	2 3/4	3 3/4	3 3/4	4 3/4	4 3/4	5 1/2	6 3/4	7 3/4

Size, ins.	2	2 1/2	3	3 1/2	4
Fig. 67B, end to end, ins.	6 1/2	9 1/2	10 1/4	11	12 3/4
Fig. 68B, face to face, ins.	8 3/4	9 1/2	10 1/2	11 1/2	12 3/4
Fig. 68B, fig. diam., ins.	6 1/2	7 1/2	8 1/4	9	10

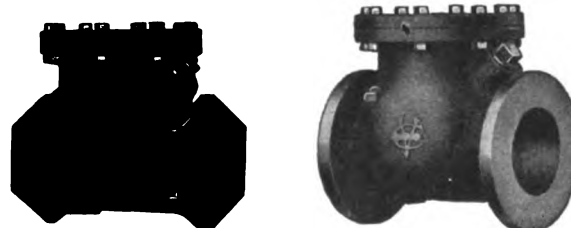
List 22, Single Disk Check Valve.

FIG. 69

FIG. 69A

IRON BODY BRASS MOUNTED SINGLE DISK CHECK VALVES

150 lbs. working pressure, 300 lbs. test. Similar in appearance to Fig. 68B

Size, ins.	2	2 1/2	3	3 1/2	4	5	6	7
Fig. 69, end to end, ins.	6 1/2	9 1/2	10 1/4	11	12 3/4	13 3/4	15 1/2	17
Fig. 69A, face to face, ins.	8 3/4	9 1/2	10 1/2	11 1/2	12 3/4	13 3/4	15 1/2	16 3/4
Fig. 69A, fig. diam., ins.	6	7	7 1/2	8 1/2	9	10	11	12 1/2

Size, ins.	8	10	12	14	16	18	20	24
Fig. 69, end to end, ins.	20	21	24 1/2	28	30	33	32 1/2	38
Fig. 69A, face to face, ins.	18 3/4	21 1/4	25 3/8	28	30	33	32 1/2	38
Fig. 69A, fig. diam., ins.	13 1/2	16	19	21	23 1/2	25	27 1/2	32

We also manufacture multiple disk check valves in sizes from 20 to 72 ins.

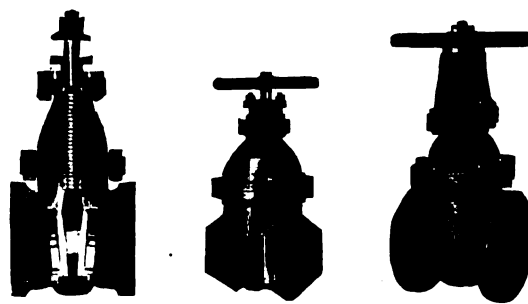
List 24, Iron Body Gate Valves.

FIG. 74

FIG. 70

FIG. 73

IRON BODY BRONZE MOUNTED SOLID WEDGE GATE VALVES FOR WATER

Made in sizes from 2 to 48 ins.

Fig. 71, Stationary spindle, flanged end; Fig. 72, Rising spindle, screw end—not illustrated

Sizes 2 to 16 ins.—150 lbs. working pressure, 300 lbs. test
Sizes 18 to 30 ins.—100 lbs. working pressure, 250 lbs. test
Sizes above 30 ins.—80 lbs. working pressure, 200 lbs. test

Size, ins.	2	2 1/2	3	3 1/2	4	4 1/2	5
Fig. 70, Fig. 72, end to end, ins.	5 3/4	6 3/4	6 3/4	6 3/4	7 1/2	8	8 1/4
Fig. 71, Fig. 73, face to face, ins.	5 3/4	7 1/2	8 1/2	8 1/2	9 1/2	9 1/2	9 3/4
Fig. 71, Fig. 73, fig. diam., ins.	6	7	7 1/2	8 1/2	9	9 1/4	10

Size, ins.	6	7	8	9	10	12
Fig. 70, Fig. 72, end to end, ins.	9	9 1/4	10 1/4	10 3/4	11 1/4	12 3/4
Fig. 71, Fig. 73, face to face, ins.	10 1/4	10 3/4	10 3/4	11 1/2	12 1/4	12 3/4
Fig. 71, Fig. 73, fig. diam., ins.	11	12 1/2	13 1/2	15	16	19

Size, ins.	14	15	16	18	20	22	24
Fig. 71, Fig. 73, face to face, ins.	14	15 3/4	16 3/4	18	21	22	24
Fig. 71, Fig. 73, fig. diam., ins.	21	22 1/4	23 1/2	25	27 1/4	29 1/4	32

List 42, Medium Pressure, Iron Body Gate Valves.

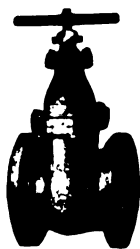


FIG. 165A



FIG. 167A

MEDIUM HEAVY IRON BODY BRONZE MOUNTED GATE VALVES FOR STEAM AND WATER
200 lbs. working pressure

Size, ins.	2½	3	3½	4	4½	5
Fig. 164A, Fig. 166A, end to end, ins.	6½	6¾	6¾	7½	8	8½
Fig. 165A, Fig. 167A, face to face, ins.	8	9½	10	10½	11	11½
Fig. 165A, Fig. 167A, flg. diam., ins.	7½	8½	9	10	10½	11

Size, ins.	6	7	8	9	10	12
Fig. 164A, Fig. 166A, end to end, ins.	9	9½	10	10½	11½	12½
Fig. 165A, Fig. 167A, face to face, ins.	12	12½	13½	14	15	16
Fig. 165A, Fig. 167A, flg. diam., ins.	12½	14	15	16½	17½	20½

List 42¼, Extra Heavy Gate Valves.



FIG. 168



FIG. 169



FIG. 171

EXTRA HEAVY IRON BODY BRONZE MOUNTED GATE VALVES FOR STEAM AND WATER
250 lbs. working pressure. 600 lbs. test
Made in sizes from 2½ to 12 ins.

Size, ins.	2½	3	3½	4	4½
Fig. 168, Fig. 170, end to end, ins.	7½	8	8¾	9¾	9¾
Fig. 169, Fig. 171, face to face, ins.	9½	9½	10½	10½	11½
Fig. 169, Fig. 171, flg. diam., ins.	7½	8½	9	10	10½

Size, ins.	5	6	7	8	9	10
Fig. 168, Fig. 170, end to end, ins.	10½	11½	12½	13½	13½	14½
Fig. 169, Fig. 171, face to face, ins.	12½	13½	14	14	15	16
Fig. 169, Fig. 171, flg. diam., ins.	11	12½	14	15	16½	17½

List 43, Extra Heavy Iron Body Gate Valves.



FIG. 180



FIG. 181



FIG. 183

EXTRA HEAVY IRON BODY BRONZE MOUNTED GATE VALVES FOR STEAM AND WATER

Suitable for extra high pressure steam and water service of all kinds. Extra heavy, with iron bodies, caps and wheels and removable bronze seat rings. 300 lbs. working pressure. 800 lbs. test
Made in sizes from 2 to 24 ins.

Size, ins.	2	2½	3	3½	4
Fig. 180, Fig. 182, end to end, ins.	6½	8¾	9½	9¾	10
Fig. 181, Fig. 183, face to face, ins.	8½	9½	11½	11½	12
Fig. 181, Fig. 183, flg. diam., ins.	6½	7½	8½	9	10

DATA, IRON BODY BRONZE MOUNTED GATE VALVES FOR WATER—(CONTINUED)

Size, ins.	4½	5	6	7	8
Fig. 180, Fig. 182, end to end, ins.	11½	12½	13½	14½	15
Fig. 181, Fig. 183, face to face, ins.	13½	15	15½	16½	16½
Fig. 181, Fig. 183, flg. diam., ins.	10½	11	12½	14	15

Size, ins.	9	10	12	14	15	16
Fig. 180, Fig. 182, end to end, ins.	16	16½	20½	21½	21½	21½
Fig. 181, Fig. 183, face to face, ins.	17	18	19½	21½	21½	21½
Fig. 181, Fig. 183, flg. diam., ins.	16½	17½	20½	23	24½	25½

List 58½, Iron Body Gate Valves.



FIG. 250 BM



FIG. 251 BM

IRON BODY BRONZE MOUNTED DOUBLE DISK GATE VALVES
Designed for low pressure steam, water and gas
Sizes 10 to 24 ins.—30 lbs. working pressure, 70 lbs. test
Sizes 26 to 72 ins.—25 lbs. working pressure, 50 lbs. test

Size, ins.	10	12	14	16	18	20	22	24	26
Fig. 250 BM, Fig. 251 BM, face to face, ins.	10½	11	11½	12	12½	13	13½	13½	13½
Fig. 250 BM, Fig. 251 BM, flg. diam., ins.	16	19	21	23½	25	27½	29½	32	34½

Size, ins.	28	30	32	36	42	48	54	60	66	72
Fig. 250 BM, Fig. 251 BM, face to face, ins.	14	15	15½	16	17½	19½	21	25	27	28½
Fig. 250 BM, Fig. 251 BM, flg. diam., ins.	36½	38½	41½	46	53	59½	66½	73	80	86½

List 59½, Iron Body Double Disk Gate Valves.



FIG. 263



FIG. 261

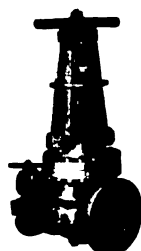
IRON BODY BRONZE MOUNTED DOUBLE DISK GATE VALVES
Sizes 2 to 12 ins.—125 lbs. working pressure, 300 lbs. test
Sizes 14 to 24 ins.—75 lbs. working pressure, 175 lbs. test
Sizes 26 ins. and above—60 lbs. working pressure, 150 lbs. test

Size, ins.	2	2½	3	3½	4	4½	5
Fig. 261, Fig. 263, face to face, ins.	7	7½	8	8½	9	9½	10
Fig. 261, Fig. 263, flg. diam., ins.	6	7	7½	8½	9	9½	10

Size, ins.	6	7	8	9	10	12	14	16
Fig. 261, Fig. 263, face to face, ins.	10½	11	11½	12	13	14	15	16
Fig. 261, Fig. 263, flg. diam., ins.	11	12½	13½	15	16	19	21	23½

Size, ins.	18	20	22	24	30	36	42	48
Fig. 261, Fig. 263, face to face, ins.	15½	17	18	18½	21½	24½	27½	30½
Fig. 261, Fig. 263, flg. diam., ins.	25	27½	29½	32	38½	46	53	59½

Continued on next page

List 63½ and 65½, Steel Gate Valves for Superheated Steam.FIG. 300
(List 63½)FIG. 303
(List 65½)FIG. 305
(List 65½)FIG. 304
(List 65½)**STEEL GATE VALVES ESPECIALLY DESIGNED FOR HIGH PRESSURE SUPERHEATED STEAM**

350 lbs. working pressure, 800 lbs. test

Fig. 300. Body and cap cast steel; monel seat rings and spindle; solid monel plug up to and including 6-in. size; sizes above 6 ins. have steel plugs with monel mountings rolled in; cap has condensation or cooling chamber.

Figs. 303, 305 and 304. Strongest design that can be made. Uniform thickness of metal insures even cooling. Seats are parallel. Disks rotating on axis have tendency to clean seats when closing. Body, cap and carrier block of cast steel; seat rings, disks, spindles and spindle seats of monel metal

DATA, STEEL GATE VALVES FOR SUPERHEATED STEAM, LIST 63½

Size, ins.	2	2½	3	3½	4	4½	5
Face to face, ins.	8½	9½	11½	11¾	12	13¼	15
Fig. diam., ins.	6½	7½	8¼	9	10	10½	11

Size, ins.	6	7	8	10	12	14	16	18	20
Face to face, ins.	15¾	16¼	16½	18	19¾	22½	24	26	29¼
Fig. diam., ins.	12½	14	15	17½	20½	23	25½	28	30½

DATA, STEEL PARALLEL SEAT, DOUBLE GATE VALVES FOR SUPERHEATED STEAM, LIST 65½

Size, ins.	2½	3	3½	4	4½	5	6	7	8
Face to face, ins.	12½	14	14¾	18½	18½	18½	19	20	20¾
Fig. diam., ins.	7½	8¼	9	10	10½	11	12½	14	15

Size, ins.	9	10	12	14	16	18	20	22	24
Face to face, ins.	21¾	22¾	23¾	25¾	32¾	33¾	35¾	35¾	35¾
Fig. diam., ins.	16¾	17½	20½	23	25½	28	30½	33	36

FIG. 311
(List 65½)FIG. 313
(List 65½)FIG. 312
(List 65½)**STEEL GATE VALVES ESPECIALLY DESIGNED FOR HIGH PRESSURE SUPERHEATED STEAM**

350 lbs. working pressure, 800 lbs. test

Note construction. When valve is open, disks and seat rings are protected; bottom ring of carrier fills aperture in valve, making continuous pipe line. No steam eddies, therefore increased efficiency in steam flow and long life. Valves have parallel seats. Disks rotating on axis have tendency to clean seats when closing. Body, cap and carrier ring of cast steel; disks, seat rings, spindle and spindle seat of monel metal

Size, ins.	4	4½	5	6	7	8	9	10
Face to face, ins.	18½	18½	18½	19	20	20½	21¾	22¾
Fig. diam., ins.	10	10½	11	12½	14	15	16¼	17½

Size, ins.	12	14	16	18	20	22	24
Face to face, ins.	23¾	25¾	32¾	33¾	35¾	35¾	35¾
Fig. diam., ins.	20½	23	25½	28	30½	33	36

Let us send you list of steel gate valve installations.

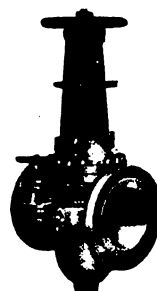
List 65½, Venturi Type Valves.

FIG. 321



FIG. 323



FIG. 322

STEEL VENTURI TYPE GATE VALVES DESIGNED ESPECIALLY FOR HIGH PRESSURE SUPERHEATED STEAM

Construction permits these valves to pass steam practically equal to the full carrying capacity of the pipe. Steam entering converging nozzle on inlet side has a portion of its pressure converted into kinetic energy, steam increasing in velocity, and dropping in temperature and pressure. At high velocity thus developed, it passes through orifice at valve seats, after which it enters diverging nozzle at high velocity, and in its passage converts its kinetic energy into increased pressure, temperature and velocity at which it entered converging nozzle on inlet side of valve.

Chance for leakage reduced on account of reduced area at seats, and valve can be opened quicker. When valve is open, disks and seat rings are protected. Bottom ring of carrier fills aperture in valve, making a continuous pipe line. No steam eddies, therefore increased efficiency in steam flow and long life.

Valves have parallel seats. Disks rotating on axis have tendency to clean seats when closing. Body, cap and carrier ring of cast steel; disks, seat rings, spindle seat of monel metal

Size, ins.	4	6	7	8	10	12
Face to face, ins.	18½	19	20	20¾	22¾	23¾
Fig. diam., ins.	10	12½	14	15	17½	20½

Size, ins.	14	16	18	20	22	24
Face to face, ins.	25¾	32¾	33¾	35¾	35¾	35¾
Fig. diam., ins.	23	25½	28	30½	33	36

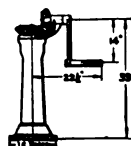
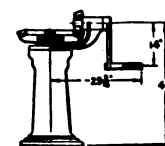
List 76, Floor Stands.FIG. 436
Outside Screw StandFIG. 437
Inside Screw StandFIG. 438
Indicator Stand**FLOOR STANDS FOR VALVES AND SLUICE GATES**

DIMENSIONS, FIGS. 436 AND 436A

Size, ins.	4 and less	4½ to 10	12 to 16	18 to 26	28 and above
Diam. base, ins.	A 9½	14	14	16	16
Diam. bolt circle in base, ins.	8¼	12½	12½	14½	14½
Number bolt holes in base.	4	4	4	6	6
Diam. bolt holes in base, ins.	H	H	H	H	H
Height of stand, ins.	B 28½	36	36	36	36
Diam. hand wheel, ins.	C 12½	16	20	24½	30

DIMENSIONS, FIGS. 437, 437A, 438 AND 438A

Size, ins.	4 and less	4½ to 16	18 and above
Diam. base, ins.	A 9½	14	16
Diam. bolt circle in base, ins.	8¼	12½	14½
Number bolt holes in base.	4	4	6
Diam. bolt holes in base, ins.	H	H	H
Height of stand, ins.	B 28½	36	36
Diam. hand wheel, ins.	C 11½	16	24½

FIG. 439
LIGHT GEARED STAND,
SINGLE CRANKFIG. 440
HEAVY GEARED STAND,
SINGLE CRANK

DATA, VALVES FOR OIL AND NATURAL GAS

LIST 103

Fig. 503, Screwed end, inside spindle.

Fig. 504, Flanged end, inside spindle.

Fig. 505, Screwed end, outside spindle.

Fig. 506, Flanged end, outside spindle.

Sizes 2 to 16 ins.

250 lbs. working pressure; 400 lbs. test.



FIG. NO. 503



FIG. NO. 504

Size, ins.	2	2½	3	3½	4	4½	5	6	7	8	9	10	12
Fig. 503, Fig. 505, end to end, ins.	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	14
Fig. 504, Fig. 506, face to face, ins.	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11	12
Flange, diam., ins.	6	7	7½	8	9	9½	10	11	12	13	14	15	16

LIST 104

Fig. 508, Screwed end, inside spindle.

Fig. 509, Flanged end, inside spindle.

Fig. 510, Screwed end, outside spindle.

Fig. 511, Flanged end, outside spindle.

Sizes 2 to 16 ins.

400 lbs. working pressure; 600 lbs. test.



FIG. NO. 508



FIG. NO. 509

Size, ins.	2	2½	3	3½	4	4½	5	6	7	8	9	10	12
Fig. 508, Fig. 510, end to end, ins.	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	14
Fig. 509, Fig. 511, face to face, ins.	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	14
Flange, diam., ins.	6½	7½	8½	9	10	10½	11	12	13	14	15	16	17

LIST 105

Fig. 515, Screwed end, inside spindle.

Fig. 516, Flanged end, inside spindle.

Fig. 517, Screwed end, outside spindle.

Fig. 518, Flanged end, outside spindle.

Sizes 2 to 16 ins.

500 lbs. working pressure; 1000 lbs. test.



FIG. NO. 515



FIG. NO. 516

Size, ins.	2	2½	3	3½	4	4½	5	6	7	8	9	10	12
Fig. 515, Fig. 517, end to end, ins.	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	14
Fig. 516, Fig. 518, face to face, ins.	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	14
Flange, diam., ins.	6½	7½	8½	9	10	10½	11	12	13	14	15	16	17

LIST 106

Fig. 520, Screwed end, inside spindle.

Fig. 521, Flanged end, inside spindle.

Fig. 522, Screwed end, outside spindle.

Fig. 523, Flanged end, outside spindle.

Sizes 2 to 16 ins.

750 lbs. working pressure; 1500 lbs. test.



FIG. NO. 520



FIG. NO. 521

Size, ins.	2	2½	3	3½	4	4½	5	6	7	8	9	10	12
Fig. 520, Fig. 522, end to end, ins.	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	14
Fig. 521, Fig. 523, face to face, ins.	9½	10½	11½	12½	13½	14½	15½	16½	17½	18½	19½	20½	21½
Flange, diam., ins.	7	7½	8	9	10	10½	11	12	13	14	15	16	17

LIST 107

Fig. 525, Screwed end, inside spindle.

Fig. 526, Flanged end, inside spindle.

Fig. 527, Screwed end, outside spindle.

Fig. 528, Flanged end, outside spindle.

Sizes 2 to 16 ins.

1200 lbs. working pressure; 2000 lbs. test.



FIG. NO. 525



FIG. NO. 526

Size, ins.	2	2½	3	3½	4	4½	5	6	7	8	9	10	12
Fig. 525, Fig. 527, end to end, ins.	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	14
Fig. 526, Fig. 528, face to face, ins.	9½	10½	11½	12½	13½	14½	15½	16½	17½	18½	19½	20½	21½
Flange, diam., ins.	7	7½	8	9	10	10½	11	12	13	14	15	16	17

THE EDWARD VALVE AND MANUFACTURING CO.

Manufacturers of Valves and Fittings for High Pressures,
Temperatures, or Other Severe Service

EAST CHICAGO, IND.

BRANCH OFFICES

BOSTON, MASS., 161 Devonshire Street NEW YORK, N. Y., 50 Church Street
PITTSBURGH, PA., 511 Wood Street PHILADELPHIA, PA., Colonial Trust Building
SAN FRANCISCO, CAL., 223 Rialto Building

Products.

EDWARD GLOBE and ANGLE, CHECK, DRUMHEAD STOP AND CHECK, BLOW-OFF, and NON-RETURN VALVES, for excessive pressures and temperatures.

Scope of Use.

Edward valves are designed for pressures to 350 lbs. and temperatures to 750° Fahr. Years of operation in the largest powerhouses in America have proved the ability of Edward valves to withstand stresses caused by weight of piping, waterhammer, and vibrations, as well as the internal temperatures and pressures for which recommended, with a liberal factor of safety.

Materials.

Only the best of materials are used: open hearth or electric steel-bronze specially alloyed for each purpose; genuine monel metal where monel is specified; extra hard steam bronze.

Edward Protected Seat and Disc.

Ability to withstand excessive pressures and temperatures without wire-drawing is gained through the use of the Edward protected seat and disc—a feature found only in Edward valves. The design is such that even in the cracked position, when erosive action is greatest as the velocity of the steam is greatly increased by being drawn through a very small opening, the seating surfaces are widely separated and entirely protected from the direct flow of steam, and the velocity across the seating surfaces is greatly reduced.

The seat and disc are made from genuine monel metal or from extra hard steam bronze, as specified. Although replacement of seating surfaces is seldom necessary, the Edward protected seat and disc is renewable.

Inspection at Factory.

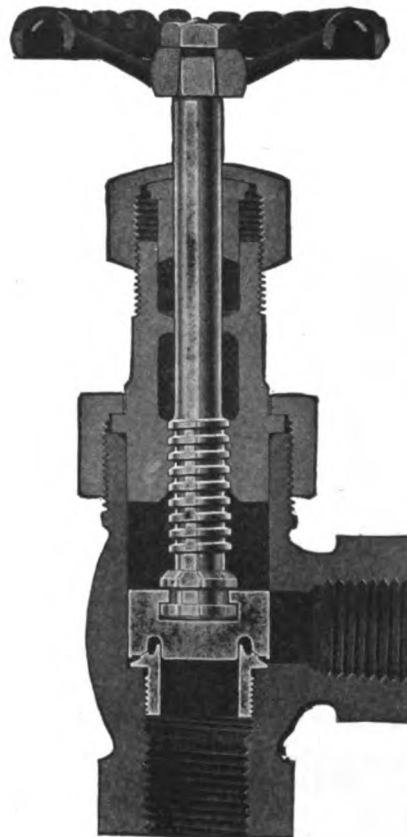
Every Edward valve must pass two severe tests before it leaves the factory. First it is subjected to hydrostatic pressure of at least two and one-half times the working pressure. Second the valve is subjected to air pressure while submerged in water to locate any small leaks not revealed by hydrostatic tests.

Guarantee.

THE EDWARD VALVE AND MANUFACTURING CO. makes the following guarantee:

"This company will replace, free of expense to the customer, all valves showing manufacturing defects within one year, and further guarantees successful operation for one year, with a minimum of regrinding under the service specified for each type of valve."

The list at the bottom of the next column gives the specifications, briefly, of some Edward valves.



EDWARD EXTRA HEAVY FORGED STEEL STOP VALVE, NO. 533

For working pressures to 300 lbs. and temperatures to 750° Fahr. Internal working parts of monel metal. Made in ¼-in. to 1-in. sizes. Ask for bulletin No. 19

STOP VALVES			
Body	Internal working parts	For temperatures to	For pressures to
Cast iron	Hard steam metal	400° Fahr.	200 lbs.
Steel	Monel metal	750° Fahr.	300 lbs.
Semisteel	Hard steam metal	480° Fahr.	250 lbs.
	Monel metal	600° Fahr.	300 lbs.
Bronze	Hard steam metal	400° Fahr.	175 lbs.
Forged steel	Monel metal	750° Fahr.	300 lbs.
NON-RETURN VALVES			
Cast iron	Hard steam metal	400° Fahr.	200 lbs.
Steel	Monel metal	750° Fahr.	300 lbs.
Semisteel	Hard steam metal	400° Fahr.	250 lbs.
BLOW-OFF VALVES			
Cast iron	Hard steam metal		200 lbs.
Steel	Monel metal		300 lbs.
Semisteel	Hard steam metal		250 lbs.
DRUMHEAD STOP AND CHECK VALVES			
Steel	Monel metal		300 lbs.
Semisteel	Hard steam bronze		300 lbs.
Bronze	Hard steam bronze		300 lbs.
CHECK VALVES			
Cast iron	Hard steam bronze		200 lbs.
Steel	Extra hard steam bronze		300 lbs.
Semisteel	Extra hard steam bronze		250 lbs.
Bronze	Extra hard steam bronze		300 lbs.
Brass	Good grade of brass		175 lbs.

FOUNDED BY R. T. CRANE, 1855

CRANE CO.**Manufacturers of Valves and Fittings for any Pipe Line**836 South Michigan Avenue
CHICAGO, ILL.

FACTORIES: CHICAGO, ILL., BRIDGEPORT, CONN.

SALES OFFICES

ABERDEEN	BROOKLYN	FARGO	MEMPHIS	PHILADELPHIA	SEATTLE
ALBANY	BUFFALO	GRAND RAPIDS	MINNEAPOLIS	PORTLAND, ORE.	SIOUX CITY
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BALTIMORE	CINCINNATI	INDIANAPOLIS	NEWARK	ROCKFORD	SPRINGFIELD, MASS.
BILLINGS	DAVENPORT	KANSAS CITY	NEW YORK	SACRAMENTO	ST. LOUIS
BIRMINGHAM	DES MOINES	KNOXVILLE	OAKLAND	SALT LAKE CITY	ST. PAUL
BOSTON	DETROIT	LITTLE ROCK	OKLAHOMA CITY	SAN FRANCISCO	SYRACUSE
BRIDGEPORT	DULUTH	LOS ANGELES	OMAHA	SAVANNAH	TACOMA
TERRE HAUTE	WASHINGTON			WICHITA	WINONA

Products.

VALVES: Regrinding Globe, Angle, Cross and Check; Extra Heavy Gate; Forged Steel Globe and Angle; Extra Heavy Hydraulic Cast Steel Gate; Crane—Erwood Automatic Double Acting Non-return and Emergency Cut-out.

FITTINGS: Screwed and Flanged, Cast Iron, Malleable Iron, Brass, Cast Steel and Forged Steel.

UNIONS: Ground Joints, Brass to Iron Seats.

UNION FITTINGS: Ground Joints, Brass to Iron Seats.

STRAINER and SEDIMENT SEPARATORS.

JOINTS: Flanged Pipe, Crane Expansion.

HEADERS: Cast Iron, Ferrosteel, Cast Steel.

EXTRA HEAVY STEAM and OIL SEPARATORS.

PIPE SUPPORTS, HANGERS and BRACKETS.

Also manufacturers of other Power Plant Specialties which include Traps; Cranetilt Steam and Vacuum; Fabricated Pipe and Bends; Valves: Pop Safety, Engine Stop, Exhaust Relief, Stop Check, Water Relief and Safety; Swivel Expansion Joints; Mine Piping; Pump Columns; Flanges; Bolts; Gaskets; Cocks for air lines; Pressure Regulators; Fittings: Screwed and Flanged, Sanitary Drainage, Long Sweep Water. Plumbing Fixtures.

20,000 articles, including valves and fittings from 1/8 in. to 72 in. Made of brass, cast iron, malleable iron, ferrosteel, cast steel and forged steel. For water pressures up to 6000 lbs., for steam pressures up to 400 lbs., any superheat, and for air pressures up to 2000 lbs.

Regrinding Globe, Angle, Cross, Check Valves.

These valves are made of Crane special brass. They are fitted with our improved, non-heating malleable iron wheel and may be repacked when open and under pressure. The body is reinforced by a heavy union ring and when pressure is applied any tendency of the body to stretch is counteracted by this ring, and the contact between the body and the ring becomes more intimate as the pressure increases. Made in medium, extra heavy and hydraulic patterns.



NO. 70 GLOBE VALVE

Extra Heavy Gate Valves, Outside Screw and Yoke.

These valves are made of Crane ferrosteel with extra heavy hard metal seats which are screwed to shoulders in body, thereby insuring perfect joints. Seats can be removed at any time it may be necessary to renew them. The gate is made very stiff and is faced with hard metal. The guides in the gates are carefully finished, so as to slide smoothly on ribs in the body, thus

preventing any rattling when the valve is open, or any uneven wear of faces. Stuffing box flange is of malleable iron with a brass follower, giving additional strength and durability at that point. These valves may be packed when open. Tested to 800 lbs. hydraulic pressure per sq. in.

Forged Steel Globe and Angle Valves.

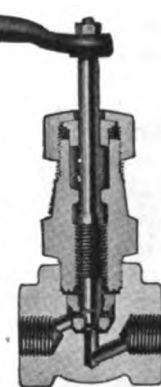
Meet the demand for a thoroughly reliable valve for use with hydraulic presses and extreme high pressure air or gas installations. The body is machined from a solid steel forging. The seat is easily renewable. These valves are recommended for cold water or oil working pressures up to 6000 lbs. hydrostatic. Valves for air or gas are special.



NO. 9-E GLOBE VALVE

Extra Heavy Hydraulic Cast Steel Gate Valves.

The bodies, bonnets, yokes and discs of these valves are made of Crane cast steel. In sizes above 2 in. the disc is faced with hard metal; size 2 in. has disc in solid hard metal. The construction of the seat and method of screwing it in the body, the strength and finish of the gate and stuffing box are similar to No. 9-E valve. Also they may be packed while under pressure. These valves are recommended for cold water or oil working pressures up to 3000 lbs. hydrostatic, and are tested to 3000 lbs. hydraulic pressure.



NO. 225-H FORGED STEEL VALVE



NO. 205-D GATE VALVE

Unions and Union Fittings.

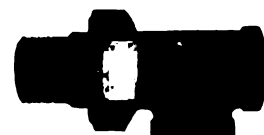
Made with leakproof brass to iron seat, requiring no gaskets, and may be taken apart readily. The seat is non-corrosive. Unions are made of malleable iron for steam working pressures up to 250 lbs. Union fittings are for 200 lbs. working pressure.



No. 519



No. 591



No. 596

UNIONS AND UNION FITTINGS

Crane-Erwood Automatic Double Acting Non-return and Emergency Cut-out Valve.

The principal duties of the Crane-Erwood valve are boiler protection, header protection, automatic cut in, line protection. These valves are extra heavy, made of ferrosteel with hard metal seats and discs and are recommended for steam working pressures up to 250 lbs. The levers on the outside of the valve are in line with the discs and give a positive indication of their position and the operation of the valve at all times. The valve may be adjusted to close at any desired velocity. Adjustments are made from the outside while the valve is in operation.



NO. 36-E
CRANE-ERWOOD
AUTOMATIC
VALVE

Extra Heavy Hydraulic Malleable Iron Screwed Fittings.

The Crane line of extra heavy hydraulic malleable iron fittings includes all the necessary sizes and shapes for cold water or oil working pressures as follows:

1 in. and smaller.....	2000 lbs. hydrostatic
1¼ to 2 in.....	1500 lbs. hydrostatic
2½ to 4 in.....	1000 lbs. hydrostatic
5 and 6 in.....	800 lbs. hydrostatic
8 in.....	600 lbs. hydrostatic
10 and 12 in.....	500 lbs. hydrostatic

These fittings are tested to hydraulic pressures corresponding to the above working pressures.



NO. 260-H

NO. 262-H

NO. 264-H

NO. 267-H

EXTRA HEAVY HYDRAULIC FITTINGS

Cranetilt Steam Traps.

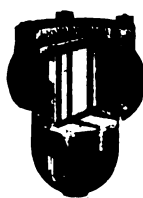
Designed as non-return, boiler feed, lifting, vacuum or metering traps. They are especially adapted for use on return lines handling condensation under varying pressures, especially where the pressure will vary from a vacuum to high steam pressure. The Cranetilt three-valve trap gives excellent service on returns on apparatus that has a varying pressure while in service or a low initial starting pressure and a high terminal pressure. Buy steam traps by their discharging capacity; not by pipe sizes.



THREE-VALVE TRAP

Strainer and Sediment Separator.

For water working pressures up to 250 pounds. These separators are constructed in a strong and substantial manner and will be found exceptionally valuable for use in connection with steam traps, pumps, injector and ejector suction pipes, feed water lines, etc., by preventing foreign substances from passing through and settling on valve seats and other places that should be kept entirely clear and free from such obstructions.



NO. 900
SEDIMENT
SEPARATOR

Headers.

CRANE Co. has exceptional facilities for making any required design of headers in cast iron, ferrosteel or cast steel, for all pressures and purposes.



WELDED HEADER

Flanged Pipe Joints.

With Crane cast steel or forged steel flanges these flanged joints are highly recommended for use in connection with pipe bends.



NO. 281-D
Screwed Joint,
with Cast Steel
Flange



NO. 295-E
Cranelap Joint,
with Forged Steel
Flange



NO. 181-D
Cranelap Joint,
with Cast Steel
Flange

THREE STANDARD TYPES FLANGED PIPE JOINTS

Extra Heavy Steam and Oil Separators.

Have large areas and ample baffle surfaces, affording the highest degree of efficiency with the slightest loss in pressure. Their design is based upon the most approved mechanical and scientific principles. This superior line of separators is offered in competition with any steam or oil separating devices on the market.



NO. 014
STEAM AND OIL SEPARATOR

Standard steam separators for steam working pressures up to 125 lbs. Extra heavy steam separators for steam working pressures up to 250 lbs.

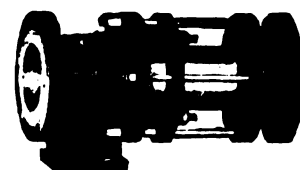
Cast steel steam separators for superheated steam working pressures up to 350 lbs. and total temperature of 800° Fahr.

Oil separators for steam working pressures up to 25 lbs.

Crane Expansion Joints.

Are made in brass, copper, cast iron, ferrosteel and cast steel for all pressures and purposes.

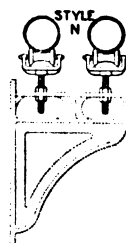
Expansion joints with anchor bases reduce the cost of installation.



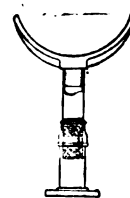
NO. 49-E EXPANSION JOINT
With anchor base

Pipe Supports, Hangers and Brackets.

Are suitable for pipe lines up to 30 in.



Style N



Style H
PIPE SUPPORTS



Style C



WALL BRACKET
With walking board
attachment

Literature.

Catalogue No. 50, which describes complete line of products, will be mailed on request.

THE FISHER GOVERNOR CO.

Oil Field Specialties

5-11 Linn Street
MARSHALLTOWN, IOWA

Products.

SAFETY and VACUUM VALVES for Oil Stills and Agitators; GASOLINE TRAPS; RELIEF VALVES.

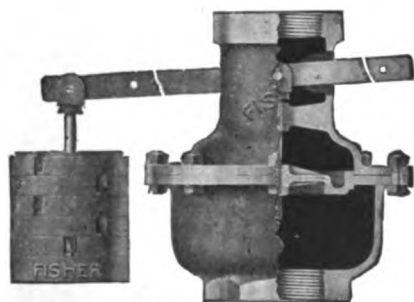
Also manufacturers of Gas Water Traps.

For Steam Specialties, see pages 1012-13.

Fisher Safety and Vacuum Valves.

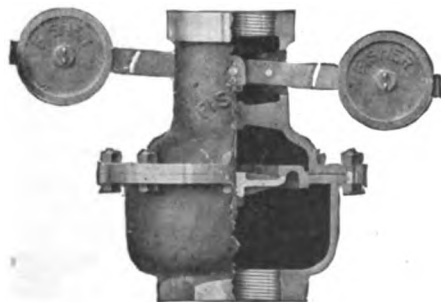
For use in oil refineries using low pressure stills, to protect shell of still from an excessive amount of pressure or vacuum. Made with heavy cast iron bodies; upper and lower parts of body securely bolted together. Inner valve made of mild bronze, and seats against a perfectly machined cast iron seat; seat ring cast separate from body casting. Both inner valve and seat removable, effecting a saving in upkeep.

Parts of safety valve interchangeable with parts of vacuum valve. Either can be converted into the other by reversing valve on stem, reversing position of cast iron seat ring, and changing leverage.



TYPE NO. 1515S SAFETY VALVE

As regularly fitted, suitable for any pressure up to 20 lbs.



TYPE NO. 1515V VACUUM VALVE

Vacuum valves fitted to handle any vacuum

Fisher Gasoline Traps.

For use where gasoline is manufactured under pressure; also for taking gasoline out of gas lines. Intermittent open bucket types—the only type practical in this field. Vapor loss reduced to a minimum. Liability of freezing greatly lessened.



TYPE NO. 333 FISHER GASOLINE TRAP

All parts extra heavy, being specially constructed for gasoline service. Casting uniform in thickness. Body and cover heavily ribbed to give additional strength.

Fisher Relief Valves.

On weathering tanks as well as in other installations where a relief valve can be used, the Fisher Type 505 has proved superior to relief valves of other constructions.

Like other Fisher specialties it is built with high grade cast iron body, with Duromite inner valve and seats. The Duromite insures long life and positive results.

Construction of this valve permits the use of a very long spring, which is compressed by the action of pressure on the diaphragm. This action of diaphragm and spring opens the inner valve and relieves the pressure to desired point.

Adjustment easily secured by releasing lock nut wheel and turning adjustment wheel in either direction. Fisher design of diaphragm rod and valve stem insures constant and perfect alignment, unaffected by adjustment.



TYPE 505 RELIEF VALVE

THE LARNER-JOHNSON VALVE & ENGINEERING CO.

Manufacturers of Hydraulic Valves

Widener Building
PHILADELPHIA, PA.

Product.

JOHNSON HYDRAULIC VALVES.

Types A and B Johnson Valves.

Types A and B are one-way valves especially designed for water power plants. They differ only in body construction and the sectionalizing of the internal parts for dismantling.

Type A (Fig. 1) is built in sizes up to and including 60-in. inlet diameter. The body and plunger are cast iron or cast steel according to the head. The standard ratio of inlet area to outlet area is approximately 2:1.

Type B (Fig. 2) is used for sizes larger than 60 in. inlet diameter. The plate steel penstock is enlarged to

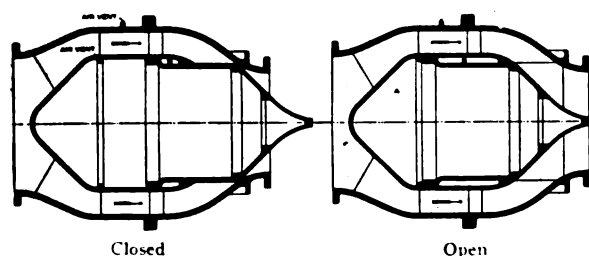


FIG. 1. TYPE A VALVE

form the inlet end of the valve body. The outlet end is split on the horizontal axis for removal of the internal parts of the valve. The standard ratio of inlet area to outlet area is 2:1, but this may be varied at will by modifying the taper of the plate steel body.

In water power plants it is customary to make the outlet diameter of the valve the same as the inlet diameter of the turbine casing, although in some cases the valve may be smaller than the turbine, provided the connecting pipe is long enough to avoid an excessive taper. Both Types A and B are rated on the basis of the inlet diameter.

These valves have a differential plunger which in combination with the internal cylinder forms two operating chambers A and B (Figs. 1 and 2). The plunger is closed by admitting pressure from the waterway to A and exhausting B to the atmosphere. It is opened by reversing this operation.

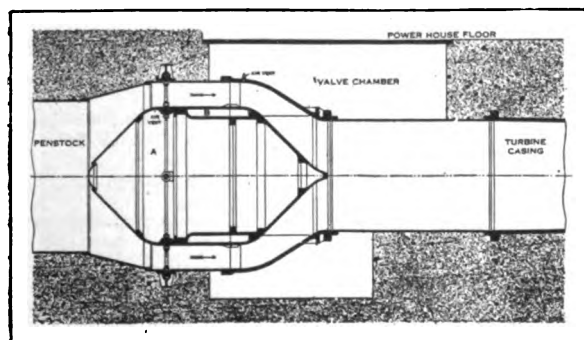


FIG. 2. TYPE B VALVE

Type C Valves.

Type C valve (Fig. 3) is hand operated but may be equipped for electrical operation. It is made in standard sizes up to and including 24 in. diameter. The inlet and outlet diameters are the same.

Type C is a one-way valve suitable for water works and general industrial purposes where the flow is in only one direction. It is also suitable for water power plants where the pressures are unusually high and the pipe lines small. The rate of opening and closing is under absolute control and the power required for operation is almost negligible. This valve is particularly suited to conditions which require operation at partial openings such as throttling valves in water works systems.

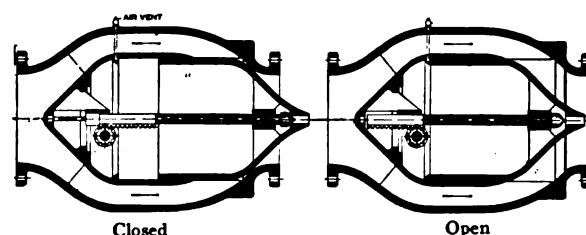


FIG. 3. TYPE C VALVE

Control of Type C valve is located inside the valve. There is no external control valve or outside discharge during operation as in Types A and B.

Type E Valves.

Type E valve (Fig. 4) is the same in design and operation as Type C except that it has a differential plunger like Types A and B, with auxiliary outlets from the two internal operating chambers. By exhausting one or the other of these outlets a powerful hydraulic force may be applied to the plunger independent of the regular operating mechanism.

The auxiliary hydraulic operation makes the Type E valve suitable for considerably larger sizes than the Type C. It is an ideal valve for high head water power plants.

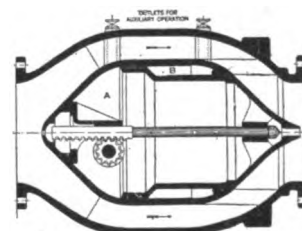


FIG. 4. TYPE E VALVE

Type N Discharge Regulator.

Type N regulator is designed specifically for controlling outlets of storage dams and for water supply systems. The design is the same as the Type E valve except for the proportions of the water passages and the inlet end of the regulator, which are modified on account of the high velocities which have to be handled in this service. This regulator will operate at all positions of the plunger without vibration or hydraulic disturbance.

HOMESTEAD VALVE MANUFACTURING CO.

Manufacturers of Valves and Other Specialties

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HOMESTEAD, PA.

Products.

HOMESTEAD QUARTER-TURN VALVES for various pressures, in Brass, Semisteel Body, All-semisteel and Cast Steel.

HOMESTEAD STRAIGHTWAY VALVES, THREE-WAY VALVES, FOUR-WAY VALVES, ANGLE VALVES.

"HOVALCO" RENEWABLE BLOW-OFF VALVES.

Also, Locomotive Blow-off Valves.

Advantages.

The simple construction gives the following advantages: The Homestead valve can be fully opened or closed with a quarter turn, which is important in times of emergency.

The straight and unobstructed passage through the Homestead valve, when open, makes it particularly suitable for the handling of heavy liquids or for carrying off sediment, as in the case of a blow-off valve.

The patent locking cam releases all pressure on the plug in turning, but locks the plug tight to the seat in the closed position.

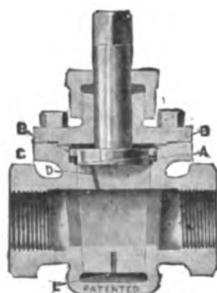
The seat is protected from wear when pressure is passing through valves.

Homestead Straightway Valves.

Made in all sizes up to 6 in., and for all pressures up to 5000 lbs. per sq. in.

The Homestead valve is unlike all others, especially globe and gate valves, for the reason that when the pressure passes directly through it, the seat is absolutely protected from wear. The plug is balanced and held in place by the pressure when open, and when closed it is locked in the seat by the patent wedging cam, insuring freedom from friction in seat while plug is turning.

This valve is so constructed that when it is closed the plug at the same time is forced firmly to its seat. This result is secured by means of the traveling cam "A," through which the stem passes. The cam is prevented from turning with the stem by means of the lugs "B," which move vertically in slots. Supposing the valve to be open, the cam will be in the lower part of the chamber in which it is placed, and the plug will be free to be easily moved.



SECTION THROUGH
HOMESTEAD VALVE



FIG. 3. Flanged Connections
200 lbs. working pressure. All brass



FIG. 5. Screwed Connections
500 lbs. working pressure. Special high grade bronze

HOMESTEAD STRAIGHTWAY VALVES

DATA, HOMESTEAD STRAIGHTWAY VALVES
200 LBS. WORKING PRESSURE. FLANGED CONNECTION. BRASS.

Size, in.	1	1½	2	2½	3	3½	4
Flgd. f. to f.	4½	5	6	7½	8	9½	12½
Diam. of flgs.	3½	4½	5	6	7	8	9
Price, ser.	\$16.66	19.20	26.70	35.00	46.40	82.90	110.50
Price, flgd.				\$0.15	.25	.40	.65
Drilling, net.							.75

DATA, HOMESTEAD STRAIGHTWAY VALVES—(Continued)
200 LBS. WORKING PRESSURE. SCREWED CONNECTION. BRASS.

Size, in.	½	¾	1	1½	2	2½	3	3½	4
Scr. e. to e.	2½	2½	2½	2½	3½	4½	5½	6½	8½
Price, ser.	\$3.83	3.83	4.00	4.50	5.37	7.17	9.60	13.40	23.30
Price, flgd.									104.13
Drilling, net.									120.40

500 LBS. WORKING PRESSURE. SCREWED AND FLANGED CONNECTION. BRONZE.

Size, in.	½	¾	1	1½	2	2½	3	3½	4
Scr. e. to e.	2½	2½	2½	2½	3½	4½	5½	6½	8½
Flgd. f. to f.									
Price, ser.									
Price, flgd.									
Drilling, net.									

Size, in.	2	2½	3	4	5	6
Scr. e. to e.	6½	7½	10	12½	12½	17½
Flgd. f. to f.	8½	9½	11	12½	14	16
Price, ser.	\$31.60	50.00	95.30	160.23	183.33	233.30
Price, flgd.	\$45.00	70.00	116.60	193.30	226.60	288.10
Drilling, net.	\$0.15	.25	.40	.65	.75	1.00

BRASS VALVES FOR 1500 LBS. WORKING PRESSURE

Size, in.	½	¾	1	1½	2	2½	3
Scr. e. to e.	3½	3½	3½	5½	6	7	7½
Flgd. f. to f.							
Price, ser.	\$6.40	6.40	10.60	15.60	24.20	31.30	41.90
Price, flgd.							
Drilling, net.							

VALVES FOR 3000 LBS. WORKING PRESSURE

Size, in.	½	¾	1	1½	2	2½	3
Scr. e. to e.	5½	6	7	7½	10	11	11
Flgd. f. to f.	6	7	8	8½	11	11	11
Price, ser.	\$15.96	29.76	38.26	53.13	63.76	73.13	116.86
Price, flgd.							
Drilling, net.							

VALVES FOR 5000 LBS. WORKING PRESSURE

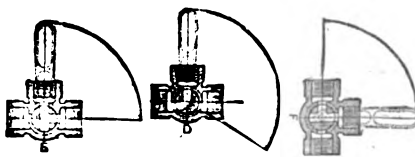
Size, in.	½	¾	1	1½	2	2½	3
Scr. e. to e.	5½	6½	7½	7½	10	11	11
Flgd. f. to f.	6	6½	7	7½	10	11	11
Price, ser.	\$17.00	23.36	38.26	51.00	63.76	89.26	165.76
Price, flgd.							
Drilling, net.							

Homestead Three-way Valves.

Suitable for various working pressures for either water, air or steam. Made according to same principle as Homestead straightway valves. They have the internal locking device, which forces the plug tight to seat of valve at both extremes of the arc in which plug turns.

Three arrangements of ports or openings shown can be used.

Valve with the two-port plug, shown in figure D, is used in majority of cases; and if not otherwise specified, is always shipped.



HORIZONTAL SECTIONS OF THREE-WAY VALVES



FIG. 9. HOMESTEAD THREE-WAY VALVE
Brass. 200 lbs. working pressure

DATA, HOMESTEAD BRASS THREE-WAY VALVES
200 LBS. WORKING PRESSURE

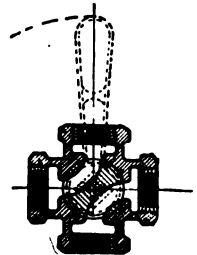
Size, in.	¾	1	1½	2	2½	3	4
Scr. e. to e. of run.	2½	3	3½	4½	5½	6½	7½
Scr. cent. of run to end of side op'ng	1½	1½	1½	2½	2½	3½	5½
Price, ser.	\$6.34	6.67	9.90	15.80	19.30	22.90	36.60
Flgd. f. to f. of run	4½	4½	5½	6½	7½	8½	10½
Diam. of flgs.	4½	4½	5	6	7	7½	9
Price, flgd.							
Drilling, net.							

DATA, HOMESTEAD BRASS THREE-WAY VALVES—(Continued)
600 LBS. WORKING PRESSURE

Size, in.	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	4
Scr. e. to e. of run...	$3\frac{1}{2}$	$4\frac{1}{4}$	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{3}{4}$	$5\frac{1}{4}$	$6\frac{1}{4}$	9	$9\frac{3}{4}$	$12\frac{1}{2}$
Scr. cent. of run to end of side op'ng		$2\frac{3}{4}$	$2\frac{3}{4}$	$2\frac{3}{4}$	$2\frac{3}{4}$	$3\frac{1}{4}$	$4\frac{1}{4}$	$4\frac{1}{2}$	5	$6\frac{1}{4}$
Price, scr.	\$10.00	12.20	20.00	24.33	31.26	36.03	47.83	71.73	119.56	208.26
Flgd. f. to f. of run...				$4\frac{1}{4}$	5	$5\frac{1}{4}$	6	$6\frac{1}{4}$	$7\frac{1}{4}$	$8\frac{1}{4}$
Diam. of flgs.				$4\frac{1}{4}$	5	$5\frac{1}{4}$	6	$6\frac{1}{4}$	$7\frac{1}{4}$	$8\frac{1}{4}$
Price, flgd.				\$31.86	39.33	46.77	68.00	102.00	148.76	255.06
Drilling, net.						\$0.15	.25	.40	.65	.75

Homestead Four-way Valves.

The Homestead four-way valve is made to hold any pressure to and including 3000 lbs. It is made with the patent device which limits the plug to a quarter turn and forces it to its seat at each extreme of this quarter turn.



HORIZONTAL SECTION FOUR-WAY VALVE

FIG. 14. HOMESTEAD FOUR-WAY VALVE
For 600 lbs. working pressureDATA, BRASS FOUR-WAY VALVES
600 LBS. WORKING PRESSURE

Size, in.	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3
Scr. e. to e.	$4\frac{1}{4}$	5	$5\frac{1}{4}$	$6\frac{1}{4}$	$7\frac{1}{4}$	$9\frac{1}{4}$	$11\frac{1}{4}$	$11\frac{3}{4}$	$11\frac{3}{4}$
Price,	\$12.77	20.10	25.10	45.10	51.00	64.60	90.90	122.10	180.60



FIG. 16. HOMESTEAD ANGLE VALVE

200 lbs. working pressure, semisteel body



FIG. 17. HOMESTEAD STRAIGHTWAY VALVE



FIG. 19. HOMESTEAD THREE-WAY VALVE

DATA, HOMESTEAD BRASS ANGLE VALVES
200 LBS. WORKING PRESSURE

Size, in.	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$
Scr. outlet to face of inlet...	$1\frac{1}{2}$	$1\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{1}{2}$	4
Flgd. outlet to face of inlet...				$4\frac{1}{4}$	$4\frac{1}{4}$	$4\frac{1}{4}$	$4\frac{1}{4}$
Price, scr.	\$7.20	8.70	13.30	15.00	16.60	29.20	40.00
Price, flgd.				\$18.30	20.80	35.83	49.73

500 LBS. WORKING PRESSURE

Size, in.	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3
Price, scr.			\$8.33	10.00	15.83	18.33	23.33	33.33	50.00	
Price, flgd.			\$23.33	25.00	30.00	46.66	66.66	73.33	123.33	

Homestead Semisteel Valves.

Homestead semisteel valves are used extensively on superheated lines. This is particularly true in the oil industry, where valves are used with entire success on vapors superheated to 700° Fahr. Homestead semisteel valves are also used on superheated steam lines in the power plant, where the results are at least equal to those usually obtained from cast steel valves.

DATA, HOMESTEAD SEMISTEEL BODY STRAIGHTWAY VALVES
200 LBS. WORKING PRESSURE

Size, in.	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	4	5	6
Scr. e. to e.	$4\frac{1}{4}$	$4\frac{3}{4}$	5	$6\frac{1}{4}$	$7\frac{1}{4}$	10	$12\frac{1}{2}$	$12\frac{1}{2}$	$17\frac{1}{2}$	$17\frac{1}{2}$
Flgd. f. to f.	$4\frac{3}{4}$	$6\frac{1}{4}$	$6\frac{1}{4}$	$8\frac{1}{4}$	$9\frac{3}{4}$	11	$12\frac{1}{2}$	14	16	16
Diam. of flgs.	$4\frac{1}{4}$	5	6	$6\frac{1}{2}$	$7\frac{1}{2}$	$8\frac{1}{2}$	10	$11\frac{1}{4}$	$12\frac{1}{4}$	$12\frac{1}{4}$
Price, scr.	\$10.22	10.22	12.80	16.66	24.00	35.55	62.22	97.82	137.82	151.15
Price, flgd.	\$12.22	15.55	20.00	31.69	47.55	82.22	120.00	166.66	217.77	

SWEET'S CATALOGUE

DATA, HOMESTEAD SEMISTEEL BODY THREE-WAY VALVES
200 LBS. WORKING PRESSURE

Size, in.	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	4	5	6
Scr. e. to e. of run...	$4\frac{3}{4}$	$5\frac{1}{4}$	6	$6\frac{1}{4}$	9	10	$12\frac{1}{4}$		
Scr. cent. of run to end of side op'ng	$2\frac{1}{2}$	$3\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{2}$	$4\frac{1}{4}$	$5\frac{1}{4}$	$6\frac{1}{4}$		
Flgd. f. to f. of run...		$5\frac{1}{4}$	$6\frac{1}{4}$	8	10	$10\frac{1}{4}$			
Price, scr.	\$19.86	23.33	26.66	40.00	55.55	75.55	127.77	177.77	244.44
Price, flgd.	\$26.66	31.11	34.66	52.76	75.60	100.03	155.55	200.00	271.15

DATA, HOMESTEAD ALL-SEMISTEEL STRAIGHTWAY VALVES
200 LBS. WORKING PRESSURE

Size, in.	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	4	5	6
Scr. e. to e. of run...	$4\frac{1}{4}$	$4\frac{3}{4}$	5	$6\frac{1}{4}$	$7\frac{1}{4}$	10	$12\frac{1}{2}$	$12\frac{1}{2}$	$17\frac{1}{2}$
Scr. cent. of run to end of side op'ng	$4\frac{3}{4}$	$6\frac{1}{4}$	$6\frac{1}{4}$	$8\frac{1}{4}$	$9\frac{3}{4}$	11	$12\frac{1}{2}$	14	16
Diam. of flgs.	$4\frac{1}{4}$	5	6	$6\frac{1}{2}$	$7\frac{1}{2}$	$8\frac{1}{4}$	10	$11\frac{1}{4}$	$12\frac{1}{4}$
Price, scr.	\$10.66	14.67	16.00	21.92	36.00	60.00	88.00	124.00	170.00
Price, flgd.	\$14.67	16.00	21.33	28.53	46.83	78.03	108.00	150.03	196.00

Similar to Fig. 3.

DATA, HOMESTEAD ALL-SEMISTEEL THREE-WAY VALVES
200 LBS. WORKING PRESSURE

Size, in.	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	4	5	6
Scr. e. to e. of run...	$4\frac{3}{4}$	$5\frac{1}{4}$	6	7	9	10	$12\frac{1}{4}$		
Scr. cent. of run to end of side op'ng	$2\frac{1}{2}$	$3\frac{1}{4}$	$3\frac{1}{4}$	4	$4\frac{1}{4}$	$5\frac{1}{4}$	$6\frac{1}{4}$		
Flgd. f. to f. of run...		$5\frac{1}{4}$	$6\frac{1}{4}$	8	10	$10\frac{1}{4}$			
Price, scr.	\$21.33	26.66	29.33	40.00	57.33	75.63	144.00	186.66	220.00
Price, flgd.	\$26.66	32.00	34.66	47.04	64.00	85.33	160.00	202.64	244.00

DATA, HOMESTEAD ALL-SEMISTEEL FOUR-WAY VALVES
200 LBS. WORKING PRESSURE

Size, in.	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3
Scr. e. to e. of run...		6	$6\frac{1}{4}$	$7\frac{1}{4}$	$9\frac{1}{4}$	$11\frac{1}{4}$	$11\frac{3}{4}$
Price, scr.	\$23.68	42.35	48.00	60.80	77.33	114.93	160.00

Homestead Cast Steel Valves.

These valves are constructed on the same principle as the other Homestead valves described before. See data tabulated below.

DATA, HOMESTEAD CAST STEEL VALVES

Size, in.	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	4	5	6
Scr. e. to e.	$4\frac{1}{4}$	$4\frac{3}{4}$	5	$6\frac{1}{4}$	$7\frac{1}{4}$	10	$12\frac{1}{2}$	$12\frac{1}{2}$	$17\frac{1}{2}$
Flgd. f. to f.	$4\frac{3}{4}$	$5\frac{1}{4}$	$6\frac{1}{4}$	$8\frac{1}{4}$	$9\frac{3}{4}$	11	$12\frac{1}{2}$	14	16
Price, scr.	\$16.00	24.00	26.66	48.00	66.66	146.66	242.66	266.66	333.33
Price, flgd.	\$34.66	37.33	48.00	66.66	88.00	186.66	266.66	346.66	413.33
Drilling flgs, net.		\$0.25	.35	.60	1.00	1.25	1.75	2.25	

"Hovalco" Blow-off Valves.

Exceptionally well constructed. Body is made of semisteel and seat and disk of special composition. Passage is free and unobstructed, and seat or disk can easily be removed, renewed or re-ground.

Once installed, valve should outlast the boiler.



SECTION OF "HOVALCO" BLOW-OFF VALVE



COMBINATION OF "HOVALCO" RENEWABLE BLOW-OFF VALVE AND HOMESTEAD QUARTER TURN VALVE

Designed for use in connection with the Homestead quarter turn valve when a double blow-off valve is required. Combination shown of these two valves is approved and used in many power plants today

DATA, "HOVALCO" BLOW-OFF VALVES
250 LBS. WORKING PRESSURE

Size, in.	$1\frac{1}{4}$	2	$2\frac{1}{2}$	3
Price, scr.	\$22.00	27.00	32.50	41.00
Price, flgd.	\$23.00	28.32	33.56	43.00

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Products.

JENKINS VALVES: Globe, Angle, Cross, Check, Hose, Blow-off and Safety Valves; Radiator Valves, in a variety of types; Air Valves; Fractional and Vacuum Valves, for heating systems; Extra Heavy Valves, specially designed for high pressures and severe conditions, in Globe, Angle, Cross, Check, Blow-off, Automatic Equalizing Stop and Check, and other patterns; Gate Valves, in standard, medium and extra heavy patterns; Valves in brass, iron body and cast steel, for all pressures and purposes; Back Pressure or Exhaust Valves.

MECHANICAL RUBBER GOODS: Jenkins '96 and Jenarco Sheet Packing and Gaskets, Gasket Tubing, Pump Valves, Jenkins Composition Valve Discs, and the like. Also manufacturers of Steam Traps and Gage Cocks.

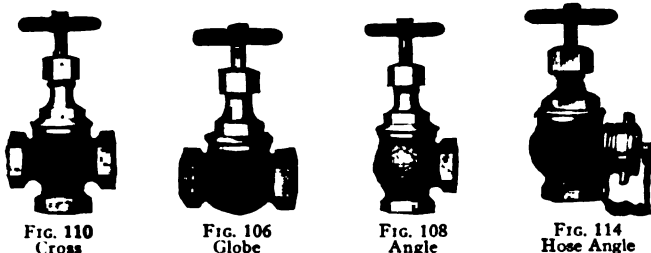
Jenkins Valves, Standard Pattern.

They represent a distinct type of valve as compared with regrinding, bevel or flat-seated valves. Instead of using a solid metal clapper, they contain a disc holder of brass or other suitable metal, and a removable disc of softer material, preferably Jenkins composition disc. This disc in service presents a slightly yielding surface to the valve seat and is flexible enough to adapt itself to any slight inequalities in the seat, insuring perfect contact. Should the disc be injured, it is only necessary to remove it and replace with a new one, which can be done by any mechanic.

Jenkins valves have full opening. They are made of a special high grade steam metal and contain, besides the Jenkins disc, other features found only in the genuine Jenkins valves.

Jenkins Brass Globe, Angle and Cross Valves.

Screwed or flanged, are regularly furnished with Jenkins No. 119 discs, suitable for 150 lbs. working steam pressure. When specified for cold water, valves are fitted with No. 93 discs, suitable for working water pressure up to 250 lbs. Regular sizes $\frac{1}{8}$ to 3 in. Larger sizes in brass made from iron body patterns.



BRASS VALVES, STANDARD PATTERN

Brass Check Valves, Standard Pattern—Jenkins brass horizontal, angle and vertical check valves correspond to same standard as the standard pattern globe and angle valves. Regularly furnished with Jenkins disc of semihard composition which will soften slightly under



the action of hot water as required for boiler feed lines. When specified for cold water, air or gas, a softer and more flexible rubber disc is supplied, usually Jenkins No. 93 composition. Suitable for 150 lbs. working pressure. Sizes $\frac{1}{8}$ to 3 in. screwed or flanged.

Jenkins brass swing check valves, standard pattern, are made with globe shaped bodies, adapted for either horizontal or vertical installation; have renewable disc feature same as the horizontal pattern; and are suitable for same working pressures. Sizes $\frac{1}{8}$ to 3 in., screwed or flanged.



FIG. 117
Horizontal



FIG. 118
Angle



FIG. 119
Vertical



FIG. 352
Swing check

BRASS CHECK VALVES, STANDARD PATTERN

Jenkins Y Valves—Besides extensive use for blow-off service, they are particularly desirable for handling muddy or gritty water. Have renewable seat rings and Jenkins discs; suitable for 150 lbs. working steam pressure, or 250 lbs. working water pressure. Brass valves, sizes $\frac{1}{8}$ to 3 in.; iron body valves, 2 to 8 in., inclusive.



FIG. 124
BRASS Y VALVE

DIMENSIONS OF BRASS VALVES, STANDARD PATTERN

Size, in.	Fig.	*	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	1 $\frac{1}{4}$	1 $\frac{1}{2}$	2	2 $\frac{1}{2}$	3
Globe, scr.	106	A	1 $\frac{1}{8}$	2 $\frac{1}{4}$	2 $\frac{3}{8}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$	3 $\frac{1}{2}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	8 $\frac{1}{2}$
Globe, fig.	107	B	2 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{8}$	3 $\frac{3}{4}$	4 $\frac{1}{4}$	4 $\frac{1}{2}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	9 $\frac{1}{2}$
Angle, scr.	108	C	1 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{3}{8}$	1 $\frac{3}{4}$	1 $\frac{3}{4}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{4}$	3 $\frac{3}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$
Angle, fig.	109	D	1 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{3}{8}$	1 $\frac{3}{4}$	1 $\frac{3}{4}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{4}$	3 $\frac{3}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$
Globe, scr. or fig.	106-107	G	2 $\frac{3}{8}$	3 $\frac{3}{8}$	4 $\frac{3}{8}$	4 $\frac{3}{8}$	5 $\frac{3}{8}$	6 $\frac{3}{8}$	7 $\frac{3}{8}$	8 $\frac{3}{8}$	9 $\frac{3}{8}$	10 $\frac{3}{8}$	11 $\frac{3}{8}$
Angle, scr. or fig.	108-109	H	1 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{3}{8}$	1 $\frac{3}{4}$	1 $\frac{3}{4}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{4}$	3 $\frac{3}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$
Horiz. check, scr.	117	A	1 $\frac{1}{8}$	2 $\frac{1}{4}$	2 $\frac{3}{8}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$	3 $\frac{1}{2}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	8 $\frac{1}{2}$
Horiz. check, fig.	120	B	1 $\frac{1}{8}$	2 $\frac{1}{4}$	2 $\frac{3}{8}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$	3 $\frac{1}{2}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	8 $\frac{1}{2}$
Angle check, scr.	118	C	1 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{3}{8}$	1 $\frac{3}{4}$	1 $\frac{3}{4}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{4}$	3 $\frac{3}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$
Angle check, fig.	120A	D	1 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{3}{8}$	1 $\frac{3}{4}$	1 $\frac{3}{4}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{4}$	3 $\frac{3}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$
Horiz. and angle	117-120A	GC	1 $\frac{1}{4}$	1 $\frac{1}{2}$	1 $\frac{3}{4}$	1 $\frac{3}{4}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{4}$	3 $\frac{3}{4}$	3 $\frac{3}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$
Vertical, scr.	119	HC	1 $\frac{1}{4}$	1 $\frac{1}{2}$	1 $\frac{3}{4}$	1 $\frac{3}{4}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{4}$	3 $\frac{3}{4}$	3 $\frac{3}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$
Vertical, fig.	120B	I	1 $\frac{1}{4}$	1 $\frac{1}{2}$	1 $\frac{3}{4}$	1 $\frac{3}{4}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{4}$	3 $\frac{3}{4}$	3 $\frac{3}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$
Y, scr.	124	A	2 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{8}$	3 $\frac{3}{4}$	4 $\frac{1}{4}$	4 $\frac{1}{2}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	9 $\frac{1}{2}$
Y, fig.	125	B	2 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{8}$	3 $\frac{3}{4}$	4 $\frac{1}{4}$	4 $\frac{1}{2}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	9 $\frac{1}{2}$
Y, scr. or fig.	124-125	G	4 $\frac{1}{4}$	5 $\frac{1}{4}$	5 $\frac{3}{8}$	5 $\frac{3}{4}$	6 $\frac{1}{4}$	6 $\frac{1}{2}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	8 $\frac{3}{4}$	9 $\frac{3}{4}$	11 $\frac{3}{4}$
Swing check, scr.	352	A	2 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{8}$	3 $\frac{3}{4}$	4 $\frac{1}{4}$	4 $\frac{1}{2}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	9 $\frac{1}{2}$
Swing check, fig.	353	B	2 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{8}$	3 $\frac{3}{4}$	4 $\frac{1}{4}$	4 $\frac{1}{2}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	9 $\frac{1}{2}$
Swing check, scr. or fig.	352-353	GC	1 $\frac{1}{4}$	1 $\frac{1}{2}$	1 $\frac{3}{4}$	1 $\frac{3}{4}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{4}$	3 $\frac{3}{4}$	3 $\frac{3}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$

*A—Face to face, screwed.

B—Face to face, flanged.

C—Angle, center to face, screwed.

D—Angle, center to face, flanged.

G—Center to top of hand wheel, open.

GC—Center to top of cap.

HC—Vertical, face to face, screwed.

I—Vertical, face to face, flanged.

Jenkins Brass Whistle Valves—Quick acting, spring and lever operated valves. A pull of lever opens them and they automatically close by means of spring as soon as lever is released.

Can be used for steam whistles, for hydraulic presses, for emergency stop, for shower baths, etc., wherever a quick opening valve is required. Made in brass with malleable iron levers, from $\frac{3}{8}$ to 3 in.

Jenkins Iron Body Valves, Standard Pattern.

These are heavier and stronger than the average iron body valves. They have renewable seat rings and Jenkins discs; and are suitable for same working pressures as the standard pattern brass valves. Globe and angle valves made in sizes 2 to 24 in., inclusive; cross valves up to 8 in. Flanges A. S. M. E. standard dimensions.

Jenkins iron body horizontal, angle, vertical and swing check valves made in sizes 2 to 10 in.; suitable for working pressures up to 150 lbs.

flexible rubber composition. For superheated steam they can be supplied with monel metal discs and seat rings.

The stuffing boxes are fitted with glands or followers, and are so arranged that they can be repacked when valves are wide open and under pressure. The large spindles are made of manganese bronze and have powerful acme standard threads.

The extra heavy horizontal, angle and swing check valves are equally heavy in design, and are guaranteed for 300 lbs. working pressure. Swing check valves can

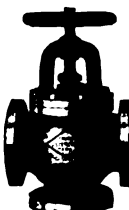
DIMENSIONS OF IRON BODY, GLOBE, ANGLE, CHECK AND Y VALVES, STANDARD PATTERN

Size, in.	Fig.	*	2	2½	3	3½	4	4½	5	6	7	8	9	10	12	14	16	18	20	24
Globe, scr.	141	A	6½	7¾	9¾	10	12	12¾	13¼	16	16½	18¾	20	21½	25¾	30½	34	38	42	50
Globe, flg.	142	B	7½	8	9½	10	11¾	12½	13¼	16	16½	18½	20	21¼	24½	30	34	38	42	50
Angle, scr.	143	C	3½	3¾	4½	5	6	6¾	6¾	8	8½	9¾	10	10¾	12¾	15¼	17	19	21	25
Angle, flg.	144	D	3¾	4½	4¾	5¾	5¾	6¾	6¾	8	8½	9½	10	10¾	12¾	15	17	19	21	25
Globe, scr. or flg.	141-142	G	9¼	11	12½	13½	14¾	15¼	17	18½	21	22	22½	24½	29	32½	39½	40	42½	47½
Angle, scr. or flg.	143-144	G	10¼	11¾	13¾	14½	15	15¾	17½	19	21¾	23¾	24	25	31	33	40½	41	45½	51½
Horiz. check, scr.	151	A	6½	7¾	9¾	10	12	12¾	13¼	16	16½	18¾	20	21½	25¾	30½	34	38	42	50
Horiz. check, flg.	153	B	7½	8	9½	10	11¾	12½	13¼	16	16½	18½	20	21¼	24½	30	34	38	42	50
Angle check, scr.	152	C	3½	3¾	4½	5	6	6¾	6¾	8	8½	9¾	10	10¾	12¾	15¼	17	19	21	25
Angle check, flg.	153A	D	3¾	4½	4¾	5¾	5¾	6¾	6¾	8	8½	9½	10	10¾	12¾	15	17	19	21	25
Horiz. and angle.	151-153A	GC	4	4½	5¾	5¾	6¾	7	7½	9	9	9¼	10	10¾	12¾	14½	17¾	19	19¼	23¾
Swing check, scr.	294	A	6½	7¾	9¾	10	12	12¾	13¼	16	16½	18¾	20	21½	25¾	30½	34	38	42	50
Swing check, flg.	295	B	7½	8	9½	10	11¾	12½	13¼	16	16½	18½	20	21¼	24½	30	34	38	42	50
Swing check, scr. and flg.	294-295	GC	3½	4½	4¾	5¾	5¾	6¾	6¾	8	8½	9½	10	10¾	12¾	15	17	19	21	25
Y or blow-off, scr.	296	A	8	9½	11½	13	13	15	16¾	18¾	21¾	23¾	24	25	31	33	40½	41	45½	51½
Y or blow-off, flg.	297	B	9	11	12½	15	14¾	16½	18¾	21¾	23¾	25¾	26	27	33	35	42½	43	47½	53½
Y or blow-off, scr. or flg.	296-297	G	12	14	16	16½	18	21½	24½	27	29	31	32	33	39	41	47½	48	53½	61½

*A—Face to face, screwed.
B—Face to face, flanged.

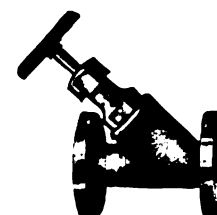
C—Angle, center to face, screwed.
D—Angle, center to face, flanged.

G—Center to top of hand wheel, open. HC—Vertical, face to face, screwed.
GC—Center to top of cap. I—Vertical, face to face, flanged.

Fig. 142
GlobeFig. 143
AngleFig. 146
CrossFig. 294
Check

IRON BODY VALVES, STANDARD PATTERN

be installed in horizontal or vertical position. Sizes ½ to 3 in.

Fig. 128
GlobeFig. 129
GlobeFig. 130
AngleFig. 135
Y or Blow-off**Jenkins All-iron Valves.**

These are recommended for service in places where, on account of possible corrosion, no brass mountings of any kind can be employed, as in the handling of solutions of cyanide, saltpetre, caustic potash, and the like.

All-iron globe and angle valves, with screwed bonnets, sizes ½ to 2 in.; with yoke, sizes to 2½ in. and up; horizontal and angle check valves, ½ in. and up.

All-iron gate valves with solid iron double face wedge, with screwed bonnets, sizes ¼, ¾ and ½ in.; with bolted bonnets, ¾ in. and up.

Fig. 97
GateFig. 79
Globe

ALL-IRON VALVES

Brass Valves, Extra Heavy Pattern.

The extra heavy pattern brass globe, angle, cross and Y valves are suitable for working steam pressures up to and including 300 lbs., or for water and air pressures up to 500 lbs. Sizes ¼ to 3 in.

Regularly fitted with renewable steam metal discs for use in steam. When ordered for cold water, or air service, they are fitted with renewable Jenkins discs of

BRASS GLOBE, ANGLE, Y AND CHECK VALVES, EXTRA HEAVY PATTERN

Size, in.	Fig.	*	¼	¾	½	¾	1	1¼	1½	2	2½	3
Globe, scr.	128	A	2¼	2½	2¾	3¼	4¼	4¾	5¾	6¼	7¼	8¼
Globe, flg.	129	B	3	3¼	3¾	4¼	4¾	5¾	6¼	7¼	8¼	9¼
Angle, scr.	130	C	1¼	1½	1¾	2¼	2¾	3¼	3¾	4¼	4¾	5¼
Angle, flg.	131	D	1¼	1½	1¾	2¼	2¾	3¼	3¾	4¼	4¾	5¼
Globe, scr. or flg.	128-129	G	4	4¼	4¾	5¼	5¾	6¼	6¾	7¼	7¾	8¼
Angle, scr. or flg.	130-131	G	3¾	4¼	4¾	5¼	5¾	6¼	6¾	7¼	7¾	8¼
Horiz. check, scr.	263	A	2¼	2½	2¾	3¼	4¼	4¾	5¾	6¼	7¼	8¼
Horiz. check, flg.	133	B	3	3¼	3¾	4¼	4¾	5¾	6¼	7¼	8¼	9¼
Angle check, scr.	132	C	1¼	1½	1¾	2¼	2¾	3¼	3¾	4¼	4¾	5¼
Angle check, flg.	133A	D	1¼	1½	1¾	2¼	2¾	3¼	3¾	4¼	4¾	5¼
Horiz. and angle.	263-133A	GC	2¼	2½	2¾	3¼	4¼	4¾	5¾	6¼	7¼	8¼
Swing check, scr.	260	A	2¼	2½	2¾	3¼	4¼	4¾	5¾	6¼	7¼	8¼
Swing check, flg.	262	B	3	3¼	3¾	4¼	4¾	5¾	6¼	7¼	8¼	9¼
Swing check, scr. or flg.	260-262	GC	2¼	2½	2¾	3¼	4¼	4¾	5¾	6¼	7¼	8¼
Y, scr.	134	A	3¼	4¼	4¾	5¼	5¾	6¼	6¾	7¼	7¾	8¼
Y, flg.	135	B	4¼	5¼	5¾	6¼	6¾	7¼	7¾	8¼	8¾	9¼
Y, scr. or flg.	134-135	G	5¼	6¼	6¾	7¼	7¾	8¼	8¾	9¼	9¾	10¼

*A—Face to face, screwed.

B—Face to face, flanged.

C—center to face, Angle, screwed.

D—Angle, center to face, flanged.

G—Center to top of hand wheel, open.

GC—Center to top of cap.

Iron Body Valves, Extra Heavy Pattern.

The extra heavy pattern iron body globe, angle, cross and Y valves are suitable for 250 lbs. working steam pressure, or 400 lbs. working water pressure. The bodies, yokes and disc holders are high grade cast iron; the spindles are of manganese bronze; the renewable seat rings and discs of durable steam metal composition.

All flanged valves have $\frac{1}{16}$ -in. raised faces inside of bolt holes, and flange dimensions are in accordance with the American extra heavy standard. When drilling is ordered, it will also be in accordance with the American extra heavy standard, unless otherwise ordered.



FIG. 162a
Globe, Screwed

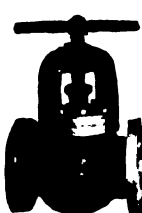


FIG. 162
Globe, Flanged



FIG. 164c
Angle, Flanged

IRON BODY GLOBE AND ANGLE VALVES, EXTRA HEAVY PATTERN

DIMENSIONS OF IRON BODY GLOBE, ANGLE, CHECK AND Y VALVES, EXTRA HEAVY PATTERN

Size, in.	Fig.	*	2	2½	3	3½	4	4½
Globe, scr.....	162A	A	7½	9	10½	11½	12½	14
Globe, fig.....	162	B	9	10	11½	12½	13½	14½
Angle, scr.....	163A	C	3½	4½	5½	6½	7½	8½
Angle, fig.....	163	D	4½	5	5½	6½	7	7½
Globe, scr. or fig.....	162A-162	G	12½	14½	15½	16½	17½	18½
Angle, scr. or fig.....	163A-163	G	14	15	16	17½	18½	19½
Horiz. check, scr.....	265	A	7½	9	10½	11½	12½	14
Horiz. check, fig.....	266	B	9	10	11½	12½	13½	14½
Angle check, scr.....	267	C	3½	4½	5½	6½	7½	8½
Angle check, fig.....	268	D	4½	5	5½	6½	7	7½
Horiz. and angle.....	265-268	GC	4½	4½	5½	5½	6	6½
Swing check, scr.....	338	A	7½	9	10½	11½	12½	14
Swing check, fig.....	339	B	9	10	11½	12½	13½	14½
Swing check, scr. or fig.....	338-339	GC	4½	4½	5½	5½	6	6
Y or blow-off, scr.....	336	A	9	10½	12	13	14	15
Y or blow-off, fig.....	337	B	10½	12½	14	15	16	17
Y or blow-off, scr. or fig.....	336-337	G	14½	16½	18½	19½	20½	21½

Size, in. (continued)	Fig.	*	5	6	7	8	9	10	12
Globe, scr.....	162A	A	15	17	18	19½	21	23	26
Globe, fig.....	162	B	15½	17	18½	20	21½	23	26
Angle, scr.....	163A	C	7½	8½	9	9½	10½	11½	13
Angle, fig.....	163	D	7½	8½	9½	10	10½	11½	13
Globe, scr. or fig.....	162A-162	G	19½	22½	23½	25	26½	28½	32
Angle, scr. or fig.....	163A-163	G	20½	23½	24½	25½	27	29½	32½
Horiz. check, scr.....	265	A	15	17	18	19½	21	23	26
Horiz. check, fig.....	266	B	15½	17	18½	20	21½	23	26
Angle check, scr.....	267	C	7½	8½	9	9½	10½	11½	13
Angle check, fig.....	268	D	7½	8½	9½	10	10½	11½	13
Horiz. and angle.....	265-268	GC	6½	7½	8½	9½	10½	11½	12½
Swing check, scr.....	338	A	15	17	18	19½	21	23	26
Swing check, fig.....	339	B	15½	17	18½	20	21½	23	26
Swing check, scr. or fig.....	338-339	GC	6½	7½	8½	9½	10½	11½	12½

*A—Face to face, screwed.
B—Face to face, flanged.
C—Angle, center to face, screwed.

D—Angle, center to face, flanged.
G—Center to top of hand wheel, open.
GC—Center to top of cap.

Cast Steel Valves.

To meet the requirements of high pressure superheated steam and hydraulic service, JENKINS BROS. manufacture a line of cast steel valves. The globe, angle and cross valves have bodies and bonnets of cast steel; and the spindles, seat rings, discs and disc rings are of monel metal. All connecting flanges are made with $\frac{1}{16}$ -in. raised faces inside of bolt holes. When ordered with flanges faced and drilled, the bolt holes will always be spot faced unless otherwise specified. Globe, angle, cross and swing check valves in sizes 2 to 12 in., inclusive, suitable for working steam pressure up to 350 lbs., and total temperature of 800° Fahr.

Automatic Equalizing Stop and Check Valves.

These valves are designed to shut off, automatically, the flow of steam from the header to a boiler in case a tube should burst or other internal rupture occur, thereby suddenly reducing the pressure in the boiler. They also serve to equalize the pressure in a battery of boilers and prevent one boiler from working at a lower pressure than the others. As the valves can only be opened by the pressure in the boiler, it is impossible to turn steam accidentally into a boiler which is being cleaned. To prevent chattering, the valve is cushioned by an internal dashpot, made of bronze, which eliminates all danger of sticking through corrosion. The stuffing boxes can be packed when valve is wide open and under full pressure. Each iron body valve is carefully tested to 800 lbs. hydraulic pressure, and is guaranteed for working steam pressures up to 250 lbs. When made with cast steel bodies and bonnets, and monel metal trimmings, they are suitable for 350 lbs. working steam pressure. Sizes 4 to 8 in.



FIG. 293
AUTO-MATIC
EQUALIZING
STOP
AND
CHECK
VALVE

Jenkins Gate Valves.

All Jenkins gate valves are of the solid wedge, double face type. The bodies are globe shaped, a design which secures great strength, good proportion and neat appearance. All patterns are made with inside screw, stationary spindle, or outside screw and yoke, rising spindle. The latter are particularly recommended for the higher pressures, as the spindle is more easily lubricated, increasing its durability. The traveling spindle also serves as an indicator, by means of which it can be seen at a glance whether the valve is open or closed. All the valves can be repacked under pressure when wide open, and all parts are renewable and interchangeable. The iron body and cast steel valves in the larger sizes are made with or without by-pass.

Valves can also be furnished with hub ends and square head stem, with spur, bevel or special styles of gearing, with floor stands or indicator posts, and various other operating mechanisms.

Standard Pattern—Brass, sizes $\frac{1}{4}$ to 3 in. Iron body, sizes 2 to 30 in. For working pressures 125 lbs. steam, 175 lbs. water. All-iron, sizes, $\frac{1}{4}$ to 30 in.

Medium Pressure Pattern—Brass, sizes $\frac{1}{4}$ to 3 in. Iron body, sizes 2 to 18 in. For working pressures 175 lbs. steam, 250 lbs. water.

Extra Heavy Pattern—Brass, sizes $\frac{1}{2}$ to 3 in. Iron body, sizes $1\frac{1}{2}$ to 24 in. For working pressures 250 lbs. steam, 400 lbs. water.

Extra Heavy Pattern—Cast steel, sizes $1\frac{1}{2}$ to 24 in. For working pressures 350 lbs. steam, and total temperature of 800° Fahr.



FIG. 370
Standard Pattern



FIG. 372



FIG. 280

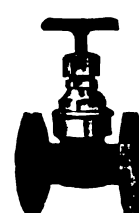


FIG. 281
Extra Heavy Pattern



FIG. 282

BRASS GATE VALVES

DIMENSIONS OF BRASS GATE VALVES

Size, in.	Fig.	*	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3
I. S., scr.	370	A	1 1/4	1 1/4	1 1/4	2 1/4	2 1/4	3 1/4	3 1/4	4 1/4	5 1/4	5 1/4
I. S., fig.	371	B	2 1/4	2 1/4	2 1/4	3 1/4	3 1/4	4 1/4	4 1/4	5 1/4	6 1/4	7 1/4
I. S., scr. or fig.	370, 371	G	3 1/4	3 1/4	3 1/4	4 1/4	4 1/4	5 1/4	5 1/4	6 1/4	7 1/4	8 1/4
O. S. and Y.	368	H	5 1/4	5 1/4	5 1/4	6 1/4	6 1/4	7 1/4	7 1/4	8 1/4	9 1/4	10 1/4
O. S. and Y.	368, 369	H	5 1/4	5 1/4	5 1/4	6 1/4	6 1/4	7 1/4	7 1/4	8 1/4	9 1/4	10 1/4
I. S., scr.	270	A	2 1/4	2 1/4	2 1/4	3 1/4	3 1/4	4 1/4	4 1/4	5 1/4	6 1/4	7 1/4
I. S., fig.	271	B	3 1/4	3 1/4	3 1/4	4 1/4	4 1/4	5 1/4	5 1/4	6 1/4	7 1/4	8 1/4
I. S., scr. or fig.	270, 271	G	3 1/4	3 1/4	3 1/4	4 1/4	4 1/4	5 1/4	5 1/4	6 1/4	7 1/4	8 1/4
O. S. and Y.	275, 276	H	5 1/4	5 1/4	5 1/4	6 1/4	6 1/4	7 1/4	7 1/4	8 1/4	9 1/4	10 1/4
O. S. and Y.	275, 276	H	5 1/4	5 1/4	5 1/4	6 1/4	6 1/4	7 1/4	7 1/4	8 1/4	9 1/4	10 1/4
I. S., scr.	280	A	2 1/4	2 1/4	2 1/4	3 1/4	3 1/4	4 1/4	4 1/4	5 1/4	6 1/4	7 1/4
I. S., fig.	281	B	3 1/4	3 1/4	3 1/4	4 1/4	4 1/4	5 1/4	5 1/4	6 1/4	7 1/4	8 1/4
I. S., scr. or fig.	280, 281	G	3 1/4	3 1/4	3 1/4	4 1/4	4 1/4	5 1/4	5 1/4	6 1/4	7 1/4	8 1/4
O. S. and Y.	282, 283	H	5 1/4	5 1/4	5 1/4	6 1/4	6 1/4	7 1/4	7 1/4	8 1/4	9 1/4	10 1/4
O. S. and Y.	282, 283	H	5 1/4	5 1/4	5 1/4	6 1/4	6 1/4	7 1/4	7 1/4	8 1/4	9 1/4	10 1/4

*A—Face to face, screwed.
B—Face to face, flanged.

G—Center to top of hand wheel, open.
H—Center to top of spindle, rising spindle, open.

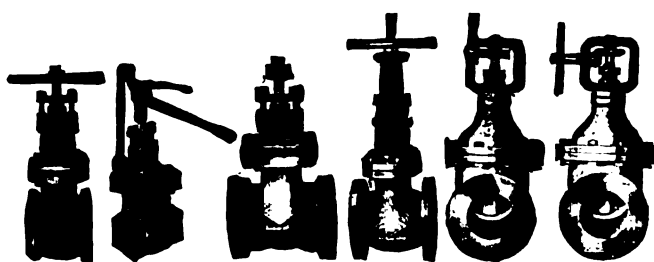


FIG. 325 Inside Screw
FIG. 334 Quick Opening, Sliding Stem and Lever
FIG. 327 Hub Ends
FIG. 331 With Yoke
FIG. 346 With Spur Gear
FIG. 348 With Bevel Gear

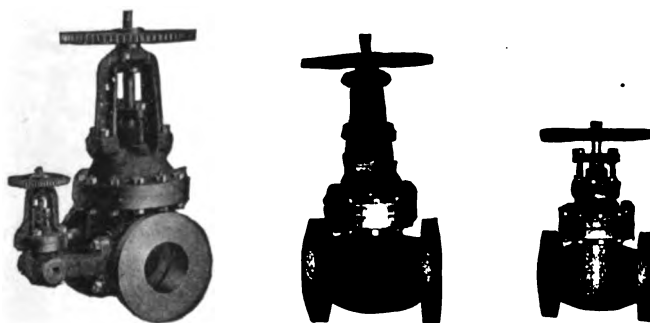
IRON BODY, COMPOSITION MOUNTED GATE VALVES
STANDARD PATTERN

FIG. 204b O. S. and Y. Rising Spindle with By-pass
FIG. 204 O. S. and Y. Rising Spindle Without By-pass
FIG. 203 Inside Screw, Stationary Spindle

EXTRA HEAVY IRON BODY, COMPOSITION MOUNTED
GATE VALVESDIMENSIONS OF IRON BODY, COMPOSITION MOUNTED GATE
VALVES, STANDARD PATTERN

Size, in.	Fig.	*	2	2 1/2	3	3 1/2	4	4 1/2	5	6
I. S. or O. S. and Y., scr.	325, 330	A	5 1/4	5 1/4	6 1/4	6 1/4	7 1/4	7 1/4	7 1/4	7 1/4
I. S. or O. S. and Y., fig.	326, 331	B	7 1/4	7 1/4	8 1/4	8 1/4	9 1/4	9 1/4	10 1/4	10 1/4
I. S., scr. or fig.	325, 326	G	10 1/4	11 1/4	13 1/4	14 1/4	15 1/4	16 1/4	18 1/4	20 1/4
O. S. and Y., scr. or fig.	330, 331	G	11 1/4	13 1/4	15 1/4	16 1/4	18 1/4	20 1/4	22 1/4	25 1/4
O. S. and Y.	330, 331	H	14 1/4	15 1/4	18 1/4	20 1/4	23 1/4	24 1/4	27 1/4	31 1/4

Size, in. (continued)	Fig.	*	7	8	9	10	12	14	15	16
I. S. or O. S. and Y., scr.	325, 330	A	8 1/4	8 1/4	9 1/4	9 1/4	11 1/4	11 1/4	11 1/4	11 1/4
I. S. or O. S. and Y., fig.	326, 331	B	11 1/4	11 1/4	12 1/4	13 1/4	14 1/4	15 1/4	16 1/4	17 1/4
I. S., scr. or fig.	325, 326	G	22 1/4	25 1/4	26 1/4	29 1/4	33 1/4	37 1/4	39 1/4	40 1/4
O. S. and Y., scr. or fig.	330, 331	G	28 1/4	31 1/4	34 1/4	36 1/4	43 1/4	51 1/4	53 1/4	58 1/4
O. S. and Y.	330, 331	H	36 1/4	39 1/4	42 1/4	48 1/4	57 1/4	66 1/4	69 1/4	74 1/4

Size, in. (continued)	Fig.	*	18	20	22	24	26	28	30
I. S. or O. S. and Y., scr.	325, 330	A	17 1/4	18 1/4	19 1/4	20 1/4	23 1/4	26 1/4	30 1/4
I. S. or O. S. and Y., fig.	326, 331	B	46 1/4	49 1/4	53 1/4	60 1/4	63 1/4	68 1/4	73 1/4
I. S., scr. or fig.	325, 326	G	63 1/4	69 1/4	75 1/4	83 1/4	90 1/4	96 1/4	100 1/4
O. S. and Y., scr. or fig.	330, 331	G	86 1/4	91 1/4	100 1/4	109 1/4	117 1/4	125 1/4	133 1/4
O. S. and Y.	330, 331	H	86 1/4	91 1/4	100 1/4	109 1/4	117 1/4	125 1/4	133 1/4

SWEET'S CATALOGUE

DIMENSIONS OF IRON BODY, COMPOSITION MOUNTED
GATE VALVES
(MEDIUM PRESSURE)

Size, in.	Fig.	*	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7
I. S. or O. S. and Y., scr.	251, 277	A	5 1/4	6 1/4	7 1/4	7 1/4	8 1/4	8 1/4	8 1/4	9 1/4	9 1/4
I. S. or O. S. and Y., fig.	255, 253	B	7 1/4	8 1/4	9 1/4	10 1/4	10 1/4	11 1/4	11 1/4	12 1/4	12 1/4
I. S., scr. or fig.	251, 255	G	11 1/4	12 1/4	14 1/4	14 1/4	16 1/4	17 1/4	19 1/4	21 1/4	22 1/4
O. S. and Y., scr. or fig.	277, 253	G	11 1/4	12 1/4	14 1/4	16 1/4	18 1/4	20 1/4	22 1/4	25 1/4	28 1/4
O. S. and Y.	277, 253	H	14 1/4	15 1/4	18 1/4	20 1/4	23 1/4	25 1/4	28 1/4	31 1/4	35 1/4

Size, in. (cont'd)	Fig.	*	8	9	10	12	14	15	16	18	20
I. S. or O. S. and Y., scr.	251, 277	A	10 1/4	10 1/4	11 1/4	12 1/4	12 1/4	12 1/4	12 1/4	12 1/4	12 1/4
I. S. or O. S. and Y., fig.	255, 253	B	13 1/4	14 1/4	15 1/4	16 1/4	18 1/4	18 1/4	19 1/4	21 1/4	22 1/4
I. S., scr. or fig.	251, 255	G	25 1/4	27 1/4	30 1/4	33 1/4	38 1/4	41 1/4	44 1/4	47 1/4	51 1/4
O. S. and Y., scr. or fig.	277, 253	G	31 1/4	34 1/4	38 1/4	43 1/4	49 1/4	52 1/4	57 1/4	63 1/4	69 1/4
O. S. and Y.	277, 253	H	40 1/4	44 1/4	49 1/4	56 1/4	64 1/4	68 1/4	74 1/4	82 1/4	90 1/4

(EXTRA HEAVY)

Size, in.	Fig.	*	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2
I. S. or O. S. and Y., scr.	203A, 204A	A	6 1/4	7 1/4	8 1/4	9 1/4	10 1/4	11 1/4	12 1/4
I. S. or O. S. and Y., fig.	203, 204, 386	B	7 1/4	8 1/4	9 1/4	10 1/4	11 1/4	12 1/4	13 1/4
I. S., scr. or fig.	203A, 203, 386	G	9 1/4	10 1/4	12 1/4	14 1/4	15 1/4	17 1/4	18 1/4
O. S. and Y., scr. or fig.	204A, 204, 388	G	10 1/4	11 1/4	14 1/4	16 1/4	18 1/4	19 1/4	22 1/4
O. S. and Y.	204A, 204, 388	H	12 1/4	13 1/4	17 1/4	20 1/4	22 1/4	24 1/4	27 1/4

Size, in. (continued)	Fig.	*	5	6	7	8	9	10	12
I. S. or O. S. and Y., scr.	203A, 204A	A	13 1/4	15 1/4	16 1/4	16 1/4	17 1/4	18 1/4	19 1/4
I. S. or O. S. and Y., fig.	203, 204, 386	B	15 1/4	16 1/4	16 1/4	16 1/4	17 1/4	18 1/4	19 1/4
I. S., scr. or fig.	203A, 203, 386	G	20 1/4	22 1/4	24 1/4	28 1/4	30 1/4	33 1/4	37 1/4
O. S. and Y., scr. or fig.	204A, 204, 388	G	24 1/4	27 1/4	30 1/4	34 1/4	37 1/4	41 1/4	47 1/4
O. S. and Y.	204A, 204, 388	H	30 1/4	34 1/4	38 1/4	42 1/4	47 1/4	52 1/4	60 1/4

Size, in. (continued)	Fig.	*	14	15	16	18	20	24
I. S. or O. S. and Y., scr.	203A, 204A	A	22 1/4	22 1/4	24 1/4	26 1/4	28 1/4	31 1/4
I. S. or O. S. and Y., fig.	203, 204, 386	B	22 1/4	22 1/4	24 1/4	26 1/4	28 1/4	31 1/4
I. S., scr. or fig.	203A, 203, 386	G	43 1/4	46 1/4	46 1/4	50 1/4	54 1/4	62 1/4
O. S. and Y., scr. or fig.	204A, 204, 388	G	53 1/4	57 1/4	57 1/4	64 1/4	70 1/4	82 1/4
O. S. and Y.	204A, 204, 388	H	68 1/4	75 1/4	75 1/4	84 1/4	91 1/4	108 1/4

*A—Face to face, screwed.
B—Face to face, flanged.

G—Center to top of hand wheel, open.
H—Center to top of spindle, rising spindle, open.

Mechanical Rubber Goods.

This company offers engineering requisites which are the result of over 56 years of progressive effort. They are the original manufacturers of rubber composition discs for valves and unvulcanized sheet packing.

Jenkins '96 is a high grade unvulcanized rubber sheeting, suitable for saturated steam joints under high or low pressure, hot water and other fluids.

Jenarco is a vulcanized red rubber sheeting, very tough and pliable, equally suitable for steam, hot or cold water and other joints.

Oiltite sheet packing is specially compounded for joints in lines carrying gasoline, kerosene, crude oil, etc.

SHEET PACKINGS

Approximate weights per sq. yd. 36 in. wide

Thickness	1/8	1/4	3/8	1/2	3/4	1
Jenkins '96 regular, lbs.	2 1/4	5 1/4	8 1/4	11 1/4	16 1/4	22 1/4
Jenkins '96 brass wire insertion, lbs.	8 1/4	10 1/4	13 1/4	19 1/4	25 1/4	31 1/4
Jenarco, regular, lbs.	2 1/4	5 1/4	8 1/4	11 1/4	16 1/4	22 1/4
Jenarco, brass wire insertion, lbs.	8 1/4	10 1/4	13 1/4	19 1/4	25 1/4	31 1/4
Oiltite, regular, lbs.	2 1/4	5 1/4	7 1/4	10 1/4	15 1/4	21 1/4

Cut gaskets in any size or shape promptly supplied. If shape is irregular, send drawing or template.

Pump Valves—A few of the Jenkins service tested compounds:

- No. 80—for hot water temperature above 180°.
- No. 88—for warm water up to 175 lbs. pressure.
- No. 93—for cold water pressures up to 175 lbs.
- No. 94—for cold water, low pressures.

Any size and compound promptly supplied. When ordering always give outside diameter, thickness, and size of hole. When in doubt, mention service conditions.

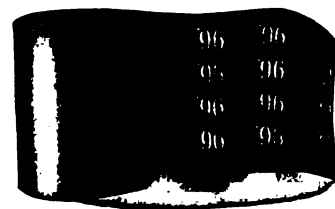


FIG. 224
JENKINS '96 PACKING

THE KELLY & JONES CO.

Brass, Iron and Steel Valves and Fittings

WORKS
GREENSBURG, PA.

OFFICES

NEW YORK, N. Y., 2509-10-11 Park Row Building
PITTSBURGH, PA., 131-37 Water Street and 132-38 First Avenue
CHICAGO, ILL., 416 Ashland Block and 155 North Clark Street

ST. LOUIS, MO., 705 Laclede Gas Building
CINCINNATI, OHIO, 1008-12 Sycamore Street
SAN FRANCISCO, CAL., Fifth and Bluxome Streets
BUFFALO, N. Y., Ellicott Square

Products.

VALVES: Globe, Gate, Y, Safety, Blow-off, Swing Check, etc., of iron, steel, or brass bodies, screwed or flanged joints, for low, medium or high pressures.

PIPE UNIONS; FLANGED PIPE FITTINGS of cast iron, steel or brass; PIPE EXPANSION JOINTS.

Also manufacturers of Ammonia, Hydraulic and Drainage Pipe Fittings; Damper Regulators; Steam Traps; Acid Resistant, Hydraulic and Hose Valves.

Co-operative Service.

We gladly offer the services of our engineers to the engineers using this catalogue, if in any way, by advice or suggestion, we can be of service to them.

Catalogue "R" which describes and illustrates our complete line will be mailed on request.

Cast Steel Valves.

As we operate our own steel foundry and control every operation from the foundry to the finishing department, we are in position to furnish steel valves absolutely uniform and of the highest quality.

The strength, elasticity, elongation, reduction and bending of the steel valves are in accordance with the strictest specifications.

Gate Valves—Steel gate valves can be furnished in all sizes from 1¼ to 24 in., and are recommended for 250 to 350 lbs. superheated steam pressure.

A complete line of brass and iron body gate valves for all pressures and purposes is also made.

Iron Body Valves.

Made in all sizes from 2 to 16 in., screwed or



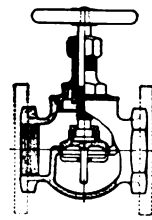
flanged, with or without yoke for 125, 175, or 250 lbs. working pressure.

Made in all styles, globe, angle, cross, check, Y, safety, blow-off, and swing check, and are correctly designed with strength added where the greatest strain is caused. The material used in their construction is of the highest quality and each valve is carefully inspected and tested to pressure before shipment.

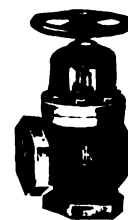
These valves can also be furnished in all-iron, steel or bronze for all pressures and purposes.



Extra Heavy Angle with Yoke



Standard Globe Inside Screw

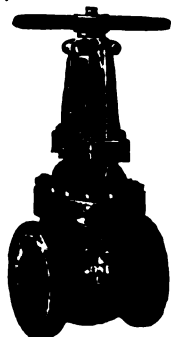


Medium Angle with Yoke

IRON BODY VALVES

Standard Saddle Type Straightway Gate Valves.

Can be furnished either black or red japanned, as desired. This saddle style is a very durable and compact valve, and economical, owing to the simplicity of construction. The steel saddle around body of valve holds bonnet securely in place, and can easily be removed, permitting of access to interior. Opens to left and has rising spindle. The solid disc is very narrow and V-shaped at bottom and can, therefore, be seated more readily when dirt or sediment is collected between the seats in the valve. Suitable for 125 lbs. working pressure.



Outside Screw and Yoke, Wedge Gate



Non-rising Stem

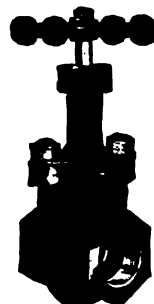


With By-pass

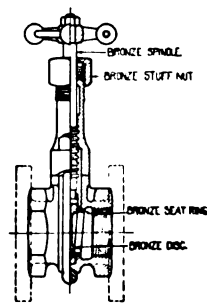
CAST STEEL VALVES, FLANGED

For superheated steam up to 350 lbs. working pressure and a total temperature of 800°

SWEET'S CATALOGUE



Solid Disc



Wedge Gate

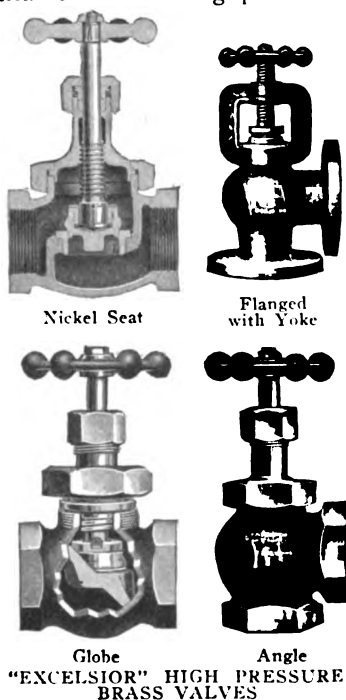
SADDLE TYPE STRAIGHTWAY GATE VALVES

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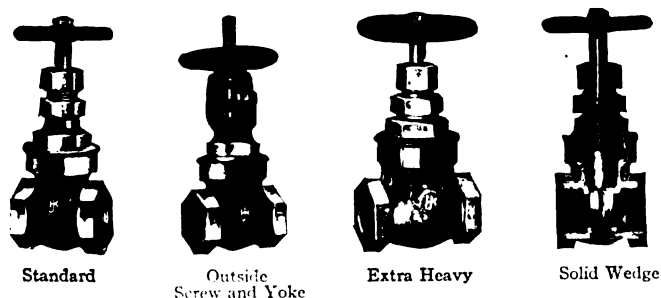
Regrinding "Excelsior" High Pressure Brass Valves.

Regrinding "Excelsior" valves are designed to meet the demand for valves suitable for working pressures from 200 to 300 lbs. of live or superheated steam, and are extensively used in modern steam plant construction. The stuffing boxes can be packed while under pressure and valve reground while in position, without disturbing the pipe connections, by making slight adjustments and rotating the stem backward and forward.

Made of the highest grade metal and furnished in globe, angle, cross or check patterns. The outside screw and yoke pattern is recommended for superheated steam. The nickel seat style is so constructed as to permit of easy removal of the seat for renewal purposes.

**Brass Straightway Valves, Solid Wedge, Gate.**

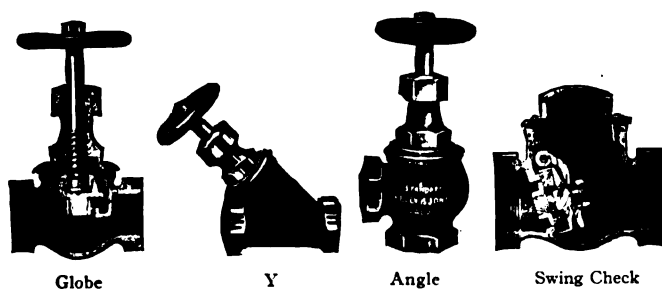
These valves are of the latest improved design, well proportioned and of good weight. They are made special pattern for pressures up to 100 lbs.; standard for 125 lbs.; heavy for 150 lbs.; medium for 175 and 200 lbs.; extra heavy for 250 lbs.; and extra heavy hydraulic for 1000 lbs.

**BRASS STRAIGHTWAY VALVES WITH SOLID WEDGES**

Guides on discs and in bodies of these valves are fitted accurately, insuring a true and easy movement and preventing wear of the faces. Standard keeps disc from touching seats in bodies except at closing point

Jenkins Type, Standard Kelly & Jones Brass Valves.

Made of best grade steam metal, carefully machined, and are very attractive in appearance.

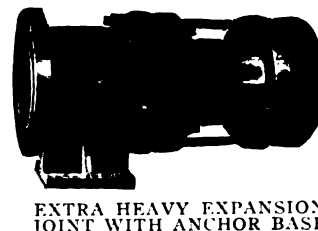
**JENKINS TYPE, STANDARD KELLY & JONES BRASS VALVES**

Standard pattern for 125 lbs. pressure
Special pattern for 100 lbs. pressure

Of standard weight, and for a practical, durable, efficient and economical brass valve, these Jenkins type valves have no equal. Thousands in general use.

Expansion Joints.

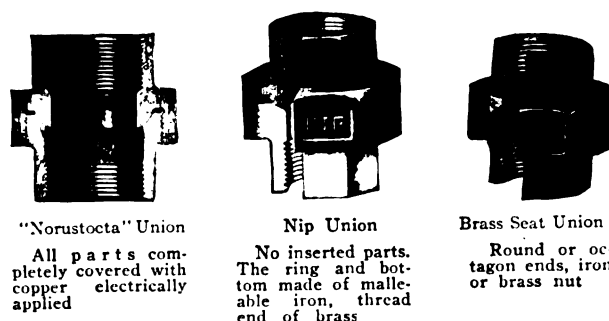
A complete line of expansion joints, all sizes, screwed or flanged for all pressures and purposes. The extra heavy iron body pattern is recommended for 250 lbs. pressure and the extra heavy cast steel pattern for 350 lbs. superheated steam pressure and can be furnished with or without anchor base.

**Malleable Iron Unions.**

Malleable iron unions can be furnished in all sizes from 1/8 to 4 in. for all pressures and purposes.

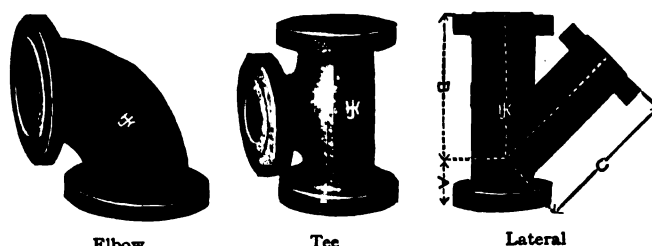
The "Nip" union is one of the simplest unions made, having only 3 parts—nut, swivel and thread end. The brass to iron seat insures a tight joint, and the brass to iron thread connection permits the union to be re-connected any number of times without injury. The straight bore or uniform diameter of the waterway insures a free passage—no pockets to collect sediment and choke up line.

The "Norustocta" union is a heavy, well made union, entirely copper covered, suitable for 250 lbs. working pressure and absolutely rustless.

**MALLEABLE IRON UNIONS****Flanged Pipe Fittings.**

A complete line of flanged fittings is made, all sizes, straight or reducing, in cast iron, steel or brass for all pressures and purposes. Only the best grade of raw material is used in the manufacture of our line of flanged fittings.

The machinework is carefully executed and dimensions are in accordance with the latest American Standard, adopted Jan. 1, 1915.

**EXTRA HEAVY CAST IRON FLANGED FITTINGS**

THE KENNEDY VALVE MFG. CO.

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Products.

GATE, CHECK, GLOBE and ANGLE VALVES, for power, heating, fire protection, water supply, plumbing, etc.

Also manufacturers of Radiator and other Valves, and Fire Hydrants.



Guarantee.

All Kennedy goods are thoroughly tested before leaving the works. Should any defects develop in proper use of goods in the service for which they are manufactured and sold, such goods will be replaced.

Catalogues.

Complete catalogues will be sent on application.

Types of Gate Valves.

Bronze valves 3 in. and smaller, and iron valves 2 in. and smaller are made with solid wedge disks.

In the larger sizes it is necessary to have a feature of flexibility that will take up and automatically follow slight variations. This is provided by the double disk feature, operated by wedging mechanism.

Outside rising stem and yoke gate valves, for all pressures, and inside stationary stem gate valves, for medium and extra heavy pressures, can be repacked while under pressure and open.

The wedging mechanisms used for operating Kennedy double disk gate valves are the "Cam," "Newtype" and "Lenticular" types.

The "Cam" type is simple—with the least possible number of working parts—and is for light and standard pressures, in sizes 2 to 12 in. inclusive, for which it is found to give the best service.

The "Newtype" water gate type meets the requirements of water works.

The "Lenticular" type combines the flexible double disk principle with the wedge feature and center spreading control. This type is best for pressures greater than the ordinary, particularly for steam.

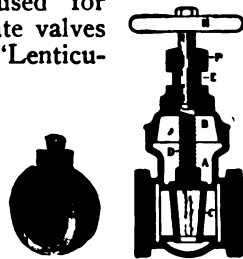


FIG. 1
KENNEDY SOLID WEDGE DISK AND SECTIONAL VIEW OF SOLID WEDGE DISK GATE VALVE

Disk is in one piece, with double taper or wedge shaped faces.

Guided by ribs, cast on inside of body, working on channels in the disk.

A, body; B, cap or bonnet; C, disk; D, stem; E, stuffing box; F, packing nut; H, cast iron hand wheel

"Cam" Type Double Disk Parallel Seat Gate Valves.

These valves have a direct passage, the full size of internal diameter of the pipe, double disks with parallel faces, operated by cams revolving on trunnions fitting into bearings in the disks, a very simple and efficient mechanism.



FIG. 6



FIG. 7

BACKS OF DISKS

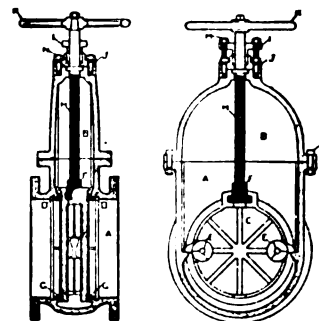
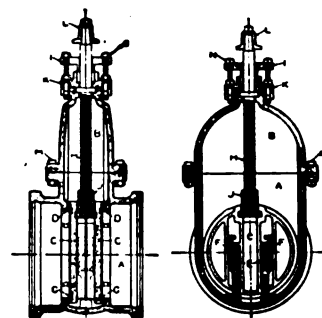


FIG. 8
SECTIONAL VIEWS OF KENNEDY "CAM" TYPE DOUBLE DISK PARALLEL SEAT GATE VALVE

A, body; B, cap or bonnet; C, disk; D, seat ring; E, cams; F, stem nut; G, disk rings

"Newtype" Double Disk Parallel Seat Gate Valves.

Especially efficient for water works purposes. Wedges, of solid bronze, act on both disks equally and independently of stem; stem always, therefore, being unimpaired and in perfect alignment. Wedging surfaces of wedges are of same angle and interchangeable. Disks can not stick, because bronze stem nut is thicker on one side than on the other; therefore, in opening valve, one disk lifts ahead of the other. Valves operate in any position.



SECTIONAL VIEWS OF SMALLER SIZES "NEWTYP" WATER GATE VALVE

Double wedging mechanism, parallel seats and independent stem nut



DISKS WITH WEDGING MECHANISM OF "NEWTYP" WATER GATE VALVE

"Lenticular" Double Disk Taper Seat Gate Valves.

Only five parts, which are moved by action of the screw—the two disks, lenticular bearing pieces, and the stem nut. The disks are provided with recesses or pockets to admit the shoulders or projections cast on stem nut and from which the disks are suspended, and on the back of each disk is a projection having its face

concaved and fitting the convex faces of the center pieces, thus making a true center bearing.



Fig. 12. Back of Disk with Stem Nut and Center Pieces in place



Fig. 13. Side View of Disk with Stem Nut

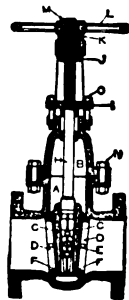


Fig. 12

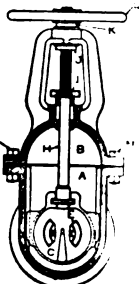


Fig. 13

Sectional Views
A, B, C, I, L, of cast iron;
D, E, F, J, K, of bronze; H,
bronze or steel according to
size; M, steel; N, O, mild steel.

KENNEDY "LENTICULAR" DOUBLE DISK GATE VALVE

"Standard" Bronze Gate Valves.

Solid wedge disks are used in sizes up to 3 in., and double disk parallel seats $3\frac{1}{2}$ in. and larger. Stem is stationary.

Sizes $\frac{1}{4}$ to 3 in. are for working pressures up to 150 lbs. water, or 125 lbs. steam; $3\frac{1}{2}$ in. to 6 in. for working pressures up to 125 lbs. water, or 100 lbs. steam, and made with bolted bonnet.

With or without gland in stuffing box.

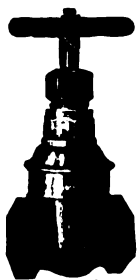


Fig. 27
"STANDARD"
BRONZE
GATE VALVE,
SCREWED

"STANDARD" BRONZE GATE VALVES (SCREWED), FIG. 27

Size, in.....	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4
End to end....	2	2	2	$2\frac{1}{4}$	$2\frac{3}{4}$	$3\frac{1}{8}$	$3\frac{3}{8}$	$3\frac{5}{8}$	$4\frac{1}{8}$	$4\frac{1}{2}$	$5\frac{1}{4}$	6
Center to top of wheel....	$3\frac{3}{8}$	$3\frac{1}{4}$	$3\frac{1}{2}$	$4\frac{1}{8}$	$4\frac{1}{4}$	$5\frac{1}{8}$	$5\frac{3}{8}$	$6\frac{1}{8}$	$7\frac{1}{8}$	9	$10\frac{1}{4}$	$11\frac{1}{2}$

"STANDARD" BRONZE GATE VALVES (FLANGED)

Size, in.....	2	$2\frac{1}{4}$	3	$3\frac{1}{2}$	4	5	6
Face to face, flgd.....	$4\frac{3}{4}$	$5\frac{1}{2}$	6	$6\frac{1}{2}$	7	8	9
Diam. flgs.....	6	7	$7\frac{1}{2}$	$8\frac{1}{2}$	9	10	11

Regrinding Bronze Globe and Angle Valves.

Seats can be reground without disturbing pipe lines. Made with non-heating wheel and strong body.

Fig. 134-135 sizes $\frac{1}{8}$ to 2 in. for 200 lbs. steam, or 225 lbs. water. Fig. 130-131 in sizes $\frac{1}{2}$ to 2 in. for maximum pressures of 125 lbs. steam, or 150 lbs. water.



Fig. 135. REGRINDING BRONZE ANGLE VALVE



Fig. 31. "STANDARD" BRONZE HOSE GATE VALVES

For working water pressures up to 150 lbs. Solid wedge disk and stationary stem. Unless otherwise specified, without cap and chain. Sizes, $\frac{1}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 and $2\frac{1}{2}$ in.



Fig. 36. "STANDARD" QUICK OPERATING LEVER VALVE

Disk can be securely locked in any position by wheel screw. For working pressure of 150 lbs. water and 125 lbs. steam. Sizes, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$ and 3 in.

Medium and Extra Heavy Gate Valves.

Made with iron wheel, solid wedge disk, and stationary stem. Gland follower in stuffing box. Fig. 37, medium pressure for water 250 lbs., steam 200 lbs. Fig. 40, extra heavy for working steam pressures up to 250 lbs.

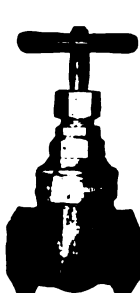


Fig. 37



Fig. 40

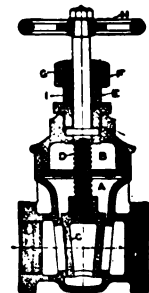


Fig. 40
Sectional View

MEDIUM AND EXTRA HEAVY GATE VALVES

MEDIUM PRESSURE GATE VALVE (FIG. 37)

Size, in.....	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3
End to end.....	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{4}$	$3\frac{1}{8}$	4	$4\frac{5}{8}$	$5\frac{1}{4}$
Center to top of wheel....	$4\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{3}{4}$	$6\frac{5}{8}$	$7\frac{1}{8}$	$8\frac{1}{2}$	$10\frac{3}{8}$	$12\frac{1}{2}$

EXTRA HEAVY BRONZE SCREWED GATE VALVE (FIG. 40)

Size, in.....	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3
End to end.....	$2\frac{3}{8}$	$3\frac{3}{8}$	$3\frac{1}{2}$	$3\frac{3}{8}$	$4\frac{3}{8}$	$5\frac{3}{8}$	$6\frac{3}{8}$	$6\frac{3}{4}$
Center of opening to top of stem.....	5	6	7	$7\frac{7}{8}$	$8\frac{3}{4}$	$10\frac{1}{2}$	$12\frac{3}{8}$	14

"Low Pressure" Gate Valves.

These are iron body, bronze mounted, or all-iron valves with steel stems. Equipped with "Newtype" disks, and are for lighter pressures than the "Standard" line. Those without ribs are tested to 30 lbs. and those for heavier service are more heavily ribbed.

Furnished with flanges of any practicable diameter and drilling.

Stems on inside screw valves are of manganese bronze of at least 50,000 lbs. tensile strength. On outside rising stem and yoke valves they are of steel, unless otherwise specified.

Valves can be furnished to operate with chain instead of hand wheel. Sizes, 14, 16, 18, 20, 24, 30, 36, 42 and 48 in. Other dimensions on application.

"Standard" Iron Body, Bronze Mounted Gate Valves.



Fig. 48
"LOW PRESSURE" GATE VALVE

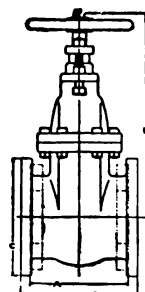
Outside rising stem and yoke. 30 lbs. test pressure. Iron body, bronze mounted, or all-iron



Fig. 57. Screwed



Fig. 58. Flanged



Dimension Diagram

"STANDARD" IRON BODY, BRONZE MOUNTED GATE VALVES
With double disks, parallel seats, inside stationary stem of bronze of 50,000 lbs. tensile strength

WORKING PRESSURES IN POUNDS PER SQUARE INCH, FOR "STANDARD" IRON BODY, BRONZE MOUNTED GATE VALVES

Sizes	Figs. 57 and 58		Fig. 59
	Water	Steam	Water
8 in. and smaller.....	150	125	125
9, 10 and 12 in.....	125	100	125
14 in. and larger.....	100	...	100
Ribbed, 14 in. and larger.....	150	...	150

Figs. 57 and 58, 12 in. and smaller, "Cam" type; 14 in. and larger, "Newtype," as described on preceding page

"STANDARD" IRON BODY, BRONZE MOUNTED GATE VALVES
(FIGS. 57 AND 58)

Size, in.....	1½	2	2½	3	3½	4	4½	5	6
A.....	4 7/8	5	6	6 1/4	6 3/4	7	7 1/2	8	8 1/2
B.....	5 1/2	6	6 1/2	7 1/4	7 1/2	8 1/2	8 3/4	9 1/2	10 1/2
C.....	5	6	7	7 1/2	8 1/2	9	9 1/4	10	11
D.....	7 3/4	10	11 1/2	12 1/4	14 1/2	14 3/4	16 3/4	17 1/2	19 1/2

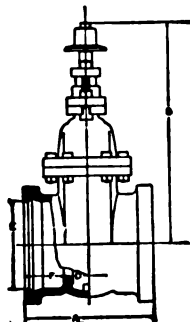
Size, in.....	7	8	9	10	12	14	16	18	20
A.....	10	10 1/4	10 3/4	11 1/2	13 1/4	14 1/2	14 3/4	15 1/2	16
B. F. to F. with by-pass.....	11	11 1/4	11 3/4	12 1/2	13 3/4	14 3/4	14 3/4	15 1/2	16
C.....	12 1/2	13 1/4	15	16	19	21	23 1/2	25	27 1/2
D.....	21	22 1/4	25 1/2	26 1/2	31 1/4	34 1/4	38 1/4	42	47 1/2
Size of by-pass.....	4	4	4	4	6	6	8	8	8

Size, in.....	22	24	Geared		30	36	By-pass		
			24				42	48	
B.....	17½	17½	17½		23½	28	31	40	.....
B. F. to F. with by-pass.....	21½	22½	22½		31	30	33	40	.....
C.....	29½	32	32		38½	46	53	59½	.....
D.....	50½	54	57½		69½	79½	91½	102½	.....
Size of by-pass.....	4	4	4		6	6	8	8	.....

Double disks, parallel seats, inside or outside rising stem and yoke with steel or bronze stem. The rising stem makes a positive indicator as to the extent the valve is open and admits of its being readily inspected, cleaned and oiled. It can be repacked under pressure.



Fig. 59. Bell Ends

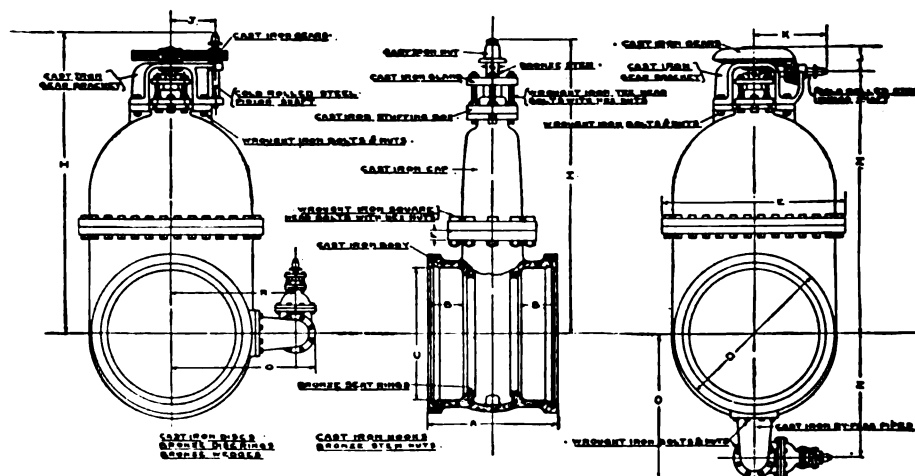


Dimension Diagram

"STANDARD" IRON BODY, BRONZE MOUNTED WATER GATE VALVES

See pressure table at bottom of preceding page, under Fig. 59 water

Working pressures are as follows: 8 in. and smaller, 150 lbs. water, 125 lbs. steam; 9 in. to 14 in. (Fig. 59), 125 lbs. water, 100 lbs. steam; (Figs. 60 and 61) 150 lbs. water, 100 lbs. steam; larger sizes for working pressures up to 100 lbs. water.

Fig. 60. Screwed Fig. 61. Flanged
"STANDARD" IRON BODY
BRONZE MOUNTED GATE VALVES

DIMENSION DIAGRAMS, LARGE SIZE "NEWTYPE" WATER GATE VALVE

"STANDARD" IRON BODY, BRONZE MOUNTED WATER GATE VALVES (FIG. 59)

Size, in.....	2	3	4	5	6	8	10	12	14
A.....	7 1/2	9 1/4	9 1/2	10 1/2	10 1/2	12 1/2	13	13 1/4	14
B.....	11	13 1/4	14 1/2	18 1/4	20 1/4	24 1/4	27 1/4	31 1/4	35 1/4
E.....	3 1/2	4 1/2	5 1/4	6 1/4	7 1/4	10	12	14 1/2	16 1/2

Size, in.....	16	18	20	24	24	30	36	42	48
A.....	15 1/2	16 1/2	16 1/2	20	20	23 1/4	26	28 1/2	32 1/2
A. F. to F. with by-pass.....	19 1/2	21 1/2	22	24	24	27 1/2	29 1/2	31 1/2	32 1/2
Size of by-pass.....	3	3	4	4	4	6	6	8	8
B.....	39 1/2	43	48	55 1/2	57 1/2	69 1/2	79 1/2	91 1/2	102 1/2
E.....	18 1/2	20 1/2	22 1/2	26 1/2	26 1/2	33	39 1/2	45 1/2	51 1/2

"STANDARD" IRON BODY, BRONZE MOUNTED GATE VALVES
(FIGS. 60 AND 61)

Size, in.....	2½	3	3½	4	4½	5
F. to F. scrd.....	6	6 1/4	6 1/2	7	7 1/4	8
F. to F. fld.....	6 1/2	7 1/4	7 1/2	8 1/2	8 3/4	9 1/2
Diam. flgs.....	7	7 1/2	8 1/2	9	9 1/4	10
Center to top of stem shut.....	12 1/2	13 1/2	16 1/2	16 1/2	20 1/2	20 1/2
Center to top of stem open.....	15 1/2	17 1/2	20 1/2	21 1/2	26	25 1/2

Size, in.....	6	7	8	10	12	14
F. to F. scrd.....	8 1/2	10	10 1/2	11 1/2	13 1/2	14
F. to F. fld.....	10 1/2	11	11 1/2	12 1/2	13 1/2	14 1/2
Diam. flgs.....	11	12 1/2	13 1/2	16	19	21
Center to top of stem shut.....	23 1/2	27 1/2	30 1/2	34 1/2	42 1/2	48
Center to top of stem open.....	30 1/2	34 1/2	39 1/2	45	55	62 1/2

Size, in.....	16	18	20	22	24
F. to F. fld.....	14 1/2	15 1/2	16	17 1/2	17 1/2
With by-pass fld.....	18	19 1/2	20 1/2	21 1/2	22 1/2
Size of by-pass.....	3	3	4	4	4
Diam. flgs.....	23 1/2	25	27 1/2	29 1/2	32
Center to top of stem open.....	70 1/2	79	86	93	102 1/2
Center to top of stem shut.....	53	60	65	70 1/2	77

"Newtype" Water Gate Valve—Fig. 59-A.

Working pressures, 4 to 8 in., inclusive, 200 lbs.; 10 to 48 in., inclusive, 150 lbs.

"NEWTYPE" WATER GATE VALVE

Size, in.	4	6	8	10	12	14	16	18	20	24	30	36	42	48
E. to E. with by-pass.....	10 1/2	13 1/2	13 1/2	15	15 1/2	16	18 1/2	18 1/2	19 1/2	21	23 1/2	26	28 1/2	32 1/2
A.....	10 1/2	13 1/2	13 1/2	15	15 1/2	16	18 1/2	18 1/2	19 1/2	21	23 1/2	26	28 1/2	32 1/2
C.....	8 1/2	10 1/2	11 1/2	12 1/2	14 1/2	16 1/2	18 1/2	20 1/2	22 1/2	26 1/2	30 1/2	33 1/2	39 1/2	45 1/2
D.....	8 1/2	10 1/2	11 1/2	12 1/2	14 1/2	16 1/2	18 1/2	20 1/2	22 1/2	26 1/2	30 1/2	33 1/2	39 1/2	45 1/2
E.....	8 1/2	11 1/2	14 1/2	17	19 1/2	22	25	27 1/2	30	36 1/2	43 1/2	51 1/2	59 1/2	67 1/2
H.....	16 1/2	20 1/2	24 1/2	28 1/2	32 1/2	36 1/2	40 1/2	44 1/2	47 1/2	57 1/2	67 1/2	79 1/2	93 1/2	105 1/2
I.....	16 1/2	20 1/2	24 1/2	28 1/2	32 1/2	36 1/2	40 1/2	44 1/2	47 1/2	57 1/2	67 1/2	79 1/2	93 1/2	105 1/2
N.....	16 1/2	20 1/2	24 1/2	28 1/2	32 1/2	36 1/2	40 1/2	44 1/2	47 1/2	57 1/2	67 1/2	79 1/2	93 1/2	105 1/2
O.....	16 1/2	20 1/2	24 1/2	28 1/2	32 1/2	36 1/2	40 1/2	44 1/2	47 1/2	57 1/2	67 1/2	79 1/2	93 1/2	105 1/2
Size of by-pass.....	3	3	3	4	4	4	4	4	4	6	6	8	8	8

All valves to open by turning stem to the left and with 2-in. square nut on stem unless otherwise ordered.

Medium Heavy Iron Body, Bronze Mounted "Lenticular" Gate Valves.

Description on second preceding page. These valves are suitable for working steam pressures up to 175 lbs. The outside rising stem makes a positive indicator as to position of valve (Fig. 75).

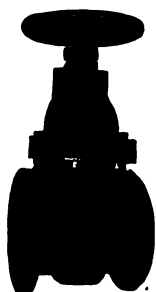


FIG. 74

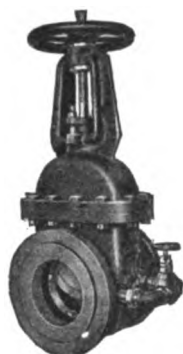
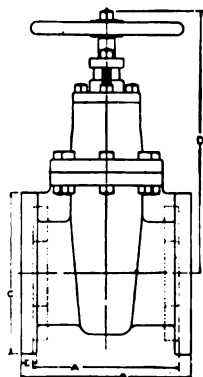


FIG. 75



Dimension Diagram

MEDIUM HEAVY FLANGED "LENTICULAR" GATE VALVES

Stems of all sizes of Fig. 74, and 5 in. and smaller, of Fig. 75, made of bronze of at least 50,000 lbs. tensile strength; and of steel, 6 in. and larger, of Fig. 75, although they can be furnished of bronze at a reasonable extra price.

Attention is called to the self-packing feature, both in the inside screw and outside screw and yoke type

MEDIUM HEAVY IRON BODY, BRONZE MOUNTED "LENTICULAR" GATE VALVES

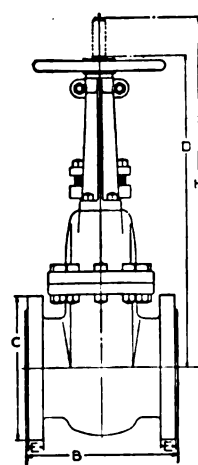
Size, in.....	2½	3	3½	4	4½	5	6	7	8	10	12
A, scrd.....	6¾	7½	8¾	9¾	9¾	10¾	11¾	12	12½	13¾	14¾
B.....	9¾	9¾	10¾	10¾	11¾	12¾	13¾	13¾	13¾	14¾	15¾
B, figd., with by-pass.....						12¾	13¾	13¾	13¾	14¾	15¾
Size of by-pass.....						1	1	1	1	1	1
C.....	7½	8¾	9	10	10¾	11¾	12¾	14	15	17½	20½
D.....	11¾	12¾	13¾	14½	16¾	18¾	21¾	23¾	25¾	30½	35
Open H.....											
O. R. S. & Y.....	15¾	17¾	20¾	22¾	25¾	29¾	34¾	38	42	51¾	59
Shut D.....											
O. R. S. & Y.....	12¾	14	15¾	17¾	19¾	22¾	26¾	29¾	32	39	44¾

Extra Heavy Iron Body, Bronze Mounted "Lenticular" Gate Valves.

FIG. 76. Inside Stem Lenticular Gate Valve. Can be repacked under pressure



FIG. 77. Outside Rising Stem and Yoke with By-pass



Dimension Diagram

EXTRA HEAVY IRON BODY, BRONZE MOUNTED "LENTICULAR" GATE VALVES**DATA, "LENTICULAR" GATE VALVES**

Stems of Fig. 76 and 77 are bronze, of at least 50,000 lbs. tensile strength. Sizes, 6-in. and larger, of steel, for working steam pressures up to 250 lbs.

Size, in.....	2½	3	3½	4	5	6	7	8	10	12	14	16	18	20
A, scrd.....	9	10	10½	10¾	13¾	13¾	14¾	15¾	18	19½	21½	23½	25	25
B.....	10	11½	11½	12¾	15	15½	16½	16½	21	22½	23½	25½	29	32
B with by-pass.....					15	15½	16½	16½	21	22½	23½	25½	29	32
Size of by-pass.....					1	1	1	1	1	1	1	1	1	1
C.....	7½	8¾	9	10	11	12½	14	15	17½	20½	23	25½	28	30½
D, Fig. 76.....	12¾	14	16¾	16¾	19¾	22	24½	26¾	30¾	36½	37¾	41¾	47½	49½
H, open.....	16¾	18¾	22½	23¾	29½	33½	38½	41½	50	62½	67½	75	83	93
D, shut.....	13¾	15¾	18¾	19¾	23¾	26½	30½	32½	39	49	52½	58	64	72

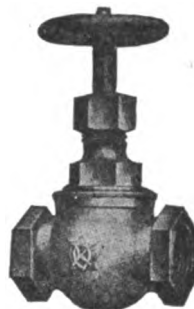
Bronze Globe and Angle Valves.

FIG. 91. Globe



FIG. 92. Angle

BRONZE GLOBE AND ANGLE VALVES

Renewable elastic disks and raised seats, insuring perfectly tight joint. Can be repacked under pressure. For working steam pressures, 150 lbs.; water, 175 lbs. Sizes, ¼, ½, ¾, 1, 1½, 2, 2½ and 3 in.

Heavy Iron Body, Bronze Mounted Globe and Angle Valves.

For working pressures up to 125 lbs. steam, and 150 lbs. water. Renewable elastic disks and raised seats, insuring tight joint. Can be repacked under pressure. Of heavy design, with full size disk and area. Sizes, 2, 2½, 3, 3½, 4, 4½, 5, 6, 7, 8 and 10 in. Complete dimensions on request.

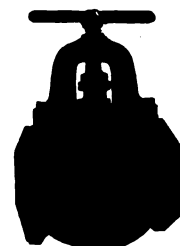
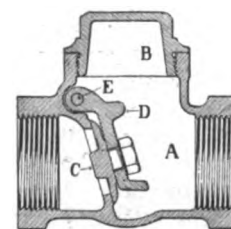


FIG. 100. SCREWED HEAVY IRON BODY, BRONZE MOUNTED GLOBE VALVE

Swing Check Valves.

FIG. 103. BRONZE SWING CHECK VALVE



SECTIONAL VIEW OF SCREWED BRONZE SWING CHECK VALVE

For 125 lbs. steam and 150 lbs. water pressure. Screwed ends. Sizes, ¾, 1, 1½, 2, 2½ and 3 in.

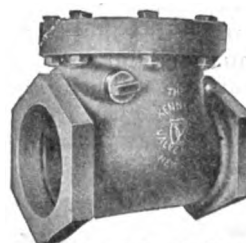


FIG. 105. SCREWED IRON BODY, BRONZE MOUNTED SWING CHECK VALVES

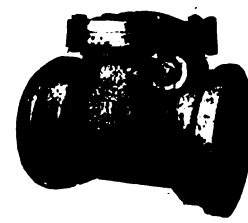


FIG. 107. BELL END, IRON BODY SWING CHECK VALVE WITH LEATHER FACED DISK

For working pressures up to 150 lbs. water, or 100 lbs. steam. These valves are straightway, having a direct passageway of full area of pipe; disks revolve and are self-adjustable. Sizes, 2, 2½, 3, 3½, 4, 5, 6, 7, 8, 10 and 12 in.

Bronze Regrinding Check Valves.

Fig. 137 has horizontal lift disk and extra strong body. The regrinding feature permits seat to be renewed without disturbing pipe line. Sizes ½ to 2 in. for maximum pressure of 200 lbs. steam, or 225 lbs. water. Fig. 133 in sizes ½ to 2 in. for 125 lbs. steam or 150 lbs. water.

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FOOT VALVES; FIRE HYDRANTS.

For Sluice Gates, Shear Gates and Flap Valves, see page 999.

Ludlow Double Gate Straightway Valves.

Internal mechanism of valve consists of stem, two gates and two bevel faced wedges, the wedges being entirely independent of gates (or disks) and working between them, as shown in illustrations (Figs. 70 and 84).

Closing and Wedging—By action of stem, gates descend parallel with their seats until lower wedge strikes stop (or boss) in bottom of the case, gates and upper wedge continuing downward movement until face of upper wedge comes in contact with face of lower wedge. Face of upper wedge moves across face of lower wedge, exerting pressure on backs of both gates, forcing them apart and squarely against their seats (Figs. 70 and 84).

Opening—First turn of stem releases upper wedge, thereby releasing both gates from their seats *before they commence to rise*, thus eliminating all grinding and reducing to a minimum the wear on the faces of both gates and seats. *No other valve possesses this advantage.*

Construction—Metal used, both iron and bronze, is of highest grade. Gates can not, under Ludlow construction, be wedged or locked until they are directly opposite valve opening; stem can not bind in wedge; no stripping of thread from stem by canting of gates to either side.

Ground Seats—All Ludlow valves have gates ground to their seats, to secure best joints possible.

Standard Flanges and Drilling—The diameter and drilling of end flanges on our iron body valves, tested at 1000 lbs. or less, now conform to the "American" Standard effective January 1, 1914.

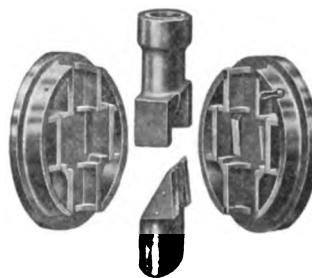


Fig. 84. STYLE OF GATES AND WEDGES FOR DOUBLE GATE VALVES

A, case; B, cover or bonnet; C, stem or spindle; D, packing plate or stuffing box; E, stuffing box gland or follower; F, stem nut; G, G, gates; H, gate rings; I, case rings; J, top wedge; K, bottom wedge; L, throat flange bolts; M, stuffing box or follower bolts

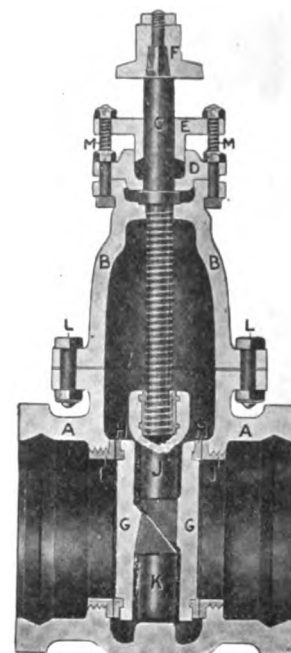
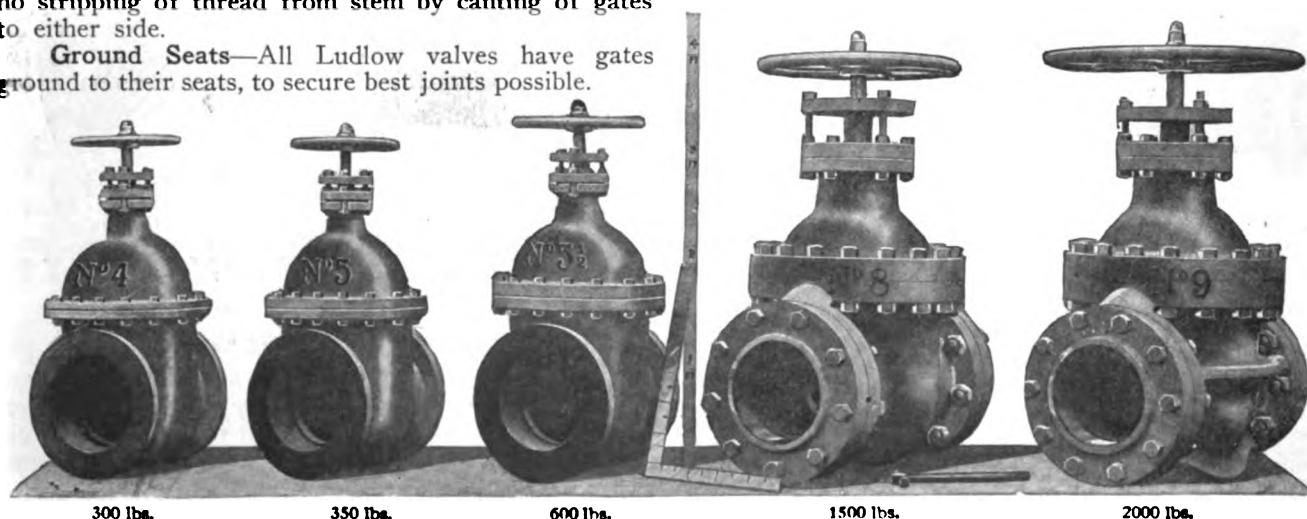


Fig. 70. LUDLOW BRONZE MOUNTED DOUBLE GATE VALVE

List No. 4, Double Gate Valves.

For heavy pressures on either side of gate. Used for water, steam, gas, oil, ammonia, etc. Valves tested at 300 lbs. water pressure. Gates are adjustable with center bearings which absolutely prevent gates becoming wedged in case. Although shorter than other



A FEW SAMPLES OF LUDLOW VALVES IN VARIOUS SIZES
Tested to above pressures



FIG. 96. Screwed End Valve, with Bronze Screwed Packing Box. Style 6-in. and under



FIG. 97. Screwed End Valve, with Bolted Packing Plate. Style above 6-in.



FIG. 98. Flanged End Valve, with Bronze Screwed Packing Box. Style 6-in. and under



FIG. 99. Flanged End Valve, with Bolted Packing Plate. Style above 6-in.



FIG. 3. Hub or Bell End Water or Gas Valve. Style of all sizes

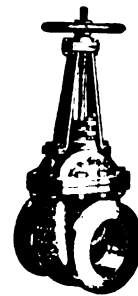


FIG. 99. Showing Outside Screw and Yoke For screwed or flanged end valves

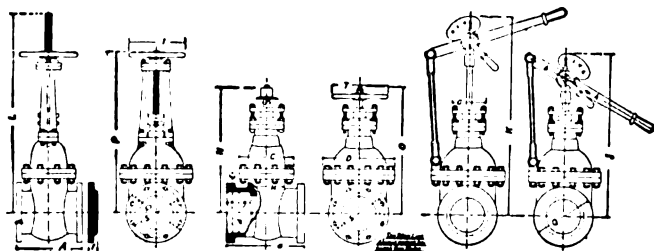


FIG. 11. Showing Sliding Stem and Lever

VALVES OF LISTS NOS. 1, 4, 5

valves, metal is thicker and will stand heavier pressures. Valves made with flanged or screwed ends for steam, and with hub or spigot ends for water.

Recommended working pressures not exceeding, steam, 75 lbs.; water, 150 lbs.



DIMENSION DIAGRAM, LIST NO. 4, IRON BODY BRONZE MOUNTED GATE VALVES

Size, ins.	A	Q	T	O	N	a	A-scr.	P	L	I	J	K
1	5	4	3 1/2	7 1/2	...	...	3 3/4	...	...	...	...	...
1 1/2	5 1/2	4 1/2	3 5/8	8	8 1/8	8 1/2	4	...	...	...	...	...
2	5 1/2	5	3 5/8	8	8 1/8	8 1/2	4	...	...	...	...	...
2 1/2	5 1/2	6	4 1/2	8 1/2	9 1/8	7	4 1/2	12	15 1/2	6	11 1/2	13 1/2
3	6 1/8	7	6	11	11	7 1/2	5 1/2	13 1/2	17	6	14 1/2	17
3 1/2	6 1/8	7 1/2	6	11 1/2	11	8 1/8	5 1/2	13 1/2	17 1/2	6	15 1/2	19
4	8 1/4	8 1/2	7 1/2	15 1/2	15 1/2	9 1/8	7 1/2	19 1/2	24 1/2	9	...	...
4 1/2	8 1/4	9	7 1/2	16	16 1/8	9 1/8	7 1/2	21	26 1/2	10	18 1/2	22 1/2
5	9 1/4	9 1/2	9	19 1/2	19	11	9 1/2	25	30 1/2	10	...	...
6	10 1/4	10	9	20	19 1/2	12	11	28 1/2	34	10	...	...
7	11 1/4	11	10	21	22	12 1/2	11 1/2	29 1/2	36 1/2	12	23	29 1/2
8	11 1/4	12 1/2	10	25 1/2	24	13 1/2	12	31 1/2	39 1/2	12	26 1/2	34 1/2
9	11 1/4	13 1/2	10	26 1/2	25	14 1/2	12 1/2	33 1/2	42 1/2	12	30 3/8	39
BM10	13 1/2	16	12	31 1/2	29 1/2	14 1/2	13 1/2	38	48 1/2	14	...	...
BM10	12 1/2	16	12	31 1/2	30	14 1/2	13 1/2	40	52	14	35 1/2	46 1/2
BM12	14 1/2	19	15	34 1/2	33	15	13 1/2	45	58	15	39 1/2	52 1/2
BM12	12 1/2	19	12	34 1/2	32 1/2	14 1/2	13 1/2	45	58	15	39 1/2	52 1/2

List No. 5, Double Gate Valves.

Valves have iron bodies and bronze mountings. Tested at 350 lbs. water pressure. Test *guaranteed*. For extra heavy working pressures either side of gate. All hub valves and all-iron valves have bolted stuffing box. These valves are also made with one end hub and other end spigot, or any other combination desired.

Recommended working pressures not exceeding, steam, 85 lbs.; water, 185 lbs.

DIMENSIONS, LIST NO. 5, DOUBLE GATE VALVES

Size, ins.	A	Q	T	O	N	a	A-scr.	P	L	I	J	K
2	5 1/2	6	4 1/2	8 1/2	9 1/2	7 1/2	4 7/8	12	15 1/2	6	11 1/2	13 1/2
2 1/2	6 1/8	7	5 1/8	11	11	7 3/4	5 1/8	13 1/2	17	6	14 1/2	17
3	8	7 1/2	7 1/2	15	14 1/2	10	7 1/2	16 1/2	20	9	...	...
3 1/2	8 1/4	8 1/2	7 1/2	15 1/2	15 1/2	9 1/8	7 1/2	19 1/2	24 1/2	9	...	...
4	8 1/4	9	9	16 1/2	17 1/2	10 1/2	7 1/2	21	26 1/2	10	...	...
4 1/2	9 1/4	9 1/2	9	19 1/2	19	11	9 1/2	25	30 1/2	10	...	...
5	10 1/4	10	9	20	19 1/2	12	11	28 1/2	34	10	...	...
6	11 1/4	11	10	24	22 1/2	13 1/2	11 1/2	28 1/2	36	12	...	...
7	11 1/4	12 1/2	10	25 1/2	24	13 1/2	12	31 1/2	39 1/2	12	26 1/2	34 1/2
8	13 1/2	13 1/2	12	26 1/2	24 1/2	14	13 1/2	34	43	12	...	...
9	13	15	12	31 1/2	29 1/2	15 1/2	13	38	48 1/2	14	...	...
10	15	16	12	30 1/2	29 1/2	14 1/2	14 1/2	41 1/2	53 1/2	14	...	...
12	15 1/2	19	15	35	33	15 1/2	14 1/2	47	61	15	...	...

For dimension diagrams, see List No. 4.

List No. 5 1/2, Double Gate Valves.

Iron body with bronze mountings and all-iron. A first class steam gate valve made to withstand easily and safely a heavy working pressure up to 250 lbs. Tested at 600 lbs. water pressure. Test *guaranteed*. All parts, both iron and bronze, exceptionally heavy. Stuffing box can be repacked with gates fully open. Made in following styles: With inside screw, outside screw and yoke, bevel or spur gear, with by-pass, with loose flanges, flanges plain or grooved, and with screwed, flanged and hub ends.

Recommended working pressures not exceeding, steam, 250 lbs.; water, 400 lbs.

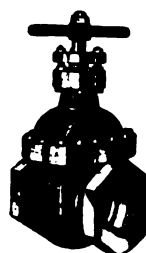
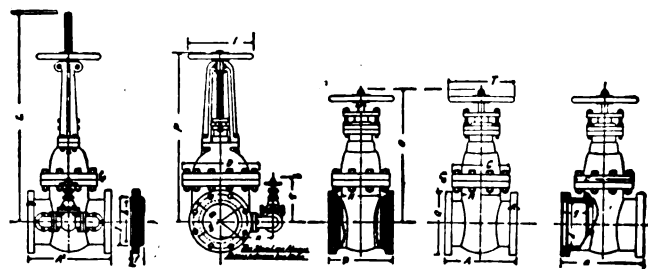


FIG. 101. Inside Screw Valve. Can be repacked with pressure on



FIG. 102. Outside Screw and Yoke Valve

VALVES OF LIST NO. 5 1/2



DIMENSION DIAGRAM, LIST NO. 5 1/2, DOUBLE GATE VALVES

Size, ins.	A	A2	Q	T	O	a	p	P	L	I	q
1 1/2	6	...	6	4 1/2	7 1/2	...	6 1/2	8 1/2	10	6	...
2	7 1/4	...	6 1/2	4 1/2	9 1/4	...	6 1/2	10 1/4	12 1/2	6	...
2 1/2	8	...	7 1/2	6	11	...	6 1/2	13	16 1/2	6	...
3	9 1/4	...	8 1/2	9	18 1/4	...	8 1/2	17	22	10	...
3 1/2	9 1/4	...	9	9	18 1/4	...	8 1/2	20	25	10	...
4	9 1/2	...	10	9	19 1/4	11 1/4	8 3/4	23	28 1/2	10	...
4 1/2	11	...	10 1/2	9	19 1/4	...	10	25 1/2	30 1/2	10	...
5	12 1/2	18	11	10	24 1/4	...	10 1/2	29	35 1/2	12	7 1/2
6	13 1/2	18	12 1/2	12	25 1/4	14	12	32	39 1/2	12	7 1/2
7	13 1/2	18	14	12	26 1/4	...	...	34	41 1/2	12	7 1/2
8	14 1/2	18 1/2	15	14	29 1/4	15	...	38	48 1/2	14	7 1/2
9	16 1/4	19	16 1/2	16	31 1/4	16 1/2	...	39	49	16	7 1/2
10	16 3/4	19	17 1/2	18	33 1/4	17 1/2	...	42 1/2	54	16	7 1/2
12	17 1/2	23 1/2	20 1/2	18	39 1/4	17 3/8	...	47	61	18	9 1/4
14	19	24	23	20	39	...	...	52 1/2	68 1/2	20	9 1/4
16	23	24	25 1/2	20	43	20 1/2	...	57	74 1/2	20	9 1/4
18	25	28	28 1/2	24	47 1/2	...	...	66 1/2	86	24	18 1/2
20	26 1/2	28 1/2	30 1/2	30	54	...	...	70 1/2	92	30	18 1/2
24	29 1/2	34 1/2	36	36	61 1/2	29 1/4	...	80	109	36	19 1/4

List No. 30, Double Gate Valves.

For water, steam, oil, natural gas. Similar in style and construction to valves in List No. 5½, except that these valves are made heavier by means of ribs to withstand greater pressure. Iron body with bronze mountings, and all-iron. Tested at 1000 lbs. water pressure. Test *guaranteed*. Can be furnished with Dresser, Custer, Hammon or Dayton couplings.

Recommended working pressures not exceeding, steam, 275 lbs.; water, gas, 500 lbs.

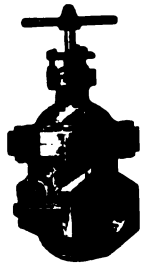


FIG. 221. Screwed End Valve



FIG. 222. Flanged End Valve with Loose Flanges Bolted On



FIG. 223. Flanged End Valve

LIST NO. 30 DOUBLE GATE VALVES
Dimensions same as List No. 5½

List No. 8, Double Gate Valves.

Iron body with bronze mountings and all-iron. These valves have been on the market during many years. Thousands in use in this and other countries.

All parts extremely heavy. Tested at 1500 lbs. water pressure. All bolts are extra large. Stuffing box and follower are triple bolted, and the former is packed with special packing.

For extreme working pressures either side of gate. Recommended for working pressure not exceeding 750 lbs.



FIG. 12. LIST NO. 8 DOUBLE GATE VALVES
6-in. No. 8 valve with loose flanges bolted on

List No. 9, Double Gate Valves.

For hydraulic work, natural gas, oil, etc. Iron body with bronze mountings, and all-iron. Similar in design to valves in List No. 8, but heavier in every way for heavier working pressures. Used extensively on oil and natural gas lines; many still giving satisfaction after 35 years continuous service. Tested at 2000 lbs. water pressure. Gates and seats have ground faces, securing perfectly tight joints.

For extreme working pressures. Recommended for working pressure not exceeding 1200 lbs.



FIG. 14. LIST NO. 9 DOUBLE GATE VALVE
6-in. valve with loose flanges bolted on

List No. 6, Double Gate Valves.

For heavy working pressures on either side of gate. Iron body with bronze mountings, and all-iron. Designed for water, steam, gas, etc. More of these valves are in use in water works systems than any other valve on the market (Fig. 108). Superior to all other water works valves, for the reason that there

is less water on the face of the gates and seats in operation, they work easier under heavy pressure, last longer and require fewer repairs.

The gates are adjustable, with center bearings and can not become stuck in the case. Gates and seats have ground faces, thus insuring watertight and steamtight joints. They work equally well with pressure either side of the gate.

By-passes of any size furnished. Valves made with hub or spigot ends for water, with flanged ends for steam. Tested at 300 lbs. water pressure.

Recommended working pressure not exceeding, steam, 75 lbs.; water, 150 lbs.



FIG. 108. DOUBLE GATE HUB OR BELL END VALVE
With spur gearing

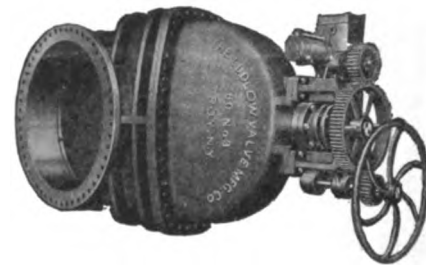
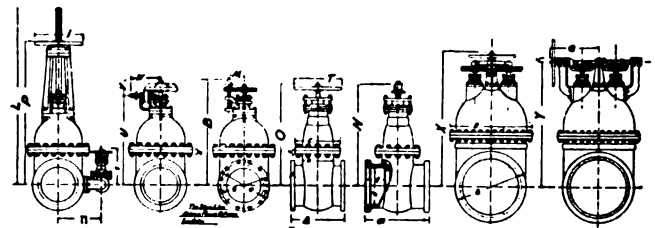


FIG. 272. SINGLE STEM HEAVY PRESSURE GATE VALVE
For electric and hand operation



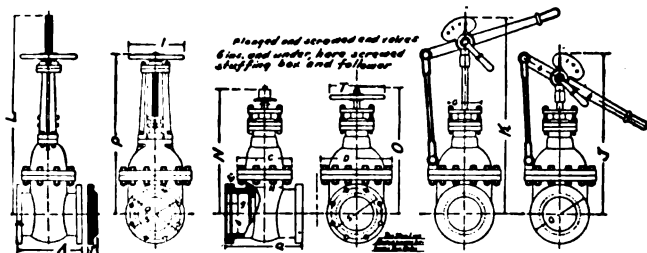
DIMENSION DIAGRAM, LIST NO. 6, DOUBLE GATE VALVE

Size, ins.	A	Q	T	O	N	a	P	L	I	n	q	B	M	U	V	W	X	Y	e
14	15½	21	15	43	40	15½	55	71	15	15½	8½	43	8½	33	7½	14½			
15	15½	22½	18	43	41	15½			18	16½	8½	46	8½	36	7½	14½			
16	16	23½	18	44	42½	15½	58	76	18	16½	8½	47	8½	35½	7½	14½			
18	17	25	21	48	47	18			21	17½	11½	47	8½	38½	7½	14½			
20	17½	27½	24	51	50½	19½			24	18½	11½	55½	8½	43½	7½	14½			
22	20½	29½	24	57	56½	19½			24	19½	11½	56	9½	48½	7½	17½			
24	21	32	24	60	60	22½			24	22½	16	58½	9½	50	7½	17½			
28	26½	36½				24½			25½	16	73	14	63½	12½	21½				
30	26½	38½				26			26	16	79	14	67½	14	21½				
36	28	46				26½			30½	21	92½	18½	78½	16½	30				
42	34½	53				33			33½	21	96½	18½	84	16½	30	99	92	34	
48	42½	59½				39			41½	26½		23½	98½	17½	33	106½	99½	40	

List No. 1, Single Gate Valves.

Iron body with bronze mountings, and all-iron. For water, gas, etc. Used where double gate valves are unnecessary, and pressure is not excessive. Gate and seat have ground faces, therefore watertight joints are assured. Tested at 200 lbs. water pressure.

Recommended working pressures not exceeding, water, 100 lbs.



DIMENSION DIAGRAM, LIST NO. 1, SINGLE GATE VALVE

Size, ins.	A	Q	T	O	N	a	A-sec.	P	L	I	J	K
1												
1 1/2												
2	5 1/2	5	3 1/2	8	8 1/2	8 1/2	4	12	15 1/2	6	11 1/4	13 1/2
2 1/2	6 1/2	6	4 1/2	8 1/2	9 1/2	7	4 1/2	13 1/4	17	6	14 1/4	17
3	6 1/2	7 1/2	5 1/2	11	11	7 1/2	5 1/2	13 1/4	17 1/2	6	15 1/2	19
3 1/2	8 1/2	8 1/2	7 1/2	15 1/2	15 1/2	9 1/2	7 1/2	19 1/2	24 1/2	9		
4	8 1/2	9	7 1/2	16	16 1/2	9 1/2	7 1/2	21	26 1/2	10	18 1/4	22 1/2
4 1/2	9 1/2	9 1/2	9	19 1/2	19	11	9 1/2	25	30 1/2	10		
5	10 1/2	10	9	20	19 1/2	12	11	28 1/4	34	10		
6	11 1/2	11	10	21	22	12 1/2	11 1/4	29 1/2	36 1/2	12	23	26 1/2
7	11 1/2	12 1/4	10	25 1/4	24	13 1/2	12	31 1/4	39 1/4	12	26 1/2	34 1/2
8	11 1/2	13 1/4	10	26 1/4	25	14 1/2	12 1/2	33 1/2	42 1/2	12	30 1/2	39
9	13	15	12	31 1/4	29 1/4	15 1/2	13	38	48 1/4	14		
10	13 1/2	16	12	31 1/2	30	14 1/2	12 1/2	40	52	14	35 1/2	46 1/2
12	12 1/2	19	12	34 1/2	32 1/2	14 1/2	13 1/4	45	58	15	39 1/2	52 1/2

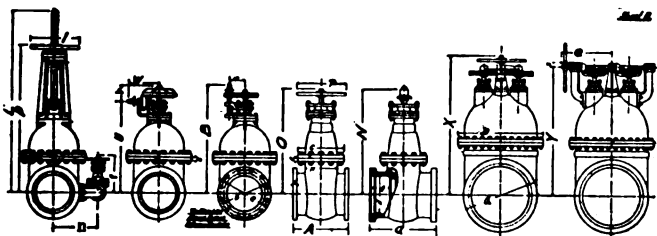
List Nos. 2 and 3, Gate Valves.

List No. 2 is single gate and List No. 3 is a double gate valve. Construction and method of wedging single gate valves are same as the double gate valves, except that one gate and one seat only have ground faces. For light working pressure steam, or medium pressure water or gas. Tested at 80 lbs. water pressure. Intended for use where double gate valves are not desirable.

Recommended working pressures not exceeding, steam, 30 lbs.; water, 40 and 50 lbs.



FIG. 104. HUB OR BELL END VALVE Without gearing



DIMENSION DIAGRAM, LIST NOS. 2 AND 3, SINGLE AND DOUBLE GATE VALVES

Size, ins.	A	Q	T	O	N	a	P	L	I	n	q	B	M	U	V	W	X	Y
14	13 1/4	21	15	40 1/4	40 1/4	15 1/2	51 1/2	68	15	15	8 1/2	42 1/2	8 1/2	32 1/2	7 1/2	14 1/2		
15	13 1/2	22 1/4	15 1/2	40	40	15 1/2		15	15 1/2	8 1/2	43	8 1/2	33	7 1/2	14 1/2			
16	13 1/2	23 1/4	15 1/2	43 1/2	42 1/2	15 1/2	56	77	15	15 1/2	8 1/2	45 1/2	8 1/2	35 1/2	7 1/2	14 1/2		
18	14 1/4	25	18	47	46	15 1/2		18	17 1/2	11 1/2	48	8 1/2	38 1/2	7 1/2	14 1/2			
20	15 1/2	27 1/2	18	50	49	17	65	89	18	18 1/2	11 1/2	53	8 1/2	42 1/2	7 1/2	14 1/2		
22	19 1/2	29 1/2	18	55	54	19		18	19 1/2	11 1/2	58	8 1/2	48	7 1/2	14 1/2			
24	17	32	24	57 1/2	55 1/2	17 1/2	76	105	24	22 1/2	16	58	8 1/2	48 1/2	7 1/2	14 1/2		
28	22 1/2	36 1/2	24	63 1/2	61 1/2	18		24	25	16	64 1/2	9 1/2	56 1/2	7 1/2	17 1/2			
30	22 1/2	38 1/2	30	69	67	19		30	26 1/2	16	71	11 1/2	60	9	19 1/2			
36	23	46				20 1/2		30 1/2	21	83	11 1/2	71 1/2	9	19 1/2				
40	28	50 1/2				25 1/2		33 1/2	21	95 1/2	14	85 1/2	14	21 1/2				
42	28	53				25 1/2		33 1/2	21	95 1/2	14	85 1/2	14	21 1/2				
48	38	59 1/2				34		41 1/2	26 1/2	106	18 1/2	92	16 1/2	28 1/2				
60	48	73						46 1/2	26 1/2									
72	48	86 1/2						46 1/2	26 1/2									
74																		

List No. 7, Bronze Double Gate Valves.

For steam or water. These valves have been tested at these pressures per square inch: Water pressure, 6 ins. and under, at 300 lbs.; 7 ins. and above, at 250 lbs.

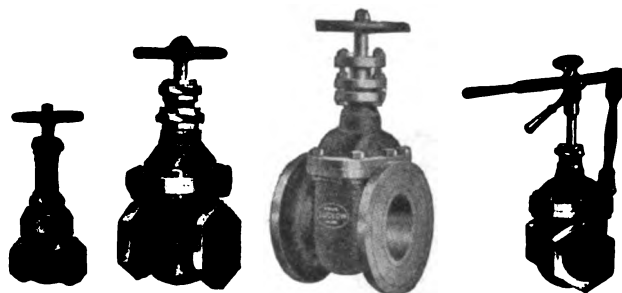
The metal in Ludlow valves is equal to that called for in Government work, and, as to tensile and transverse strength, is superior to that used in other valves.

Valves made to bear a heavy working pressure.

Gates and seats have ground faces, thus insuring steamtight and watertight joints.

All sizes up to 6 ins. inclusive have the screwed stuffing box and follower nut, unless otherwise specified; and all sizes above 6 ins. have the bolted packing gland or follower.

Working pressures recommended should not exceed the following: Steam, 3 ins. and under, 125 lbs., 3 1/2 ins. to 6 ins., 100 lbs., 7 ins. to 12 ins., 75 lbs.; water, 6 ins. and under, 175 lbs., 7 ins. and above, 125 lbs.

FIG. 85
Screwed Cover
and Rising Stem
3/4, 1/2, 1/4
1 in.FIG. 87
Bolted Cover and
Screwed Stuffing
Box
2 1/2 to 6 ins.FIG. 91
Flanged End, with
Bolted Cover and
Stuffing Box
7 ins. and aboveFIG. 21
Sliding Stem and
Lock Lever Valve
Gate held in any
position

LIST NO. 7, BRONZE DOUBLE GATE VALVES

List No. 7 1/2, Extra Heavy Bronze Double Gate Valves.

Recommended working pressures: Water, 6 ins. and under, 400 lbs., and 7 ins. and above, 300 lbs.; steam, 6 ins. and under, 250 lbs., and 7 ins. and above, 200 lbs.

These valves are also made for heavy pressure hydraulic work, working water pressure not to exceed 1000 lbs.



FIG. 153. LIST NO. 7 1/2 EXTRA HEAVY BRONZE DOUBLE GATE VALVE

List No. 10, Bronze Horizontal Swing Check Valves.

Made heavy and substantial, of highest grade of metal, for any desired working pressure. Gate and seat have ground faces.

Every valve is *guaranteed*. Tested at 300 lbs. water pressure.

Recommended working pressures not exceeding, steam, 100 lbs.; water, 175 lbs.



FIG. 35. SWING CHECK VALVE

List No. 10 1/2, Extra Heavy Bronze Horizontal Swing Check Valves.

Tested at 600 lbs. water pressure. Test *guaranteed*. Sizes, 1/2 to 4 ins.

Recommended working pressures not exceeding, steam, 250 lbs.; water, 400 lbs.

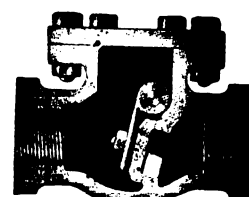


FIG. 154. EXTRA HEAVY BRONZE HORIZONTAL SWING CHECK VALVE

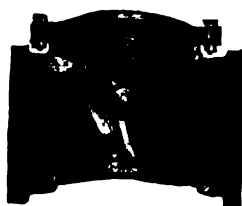
NOTE—The foregoing valves (Lists 10 and 10½) are not made to compete in price with light and inferior goods, but are made heavy and substantial, and the workmanship is unsurpassed. They are strong, and are not warped out of shape when screwed into a line pipe, as is often the case with inferior goods.

List Nos. 11 and 12, Horizontal Swing Check Valves, Iron Body with Bronze Mountings.

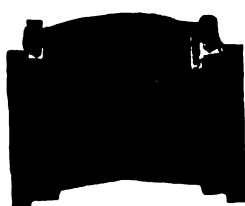
These valves are made with iron bodies, bronze mounted, are heavy and substantial. They are so constructed that bottom of the case is flattened and raised toward the seat, eliminating pockets or receptacles for stones or gravel. Gates in all sizes can be taken out by removing the cover or manhole plate.

Sizes 14 ins. and above are made with by-pass. Tested, 24 ins. and under at 300 lbs. per sq. in. water pressure; 30 ins. and above at 250 lbs. per sq. in. water pressure.

Recommended working pressures: Steam, 24 ins. and under, 75 lbs.; water, 24 ins. and under, 150 lbs.; 30 ins. and above, 125 lbs.

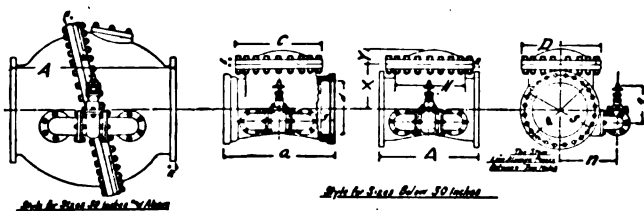


LIST No. 11



LIST No. 12

HORIZONTAL SWING CHECK VALVES, IRON BODY WITH BRONZE MOUNTINGS



DIMENSION DIAGRAM, LIST NOS. 11 AND 12, HORIZONTAL SWING CHECK VALVES

Size, ins.	A	Q	C	D	X	Y	a	n
2	7 3/4	6	6 1/2	6 1/2	2 1/2	1 1/2	9 1/4	.....
2 1/2	8 1/4	7	7 1/2	7 1/2	2 3/4	1 3/4	9 3/4	.....
3	9 1/4	7 1/2	7 3/4	7 3/4	3 1/4	1 3/4	11 1/4	.....
3 1/2	9 3/4	8 1/2	8 1/2	8 1/2	4 1/4	1 3/4	11 3/4	.....
4	11 1/4	9	11 1/2	11	6	2	13 1/4	.....
4 1/2	12 1/4	9 1/2	11	10 1/2	6	1 3/4	16 1/2	.....
5	13 1/4	10	12 1/2	11 1/2	7	1 3/4	15	.....
6	14 1/2	11	12 3/4	11 3/4	6 1/2	1 3/4	16	.....
7	16	12 1/2	14 1/2	13 1/2	7 1/2	2	18 1/2	.....
8	17 1/2	13 1/2	15 1/2	14 1/2	8	2 1/2	19	.....
9	21 1/2	15	21 1/2	19 1/2	11 1/2	3 1/2	24	.....
10	21 1/2	16	21 1/2	19 1/2	11 1/2	3 1/2	24	.....
12	24 1/2	19	23 1/2	21 1/2	11 1/2	3 1/2	26 1/2	.....
14	26	21	25	23 1/2	12 1/2	3 1/2	29	13 1/2
16	29	23 1/2	26 1/2	25 1/2	14 1/2	4	31	16
18	31 1/2	25	29 1/2	27 1/2	15 1/2	4 1/2	34 1/2	17 1/2
20	35 1/2	27 1/2	31 1/2	29 1/2	16 1/2	5 1/2	38	19
24	39 1/2	32	38	35 1/2	20 1/2	7 1/2	44 1/2	21 1/2
30	54 1/2	38 1/2	.....	.....	.....	.....	54 1/2	33 1/2
36	61 1/2	46	.....	.....	.....	.....	61 1/2	37 1/2
48	105	59 1/2	.....	.....	.....	.....	115 1/2	.....

List No. 12½, Extra Heavy Horizontal Swing Check Valves.

For use under heavy pressure. Made with iron bodies and are bronze mounted. Similar in construction to the valves in List Nos. 11 and 12, but heavier throughout. All parts extra strong. Tested at 600 lbs. water pressure. Sizes 14 ins. and above made with by-pass; 12 ins. and under made without by-pass.

Recommended working pressures: Steam, 24 ins. and under, 200 lbs.; 30 ins. and above, 125 lbs.; water,

24 ins. and under, 400 lbs.; 30 ins. and above, 200 lbs.

DIMENSIONS, LIST NO. 12½, HORIZONTAL SWING CHECK VALVES

Size, ins.	A	Q	X	Y	a	P. to P. screw
2	7 3/4	6 1/2	2 1/2	1 1/2	.....	6 3/4
2 1/2	10 1/4	7 1/2	2 3/4	1 3/4	.....	9 1/4
3	12 1/4	8 1/2	4	1 3/4	.....	11 1/4
3 1/2	13	9	5 1/4	2	.....	.....
4	13	10	5 3/4	1 3/4	.....	12
4 1/2	14 1/2	10 1/2	.....	.....	.....	.....
5	14 1/2	11	7 1/2	2	.....	13 1/2
6	18 1/2	12 1/2	6 1/2	3 1/2	.....	15
7	19 1/2	14	.....	.....	.....	.....
8	19 1/2	15	8	2 3/4	.....	19
9	23 1/2	16 1/2	.....	.....	.....	.....
10	23 1/2	17 1/2	11 1/2	4 1/2	.....	.....
12	26	20 1/2	12 1/2	5 1/2	.....	.....
14	28	23	14 1/2	5 1/2	.....	.....
16	32	25 1/2	.....	.....	.....	.....

For dimension diagram, see List Nos. 11 and 12

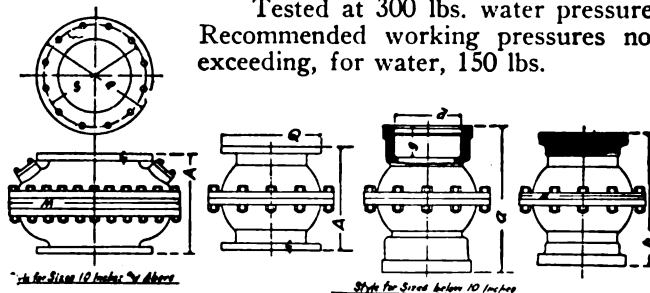
List No. 13, Vertical Check Valves.

Iron body, gates faced with solid rubber disks, iron seat. Rubber, of best quality.

Made in two styles: 9 ins. and under, with single gate; sizes above 9 ins. are made with gate plate and a nest of small gates varying in number according to size of valve, also with handholes for cleaning purposes.

FIG. 127. VERTICAL CHECK VALVE
Screwed, flanged or hub ends

Tested at 300 lbs. water pressure. Recommended working pressures not exceeding, for water, 150 lbs.



DIMENSION DIAGRAM, LIST NO. 13, VERTICAL CHECK VALVES

Size, ins.	A	Q	p	a	M	Handhole.
2	4 3/8	6	7 3/4	9 1/2	7	.....
2 1/2	5 1/4	7	7 3/8	9 3/4	7 1/2	.....
3	5 3/4	7 1/2	8 1/2	11	8 1/2	.....
3 1/2	7 1/4	8 1/2	10 1/2	.....	10 1/2	.....
4	6 1/4	9	10 1/2	12 1/4	11	.....
5	9 1/2	10	12 1/2	16 1/2	12	.....
6	9 1/2	11	13 1/2	17 1/4	14	.....
7	9 1/2	12 1/2	13 1/2	.....	16 1/4	.....
8	10 1/2	13 1/2	14	19 1/4	16 1/2	.....
9	11 1/2	15	14 3/4	.....	18 1/2	.....
10	17 1/2	16	.....	25 1/2	27 1/2	2 1/2 x 5 1/2
12	20 1/2	19	.....	29	30 1/2	3 x 6
14	18 1/2	21	.....	27 1/2	31	3 1/2 x 6
16	21 1/2	23 1/2	.....	30	34	3 1/2 x 6
18	23 1/2	25	.....	31	36 1/2	3 1/2 x 6
20	23 1/2	27 1/2	.....	33 1/2	39	3 1/2 x 6
24	29 1/2	32	.....	40 1/2	53 1/2	3 1/2 x 6
30	29 1/2	38 1/4	.....	.....	65 1/2	4 x 7

List No. 14, Vertical Foot Valves.

Of similar construction to above vertical check valves. Iron body and iron gate plate. Gates faced with solid rubber. Sizes above 9 ins. have, in addition to nest of small gates, a plate screen or strainer bolted to bottom of valves and made of heavy brass wire, also handholes. Sizes under 9 ins. made with single gate, with basket screen or strainer. Tested

FIG. 128. VERTICAL FOOT VALVE
Screwed end

at 100 lbs. water pressure (Fig. 128). Smaller types, with screen omitted, are adapted for service as vertical check valves. Recommended working pressure not exceeding, for water, 50 lbs. Prices and dimensions sent upon application.

List No. 16, Bronze Hose Valves.

Light and heavy pattern double gate hose valves are intended for use in standpipes in public and office buildings, mills, etc. Single gate hose valves are to be carried on hose carriages for use with hydrants. Double gate patterns, recommended working water pressures, 150 and 125 lbs. Single gate pattern, recommended working water pressure, 100 lbs.



FIG. 71. BRONZE HOSE VALVES With cap and chain

List No. 75, Ludlow Slide Gate Fire Hydrant.

Gate type. A first class non-freezing hydrant, strong, simple in construction, tight under all pressures, with a positive drip that drains hydrant barrel completely. All working parts can be taken out without doing any digging or disturbing hydrant barrel.

Closing and Opening Hydrant Gate and Drip Valve—

In closing, gate is moved downward by action of stem through threaded bronze wedge nut in back of gate (Fig. 131), until it strikes the stop at bottom of projection in back of hydrant, when, by action of bronze wedge nut, moving along incline on back of gate, it is forced squarely against its seat without any grinding movement on either rubber gasket, with which gate is faced, or on bronze seat ring, against which it closes, the projections at top and bottom of gate keeping rubber gasket away from seat ring until it is forced squarely against it by action of wedge nut.

The final turn of stem, after gate is closed and wedged, opens drip valve.

In opening hydrant, first turn of stem closes drip valve, after which bronze wedge nut in back of gate is loosened, thus relieving gate from its seat.

Gate Locking Device—

Consists of 2 lock nuts on stem below gate, which lock gate after it is closed, preventing street from being flooded in case hydrant barrel or standpipe is broken by accident.

Device, fully covered by patent, operates the instant gate is closed and drip is open; and is released immediately upon starting to open hydrant.

Drip Valve—Bronze and faced with rubber, drip valve is screwed to lower end of hydrant stem and works in a bronze cup in extreme bottom of hydrant.

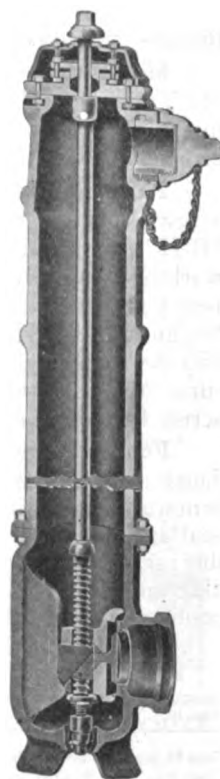


FIG. 131. LUDLOW SLIDE GATE FIRE HYDRANT

List No. 75, bronze mounted rubber faced gate. Sectional view showing gate closed and locked and drip valve in extreme bottom of hydrant open

Opens only *after* gate is closed and wedged; and closes *before* gate is released or any water enters barrel.

Fig. 131 shows location of drip valve which prevents freezing of hydrant. Valve does not open until after gate is closed and locked, shutting off water from hydrant barrel; and closes before gate is released from its seat, letting water into hydrant.

List No. 80, Ludlow Fire Hydrant with Balanced Valve.

Compression type. Built strong in every part, remains tight under all pressures, has positive drip and all parts can be removed without digging or disturbing hydrant barrel.

Bronze is used for seats, sleeve, drip cylinder, drip valve, nozzles; all wearing surfaces are either bronze mounted or rubber faced (Fig. 179).

Other Ludlow Hydrants.

Slide gate flush hydrants; flush hydrants or street washers; slide gate fire hydrant, with water crane attachment; water crane, with automatic drip in main valve, for supplying sprinkling carts; underwriter hydrant, built in accordance with National Board of Fire Underwriters.



FIG. 179. LUDLOW FIRE HYDRANT WITH BALANCED VALVE Showing main valve and drip valve

List No. 29, Automatic Globe Air Valves.

Placed on mains at high points where air accumulates and obstructs flow of water.

When air takes the place of water about float in valve chamber, valve opens permitting air to escape. As water returns, valve is closed (Fig. 146).



FIG. 146. AUTOMATIC GLOBE AIR VALVES

List No. 23, Automatic Lever and Float Air Valves.

With bronze mountings and copper float. Placed on mains at high points where air accumulates and obstructs flow of water. When air takes the place of water about float, B, in valve chamber, float (attached to bronze lever A) drops, thus opening valve, D, allowing air to escape. As water returns it lifts float (relieved of the air pressure), thereby closing valve, D (Figs. 49 and 117).



FIG. 117

AUTOMATIC LEVER AND FLOAT AIR VALVES



FIG. 49

THE LUNKENHEIMER COMPANY

Manufacturers of High Grade Engineering Appliances

CABLE ADDRESS:
"LUNKEN" for—
Cincinnati, New York
and London

EXECUTIVE OFFICES AND FACTORIES

CINCINNATI, OHIO

NEW YORK, N. Y., 129-135 Lafayette Street
BOSTON, MASS., 136-138 High Street

CHICAGO, ILL., 188 North Dearborn Street
LONDON, ENG., 35 Great Dover Street, S.E.

CODES USED:
"ABC," Fourth and
Fifth Editions;
"Western Union," Five
Letter Edition;
"Lieber's"

Products.

VALVES:

Bronze	Engine Throttle
Iron	Safety Non-return
Cast steel	Stop Check
Anti-acid	Needle
Globe	Radiator
Angle	Regulating Check
Cross	Blow-off
Check	Pop Safety
Gate	Relief

Also Oil and Grease Cups, Oil Pumps, Oiling Devices, Injectors and Ejectors, Water Columns and Gages, Gage Cocks, Whistles, Ground Key Work, Low Water Alarms, Fusible Plugs, Unions, Bronze Pipe Fittings.

Automotive Accessories: Generator Valves, Carburetor Check Valves, Gasoline Engine Primers, Priming Cups, Gasoline Strainers, Unions, Cocks, etc.

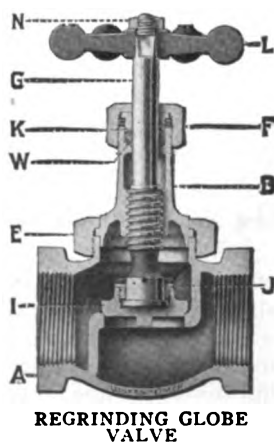
Lubricators for Steam, Gas, Oil, Gasoline and Diesel Engine and Compressor Cylinders.

Bronze Regrinding Globe, Angle and Cross Valves.

Materials—Body and trimmings of "Valve-bronze"; hand wheel of iron.

Patterns—Medium with screw ends for 200 lbs. and "B-H" flange ends for 150 lbs. working steam pressure; extra heavy with screw ends for 300 lbs. and "B-X" flange ends for 250 lbs. working steam pressure. Also furnished in outside screw, bolted or screwed yoke patterns.

Features—Seating surfaces regrindable; all parts renewable; stuffing box repackable under pressure when valve is wide open; flow areas in excess of pipe areas.



REGRINDING GLOBE VALVE

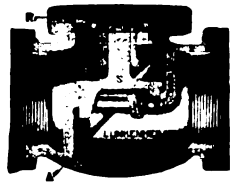
DATA, REGRINDING GLOBE, ANGLE AND CROSS VALVES

Size, in.		$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	1	$1\frac{1}{4}$
Face to face, flanged globe.	Medium, in.			$2\frac{1}{4}$	$3\frac{3}{8}$	$4\frac{1}{4}$	$4\frac{3}{4}$	$4\frac{1}{2}$
	Ex. Hy., in.			$3\frac{3}{8}$	$3\frac{3}{8}$	$4\frac{1}{2}$	$4\frac{3}{4}$	$5\frac{1}{4}$
Center to face, flanged angle or cross.	Medium, in.			$1\frac{1}{4}$	2	$2\frac{1}{4}$	$2\frac{3}{4}$	$2\frac{1}{2}$
	Ex. Hy., in.			$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{3}{4}$	$2\frac{3}{4}$	$3\frac{1}{4}$
Diam. of flanges.	Medium, in.			$2\frac{1}{4}$	3	$3\frac{1}{4}$	4	$4\frac{1}{4}$
	Ex. Hy., in.			3	$3\frac{1}{4}$	4	$4\frac{1}{4}$	5
Thickness of flanges	Medium, in.			$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{3}{8}$
	Ex. Hy., in.			$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{2}$
Face to face, screw globe.	Medium, in.	$1\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{4}$	$3\frac{3}{4}$	$3\frac{3}{4}$
	Ex. Hy., in.		$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{4}$	$3\frac{3}{8}$	$3\frac{3}{4}$	$4\frac{1}{4}$
Center of valve body to top of stem, wide open.	Medium, in.	$2\frac{3}{4}$	4	4	$4\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{4}$	$6\frac{1}{4}$
	Ex. Hy., in.		$4\frac{1}{4}$	$4\frac{1}{4}$	$4\frac{1}{4}$	$5\frac{1}{4}$	$6\frac{1}{4}$	$6\frac{1}{4}$

Bronze Regrinding Horizontal, Angle and Vertical Check Valves.

Materials—Body and trimmings of "Valve-bronze."

Patterns—Medium with screw ends for 200 lbs. and "B-H" flange ends for 150 lbs. working steam pressure; extra heavy with screw ends for 300 lbs. and "B-X" flange ends for 250 lbs. working steam pressure. Also furnished with flanged instead of screwed cap.



REGRINDING
HORIZONTAL CHECK
VALVE

Features—Disc, properly guided at both top and bottom, insures perfect seating; seating surfaces regrindable; all parts renewable; flow areas in excess of pipe areas.

DATA, REGRINDING HORIZONTAL, ANGLE AND VERTICAL CHECK VALVES

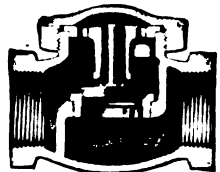
Size, in.	1/4	3/8	1/2	3/4	1	1 1/4
Face to face, flanged horizontal.	Medium, in. 2 3/8	3 5/8	4 3/4	5 1/2	6 1/2	7 1/2
Ex. Hy., in. 2 1/2	3 1/4	4 1/4	5 1/4	6 1/4	7 1/4	8 1/4
Face to face, flanged vertical.	Medium, in. 2 1/2	3 1/4	4 1/4	5 1/4	6 1/4	7 1/4
Ex. Hy., in. 2 1/4	3 1/2	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2
Center to face, flanged angle.	Medium, in. 1 1/2	2 1/4	3 1/4	4 1/4	5 1/4	6 1/4
Ex. Hy., in. 1 1/4	2 1/2	3 1/2	4 1/2	5 1/2	6 1/2	7 1/2
Diam. of flanges.	Medium, in. 2 1/2	3 1/4	4 1/4	5 1/4	6 1/4	7 1/4
Ex. Hy., in. 2 1/4	3 1/2	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2
Thickness of flanges.	Medium, in. 1 1/2	2 1/4	3 1/4	4 1/4	5 1/4	6 1/4
Ex. Hy., in. 1 1/4	2 1/2	3 1/2	4 1/2	5 1/2	6 1/2	7 1/2
Face to face, screw horizontal.	Medium, in. 1 1/2	2 1/4	3 1/4	4 1/4	5 1/4	6 1/4
Ex. Hy., in. 1 1/4	2 1/2	3 1/2	4 1/2	5 1/2	6 1/2	7 1/2
Face to face, screw vertical.	Medium, in. 1 1/2	2 1/4	3 1/4	4 1/4	5 1/4	6 1/4
Ex. Hy., in. 1 1/4	2 1/2	3 1/2	4 1/2	5 1/2	6 1/2	7 1/2
Center to face, screw angle.	Medium, in. 1 1/2	2 1/4	3 1/4	4 1/4	5 1/4	6 1/4
Ex. Hy., in. 1 1/4	2 1/2	3 1/2	4 1/2	5 1/2	6 1/2	7 1/2
Center of body to top of cap.	Medium, in. 1 1/2	2 1/4	3 1/4	4 1/4	5 1/4	6 1/4
Ex. Hy., in. 1 1/4	2 1/2	3 1/2	4 1/2	5 1/2	6 1/2	7 1/2

Size, in.	1 1/2	2	2 1/2	3	3 1/2	4
Face to face, flanged horizontal.	Medium, in. 5 7/8	6 7/8	7 7/8	8 7/8	9 7/8	10 7/8
Ex. Hy., in. 5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2
Face to face, flanged vertical.	Medium, in. 5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2
Ex. Hy., in. 5 1/4	6 1/4	7 1/4	8 1/4	9 1/4	10 1/4	11 1/4
Center to face, flanged angle.	Medium, in. 4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2
Ex. Hy., in. 4 1/4	5 1/4	6 1/4	7 1/4	8 1/4	9 1/4	10 1/4
Diam. of flanges.	Medium, in. 5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2
Ex. Hy., in. 5 1/4	6 1/4	7 1/4	8 1/4	9 1/4	10 1/4	11 1/4
Thickness of flanges.	Medium, in. 4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2
Ex. Hy., in. 4 1/4	5 1/4	6 1/4	7 1/4	8 1/4	9 1/4	10 1/4
Face to face, screw horizontal.	Medium, in. 4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2
Ex. Hy., in. 4 1/4	5 1/4	6 1/4	7 1/4	8 1/4	9 1/4	10 1/4
Face to face, screw vertical.	Medium, in. 4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2
Ex. Hy., in. 4 1/4	5 1/4	6 1/4	7 1/4	8 1/4	9 1/4	10 1/4
Center to face, screw angle.	Medium, in. 4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2
Ex. Hy., in. 4 1/4	5 1/4	6 1/4	7 1/4	8 1/4	9 1/4	10 1/4
Center of body to top of cap.	Medium, in. 4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2
Ex. Hy., in. 4 1/4	5 1/4	6 1/4	7 1/4	8 1/4	9 1/4	10 1/4

Bronze "Renewo" Horizontal and Angle Check Valves.

Materials—Body, cap and disc guide of "Valve-bronze"; seat and disc of "Valve-nickel."

Patterns—Medium with screw ends for 200 lbs. and "B-H" flange ends for 150 lbs. working steam pressure; extra heavy with screw ends for 300 lbs. and "B-X" flange ends for 250 lbs. working steam pressure.



"RENEWO"
HORIZONTAL CHECK
VALVE

Features—Disc, properly guided, insures perfect seating; seating surfaces regrindable; all parts renewable, including the nickel seat and disc, making these valves practically indestructible; flow areas in excess of pipe areas.

DATA, "RENEWO" HORIZONTAL AND ANGLE CHECK VALVES

Size, in.	1/4	3/8	1/2	3/4	1
Face to face, flanged horizontal.	Medium, in. 3 1/4	3 3/4	4 1/4	4 3/4	5 1/4
Ex. Hy., in. 3 1/8	3 3/8	3 7/8	4 1/8	4 5/8	5 1/8
Center to face, flanged angle.	Medium, in. 2 1/4	2 3/4	3 1/4	3 3/4	4 1/4
Ex. Hy., in. 2 1/8	2 3/8	2 7/8	3 1/8	3 5/8	4 1/8
Diam. of flanges.	Medium, in. 2 1/4	2 3/4	3 1/4	3 3/4	4 1/4
Ex. Hy., in. 2 1/8	2 3/8	2 7/8	3 1/8	3 5/8	4 1/8
Thickness of flanges.	Medium, in. 1 1/4	1 3/4	2 1/4	2 3/4	3 1/4
Ex. Hy., in. 1 1/8	1 3/8	1 7/8	2 1/8	2 5/8	3 1/8
Face to face, screw horizontal.	Medium, in. 2 1/4	2 3/4	3 1/4	3 3/4	4 1/4
Ex. Hy., in. 2 1/8	2 3/8	2 7/8	3 1/8	3 5/8	4 1/8
Center to face, screw angle.	Medium, in. 1 1/4	1 3/4	2 1/4	2 3/4	3 1/4
Ex. Hy., in. 1 1/8	1 3/8	1 7/8	2 1/8	2 5/8	3 1/8
Center of body to top of cap.	Medium, in. 1 1/4	1 3/4	2 1/4	2 3/4	3 1/4
Ex. Hy., in. 1 1/8	1 3/8	1 7/8	2 1/8	2 5/8	3 1/8

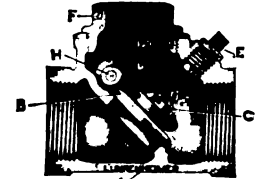
DATA, "RENEWO" HORIZONTAL AND ANGLE CHECK VALVES—
Continued

Size, in.	1 1/4	1 1/2	2	2 1/2	3
Face to face, flanged horizontal.	Medium, in. 5 1/4	6 1/4	7 1/4	8 1/4	9 1/4
Ex. Hy., in. 5 1/8	6 1/8	7 1/8	8 1/8	9 1/8	10 1/8
Center to face, flanged angle.	Medium, in. 4 1/4	4 3/4	5 1/4	5 3/4	6 1/4
Ex. Hy., in. 4 1/8	4 3/8	4 7/8	5 1/8	5 5/8	6 1/8
Diam. of flanges.	Medium, in. 4 1/2	5	6	7	8 1/2
Ex. Hy., in. 4 1/4	5 1/4	6 1/4	7 1/4	8 1/4	9 1/4
Thickness of flanges.	Medium, in. 3 1/4	3 3/4	4 1/4	4 3/4	5 1/4
Ex. Hy., in. 3 1/8	3 3/8	3 7/8	4 1/8	4 5/8	5 1/8
Face to face, screw horizontal.	Medium, in. 4 1/4	4 3/4	5 1/4	5 3/4	6 1/4
Ex. Hy., in. 4 1/8	4 3/8	4 7/8	5 1/8	5 5/8	6 1/8
Center to face, screw angle.	Medium, in. 2 1/4	2 3/4	3 1/4	3 3/4	4 1/4
Ex. Hy., in. 2 1/8	2 3/8	2 7/8	3 1/8	3 5/8	4 1/8
Center of body to top of cap.	Medium, in. 2 1/4	2 3/4	3 1/4	3 3/4	4 1/4
Ex. Hy., in. 2 1/8	2 3/8	2 7/8	3 1/8	3 5/8	4 1/8

Bronze Regrinding Swing Check Valves.

Materials—Body and trimmings of "Valve-bronze."

Patterns—Medium with screw ends for 200 lbs. and "B-H" flange ends for 150 lbs. working steam pressure; extra heavy with screw ends for 300 lbs. and "B-X" flange ends for 250 lbs. working steam pressure.



REGRINDING SWING
CHECK VALVE

Also furnished with flanged instead of screwed cap.

Features—Practically straightway flow channel, with flow areas in excess of pipe areas; two renewable disc-carrier bearings, insuring constant alignment of disc; seating surfaces regrindable; all parts renewable.

DATA, REGRINDING SWING CHECK VALVES

Size, in.	1/4	3/8	1/2	3/4	1
Face to face, flanged.	Medium, in. 3 1/4	3 3/4	4 1/4	4 3/4	5 1/4
Ex. Hy., in. 3 1/8	3 3/8	3 7/8	4 1/8	4 5/8	5 1/8
Diam. of flanges.	Medium, in. 2 1/4	2 3/4	3 1/4	3 3/4	4 1/4
Ex. Hy., in. 2 1/8	2 3/8	2 7/8	3 1/8	3 5/8	4 1/8
Thickness of flanges.	Medium, in. 1 1/4	1 3/4	2 1/4	2 3/4	3 1/4
Ex. Hy., in. 1 1/8	1 3/8	1 7/8	2 1/8	2 5/8	3 1/8
Face to face, screw.	Medium, in. 2 1/4	2 3/4	3 1/4	3 3/4	4 1/4
Ex. Hy., in. 2 1/8	2 3/8	2 7/8	3 1/8	3 5/8	4 1/8
Center of body to top of cap.	Medium, in. 1 1/4	1 3/4	2 1/4	2 3/4	3 1/4
Ex. Hy., in. 1 1/8	1 3/8	1 7/8	2 1/8	2 5/8	3 1/8

Size, in.	1 1/4	1 1/2	2	2 1/2	3
Face to face, flanged.	Medium, in. 5 1/4	6 1/4	7 1/4	8 1/4	9 1/4
Ex. Hy., in. 5 1/8	6 1/8	7 1/8	8 1/8	9 1/8	10 1/8
Diam. of flanges.	Medium, in. 4 1/2	5	6	7	8 1/2
Ex. Hy., in. 4 1/4	5 1/4	6 1/4	7 1/4	8 1/4	9 1/4
Thickness of flanges.	Medium, in. 3 1/4	3 3/4	4 1/4	4 3/4	5 1/4
Ex. Hy., in. 3 1/8	3 3/8	3 7/8	4 1/8	4 5/8	5 1/8
Face to face, screw.	Medium, in. 4 1/4	4 3/4	5 1/4	5 3/4	6 1/4
Ex. Hy., in. 4 1/8	4 3/8	4 7/8	5 1/8	5 5/8	6 1/8
Center of body to top of cap.	Medium, in. 2 1/4	2 3/4	3 1/4	3 3/4	4 1/4
Ex. Hy., in. 2 1/8	2 3/8	2 7/8	3 1/8	3 5/8	4 1/8

Double Disc Gate Valves.

Materials—Body and trimmings of "Valve-bronze"; hand wheel of iron.

Patterns—Medium with screw or flange ends for 150 lbs. working steam pressure.

Features—Ball and socket bearing between the discs provides greatest degree of flexibility in seating engagement; all parts renewable; stuffing box repackable under pressure when valve is wide open; pressure can be taken from either end.



DOUBLE DISC
GATE VALVE

DATA, DOUBLE DISC GATE VALVES

Size, in.	1/4	3/8	1/2	3/4	1
Face to face, flanged, in.	2 1/4	3 1/4	3 3/4	4 1/4	5 1/4
Diam. of flanges, in.	2 1/4	3	3 1/4	3 3/4	4 1/4
Thickness of flanges, in.	1 1/4	1 3/4	2 1/4	2 3/4	3 1/4
Face to face, screw, in.	1 7/8	2	2 1/4	2 3/4	3 1/4
Center of body to top of stem, open, in.	4 3/8	4 3/4	5 1/4	6 1/4	7 1/4
Size, in.	1 1/4	1 1/2	2	2 1/2	3
Face to face, flanged, in.	4 1/4	4 3/4	5 1/4	6 1/4	7 1/4
Diam. of flanges, in.	4 1/4	5	6	7	8 1/2
Thickness of flanges, in.	3 1/4	3 3/4	4 1/4	4 3/4	5 1/4
Face to face, screw, in.	2 3/4	3 1/4	3 3/4	4 1/4	5 1/4
Center of body to top of stem, open, in.	8 3/8	9 1/4	11 1/4	14 1/4	16 1/4

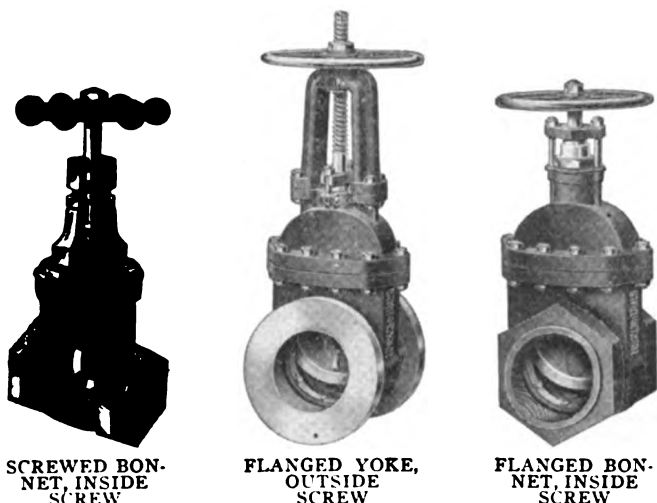
Bronze Wedge Disc Gate Valves.

Materials—Body and trimmings of "Valve-bronze"; hand wheel of iron.

Patterns—Screwed bonnet, inside screw, or screwed yoke, outside screw; medium pattern with screw ends for 200 lbs. and with "B-H" flanged ends for 150 lbs. working steam pressure; extra heavy with screw ends for 300 lbs. and with "B-X" flange ends for 250 lbs. working steam pressure.

Flanged bonnet, inside screw, or flanged yoke, outside screw; medium pattern with screw or flanged ends for 125 lbs. and extra heavy pattern for 250 lbs. working steam pressure.

Features—Double seated, permitting pressure to be taken from either end; stuffing box repackable under pressure when valve is full open; all parts renewable, including the seats on all sizes with exception of $\frac{1}{4}$ to $\frac{3}{4}$ in., inclusive.



SCREWED BONNET, INSIDE SCREW

FLANGED YOKE, OUTSIDE SCREW

FLANGED BONNET, INSIDE SCREW

DATA, SCREWED BONNET, INSIDE SCREW, AND SCREWED YOKE, OUTSIDE SCREW, WEDGE DISC GATE VALVES

Size, in.	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1
Face to face, flanged	Medium, in.	2 $\frac{1}{2}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	4 $\frac{1}{2}$
	Ex. Hy., in.	3 $\frac{1}{2}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	5 $\frac{1}{2}$
Diam. of flanges	Medium, in.	2 $\frac{1}{2}$	3	3 $\frac{3}{4}$	4
	Ex. Hy., in.	3 $\frac{1}{2}$	4	4 $\frac{3}{4}$	5
Thickness of flanges	Medium, in.	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
	Ex. Hy., in.	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
Face to face, screw	Medium, in.	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	3
	Ex. Hy., in.	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	3
Center of body to top of stem, open	Inside screw	4 $\frac{1}{2}$	4 $\frac{1}{2}$	4 $\frac{1}{2}$	5 $\frac{1}{2}$
	Outside screw and yoke	5 $\frac{1}{2}$	5 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$
	Ex. Hy., in.	5 $\frac{1}{2}$	5 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$

Size, in.	1 $\frac{1}{2}$	2	2 $\frac{1}{2}$	3
Face to face, flanged	Medium, in.	4 $\frac{1}{2}$	5 $\frac{1}{4}$	6 $\frac{1}{4}$
	Ex. Hy., in.	5 $\frac{1}{4}$	6 $\frac{1}{4}$	7 $\frac{1}{4}$
Diam. of flanges	Medium, in.	4 $\frac{1}{2}$	5	6
	Ex. Hy., in.	5	6	7
Thickness of flanges	Medium, in.	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
	Ex. Hy., in.	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
Face to face, screw	Medium, in.	3 $\frac{1}{2}$	4 $\frac{1}{4}$	5 $\frac{1}{4}$
	Ex. Hy., in.	4 $\frac{1}{4}$	5 $\frac{1}{4}$	6 $\frac{1}{4}$
Center of body to top of stem, open	Inside screw	7 $\frac{1}{4}$	8 $\frac{1}{4}$	10 $\frac{1}{4}$
	Outside screw and yoke	8 $\frac{1}{4}$	9 $\frac{1}{4}$	11 $\frac{1}{4}$
	Ex. Hy., in.	8 $\frac{1}{4}$	9 $\frac{1}{4}$	11 $\frac{1}{4}$

DATA, FLANGED BONNET, INSIDE SCREW, AND FLANGED YOKE, OUTSIDE SCREW, WEDGE DISC GATE VALVES

Size, in.	2	2 $\frac{1}{2}$	3	3 $\frac{1}{2}$	4
Face to face, flanged	Medium, in.	4 $\frac{1}{2}$	5 $\frac{1}{4}$	6 $\frac{1}{4}$	7 $\frac{1}{4}$
	Ex. Hy., in.	5 $\frac{1}{4}$	6 $\frac{1}{4}$	7 $\frac{1}{4}$	8 $\frac{1}{4}$
Diam. of flanges	Medium, in.	4 $\frac{1}{2}$	5	6	7
	Ex. Hy., in.	5	6	7	8
Thickness of flanges	Medium, in.	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
	Ex. Hy., in.	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
Face to face, screw	Medium, in.	4 $\frac{1}{2}$	5 $\frac{1}{4}$	6 $\frac{1}{4}$	7 $\frac{1}{4}$
	Ex. Hy., in.	5 $\frac{1}{4}$	6 $\frac{1}{4}$	7 $\frac{1}{4}$	8 $\frac{1}{4}$
Center to top of stem, open	Inside screw	10 $\frac{1}{4}$	11 $\frac{1}{4}$	13 $\frac{1}{4}$	15 $\frac{1}{4}$
	Outside screw and yoke	12 $\frac{1}{4}$	14 $\frac{1}{4}$	16 $\frac{1}{4}$	18 $\frac{1}{4}$
	Ex. Hy., in.	12 $\frac{1}{4}$	14 $\frac{1}{4}$	16 $\frac{1}{4}$	18 $\frac{1}{4}$

DATA, FLANGED BONNET, INSIDE SCREW, AND FLANGED YOKE, OUTSIDE SCREW, WEDGE DISC GATE VALVES—Continued

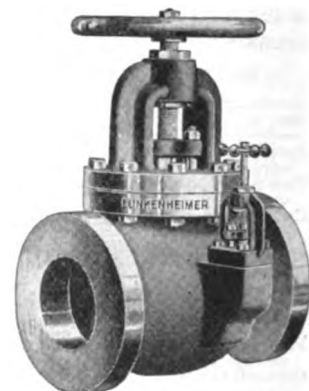
Size, in.	4 $\frac{1}{2}$	5	6	7	8
Face to face, flanged	Medium, in.	7 $\frac{1}{4}$	8 $\frac{1}{4}$	9 $\frac{1}{4}$	10 $\frac{1}{4}$
	Ex. Hy., in.	8 $\frac{1}{4}$	9 $\frac{1}{4}$	10 $\frac{1}{4}$	11 $\frac{1}{4}$
Diam. of flanges	Medium, in.	4 $\frac{1}{2}$	5	6	7
	Ex. Hy., in.	5	6	7	8
Thickness of flanges	Medium, in.	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
	Ex. Hy., in.	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
Face to face, screw	Medium, in.	6 $\frac{1}{2}$	7 $\frac{1}{4}$	8 $\frac{1}{4}$	9 $\frac{1}{4}$
	Ex. Hy., in.	7 $\frac{1}{4}$	8 $\frac{1}{4}$	9 $\frac{1}{4}$	10 $\frac{1}{4}$
Center to top of stem, open	Inside screw	17 $\frac{1}{2}$	18 $\frac{1}{2}$	20 $\frac{1}{2}$	22 $\frac{1}{2}$
	Outside screw and yoke	17 $\frac{1}{2}$	18 $\frac{1}{2}$	20 $\frac{1}{2}$	22 $\frac{1}{2}$
	Ex. Hy., in.	22 $\frac{1}{2}$	23 $\frac{1}{2}$	25 $\frac{1}{2}$	27 $\frac{1}{2}$

Iron Body Flanged Yoke Globe, Angle and Cross Valves.

Materials—Body and yoke of "Valve-iron"; bearing parts of "Valve-bronze." Also furnished with cast steel body, flanged yoke bonnet, and with seat and disc of "Valve-nickel."

Patterns—Standard pattern, sizes 2 to 12 in. inclusive, for 125 lbs. working steam pressure; heavy pattern, sizes 2 to 8 in. inclusive, and with interior by-pass, $3\frac{1}{2}$ to 12 in. inclusive, for 175 lbs. working steam pressure; extra heavy pattern, sizes 2 to 8 in. inclusive, and with interior or exterior by-pass, $3\frac{1}{2}$ to 12 in. inclusive, for 250 lbs. working steam pressure.

Features—Seating surfaces regrindable; all parts renewable, including the seat and disc; self-cleansing seating surfaces; stuffing box repackable under pressure when valve is wide open; flow areas in excess of pipe areas.



IRON BODY FLANGED YOKE GLOBE VALVE WITH EXTERIOR BY-PASS

DATA, FLANGED YOKE GLOBE, ANGLE AND CROSS VALVES

Size, in.	2	2 $\frac{1}{2}$	3	3 $\frac{1}{2}$	4	4 $\frac{1}{2}$
*Face to face, flanged globe	Stand., in.	7 $\frac{1}{2}$	8 $\frac{1}{2}$	9 $\frac{1}{2}$	10 $\frac{1}{2}$	11 $\frac{1}{2}$
	Heavy, in.	9 $\frac{1}{2}$	11	12 $\frac{1}{2}$	13 $\frac{1}{2}$	14 $\frac{1}{2}$
*Center to face, flanged angle or cross	Stand., in.	3 $\frac{1}{2}$	4 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$	7 $\frac{1}{2}$
	Heavy, in.	4 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$	7 $\frac{1}{2}$	8 $\frac{1}{2}$
Diam. of flanges	Stand., in.	6	7	8	9	10
	Hy. and Ex. Hy., in.	6 $\frac{1}{2}$	7 $\frac{1}{2}$	8 $\frac{1}{2}$	9 $\frac{1}{2}$	10 $\frac{1}{2}$
*Thickness of flanges	Stand., in.	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
	Hy. and Ex. Hy., in.	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
Face to face, screw globe	Stand., in.	6 $\frac{1}{2}$	7 $\frac{1}{2}$	8 $\frac{1}{2}$	9 $\frac{1}{2}$	10 $\frac{1}{2}$
	Heavy, in.	7 $\frac{1}{2}$	8 $\frac{1}{2}$	9 $\frac{1}{2}$	10 $\frac{1}{2}$	11 $\frac{1}{2}$
Center to face, screw angle or cross	Stand., in.	3 $\frac{1}{2}$	4 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$	7 $\frac{1}{2}$
	Heavy, in.	4 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$	7 $\frac{1}{2}$	8 $\frac{1}{2}$
Center to top of stem, open	Stand., in.	10 $\frac{1}{2}$	12 $\frac{1}{2}$	13 $\frac{1}{2}$	14 $\frac{1}{2}$	15 $\frac{1}{2}$
	Heavy, in.	11 $\frac{1}{2}$	13 $\frac{1}{2}$	14 $\frac{1}{2}$	15 $\frac{1}{2}$	16 $\frac{1}{2}$
	Ex. Hy., in.	13 $\frac{1}{2}$	14 $\frac{1}{2}$	16 $\frac{1}{2}$	17 $\frac{1}{2}$	18 $\frac{1}{2}$

Size, in.	5	6	7	8	10	12
*Face to face, flanged globe	Stand., in.	12 $\frac{1}{2}$	14 $\frac{1}{2}$	16 $\frac{1}{2}$	19 $\frac{1}{2}$	21 $\frac{1}{2}$
	Heavy, in.	15 $\frac{1}{2}$	17 $\frac{1}{2}$	19 $\frac{1}{2}$	21 $\frac{1}{2}$	23 $\frac{1}{2}$
*Center to face, flanged angle or cross	Stand., in.	6 $\frac{1}{2}$	7 $\frac{1}{2}$	8 $\frac{1}{2}$	9 $\frac{1}{2}$	10 $\frac{1}{2}$
	Heavy, in.	7 $\frac{1}{2}$	8 $\frac{1}{2}$	9 $\frac{1}{2}$	10 $\frac{1}{2}$	11 $\frac{1}{2}$
Diam. of flanges	Stand., in.	10	11	12 $\frac{1}{2}$	13 $\frac{1}{2}$	15
	Hy. and Ex. Hy., in.	11	12 $\frac{1}{2}$	14	15	17 $\frac{1}{2}$
*Thickness of flanges	Stand., in.	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
	Hy. and Ex. Hy., in.	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
Face to face, screw globe	Stand., in.	12 $\frac{1}{2}$	14 $\frac{1}{2}$	16 $\frac{1}{2}$	19 $\frac{1}{2}$	21 $\frac{1}{2}$
	Heavy, in.	14 $\frac{1}{2}$	16 $\frac{1}{2}$	18 $\frac{1}{2}$	20 $\frac{1}{2}$	22 $\frac{1}{2}$
Center to face, screw angle or cross	Stand., in.	6	7 $\frac{1}{2}$	8 $\frac{1}{2}$	9 $\frac{1}{2}$	10 $\frac{1}{2}$
	Heavy, in.	7 $\frac{1}{2}$	8 $\frac{1}{2}$	9 $\frac{1}{2}$	10 $\frac{1}{2}$	11 $\frac{1}{2}$
Center to top of stem, open	Stand., in.	17 $\frac{1}{2}$	19 $\frac{1}{2}$	21 $\frac{1}{2}$	23 $\frac{1}{2}$	25 $\frac{1}{2}$
	Heavy, in.	19 $\frac{1}{2}$	21 $\frac{1}{2}$	23 $\frac{1}{2}$	25 $\frac{1}{2}$	27 $\frac{1}{2}$
	Ex. Hy., in.	23 $\frac{1}{2}$	25 $\frac{1}{2}$	27 $\frac{1}{2}$	29 $\frac{1}{2}$	31 $\frac{1}{2}$

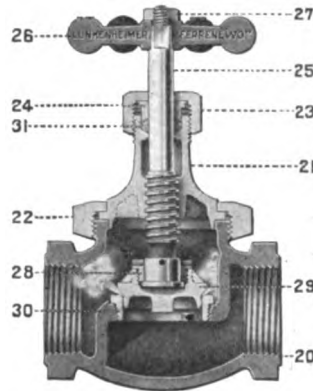
*Heavy and extra heavy valves have $\frac{1}{2}$ -in. raised face on flange ends, which is included in dimensions.

Iron Body "Ferrenewo" Globe, Angle and Cross Valves.

Materials—Body of "Valve-iron"; seat and disc of "Valve-nickel"; hand wheel of iron; other trimmings of "Valve-bronze."

Patterns—Screw ends only. For 150 lbs. working steam pressure.

Features—Self-cleansing seating surfaces; regrindable seating surfaces; all parts renewable, including the nickel seat and disc; stuffing box re-packable under pressure when valve is wide open; flow areas in excess of pipe areas.



"FERRENEWO" GLOBE VALVE

DATA, "FERRENEWO" GLOBE, ANGLE AND CROSS VALVES

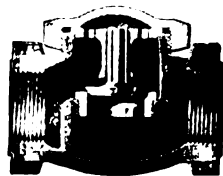
Size, in.	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2
Face to face, screw globe, in.	2 1/4	2 1/2	3	3 1/4	4 1/8	4 3/4	5 1/4	6 1/4
Center to face, screw angle or cross, in.	1 1/4	1 1/2	1 3/4	1 5/8	1 7/8	2 1/4	2 3/4	3

Iron Body "Ferrenewo" Horizontal and Angle Check Valves.

Materials—Body of "Valve-iron"; seat and disc of "Valve-nickel"; disc guide and cap of "Valve-bronze."

Patterns—Screw ends only. For 150 lbs. working steam pressure.

Features—Disc properly guided at both top and bottom insures perfect seating; seating surfaces regrindable; all parts renewable, including the nickel seat and disc; flow areas in excess of pipe areas.



"FERRENEWO" HORIZONTAL CHECK VALVE

DATA, "FERRENEWO" CHECK VALVES

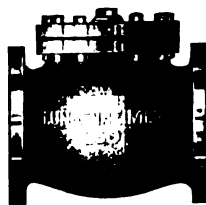
Size, in.	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2
Face to face, screw horizontal, in.	2 1/4	2 1/2	3	3 1/4	4 1/8	4 3/4	5 1/4	6 1/4
Center to face, screw angle, in.	1 1/4	1 1/2	1 3/4	1 5/8	1 7/8	2 1/4	2 3/4	3
Center to top of cap, in.	1 1/4	1 1/2	1 3/4	1 5/8	1 7/8	2 1/4	2 3/4	3 1/4

Iron Body Flanged Cap Horizontal and Angle Check Valves.

Materials—Body and cap of "Valve-iron"; seat, disc and disc guide of "Valve-bronze." Also furnished with seat and disc of "Valve-nickel."

Patterns—Standard pattern, sizes 2 to 12 in. inclusive, for 125 lbs. working steam pressure; extra heavy pattern, sizes 2 to 8 in. inclusive, for 250 lbs. working steam pressure.

Features—Identical with those of the "Ferrenewo."



HORIZONTAL CHECK VALVE

DATA, FLANGED CAP HORIZONTAL AND ANGLE CHECK VALVES

Size, in.	2	2 1/2	3	3 1/2	4	4 1/2
*Face to face, flanged horizontal, in.	Stand., in. 7 1/4	8 1/4	9 1/4	10 1/4	11 1/4	12 1/4
Ex. Hy., in.	9 1/4	11 1/4	12 1/4	13 1/4	14	15
*Center to face, flanged angle, in.	Stand., in. 3 1/4	4 1/4	4 3/4	5 1/4	5 1/2	6 1/4
Ex. Hy., in.	4 1/4	5 1/4	6 1/4	6 3/4	7	7 1/4
Diam. of flanges, in.	Stand., in. 6	7	7 1/2	8 1/2	9	10
Ex. Hy., in.	6 1/2	7 1/2	8 1/4	9	10	10 1/2
*Thickness of flanges, in.	Stand., in. 1 1/4	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4
Ex. Hy., in.	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
Face to face, screw horizontal, in.	Stand., in. 8 1/4	10 1/4	11 1/4	12 1/4	13	14 1/4
Ex. Hy., in.	10 1/4	12 1/4	13 1/4	14 1/4	15 1/4	16 1/4
Face to face, screw angle, in.	Stand., in. 3 1/4	4 1/4	4 3/4	5 1/4	5 1/2	6 1/4
Ex. Hy., in.	4 1/4	5 1/4	6 1/4	6 3/4	7	7 1/4

*Extra heavy valves have 1/4-in. raised face on flange ends, which is included in dimensions.

DATA, FLANGED CAP HORIZONTAL AND ANGLE CHECK VALVES—Continued

Size, in.	5	6	7	8	10	12
*Face to face, flanged horizontal, in.	Stand., in. 12 3/4	14 3/4	16 1/4	19 1/4	24 1/4	27 1/4
Ex. Hy., in.	15 3/4	17 1/4	19 1/4	21 1/4	24 1/4	27 1/4
*Center to face, flanged angle, in.	Stand., in. 6 3/4	7 1/4	8 1/4	9 1/4	10 1/4	12
Ex. Hy., in.	7 3/4	8 3/4	9 3/4	10 3/4	11 3/4	13
Diam. of flanges, in.	Stand., in. 10	11	12 1/2	13 1/2	16	19
Ex. Hy., in.	11	12 1/2	14	15	17 1/2	20 1/2
*Thickness of flanges, in.	Stand., in. 1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Ex. Hy., in.	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
Face to face, screw horizontal, in.	Stand., in. 12	13 1/4	14 1/4	15 1/4	17 1/4	19 1/4
Ex. Hy., in.	14 1/4	15 1/4	16 1/4	17 1/4	19 1/4	21 1/4
Face to face, screw angle, in.	Stand., in. 6	6 1/4	6 1/4	6 1/4	6 1/4	6 1/4
Ex. Hy., in.	6 1/4	6 3/4	6 3/4	6 3/4	6 3/4	6 3/4

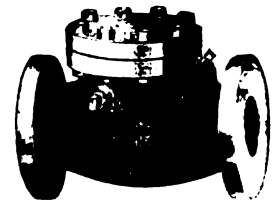
*Extra heavy valves have 1/4-in. raised face on flange ends, which is included in dimensions.

Iron Body Flanged Cap Swing Check Valves.

Materials—Body and cap of "Valve-iron"; bearing parts of "Valve-bronze." Also procurable with steel body and cap. Seat and disc may be had of "Valve-nickel."

Patterns—Standard pattern for 125 lbs. working steam pressure; extra heavy for 250 lbs. working steam pressure. Screw or flange ends.

Features—Practically straightway flow channel. Two bronze side plugs provided as disc-carrier bearings which are renewable, as are all other parts; seating surfaces regrindable.



FLANGED CAP SWING CHECK VALVE

DATA, FLANGED CAP SWING CHECK VALVES

Size, in.	2	2 1/2	3	3 1/2	4
*Face to face, flanged, in.	Stand., in. 8	9	10 1/4	10 1/4	11 1/4
Ex. Hy., in.	10 1/4	11 1/4	12 1/4	13 1/4	14 1/4
Diam. of flanges, in.	Stand., in. 6 1/2	7 1/2	8 1/2	9	10
Ex. Hy., in.	6 3/4	7 3/4	8 3/4	9 1/4	10 1/4
*Thickness of flanges, in.	Stand., in. 1 1/4	1 1/2	1 1/2	1 1/2	1 1/2
Ex. Hy., in.	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4
Face to face, screw, in.	Stand., in. 5 1/4	7	7 1/4	9	9 1/4
Ex. Hy., in.	7 1/4	9 1/4	9 1/4	10 1/4	10 1/4
Center of body to top of cap bolts, in.	Stand., in. 4 1/4	5 1/4	5 1/4	6 1/4	6 1/4
Ex. Hy., in.	5 1/4	6 1/4	6 1/4	7 1/4	7 1/4

Size, in.	4 1/2	5	6	7	8
*Face to face, flanged, in.	Stand., in. 12 3/4	13 1/4	14 1/4	15 1/4	17 1/4
Ex. Hy., in.	15 3/4	16 1/4	18	20	21 1/4
Diam. of flanges, in.	Stand., in. 9 1/4	10 1/4	11	12 1/4	13 1/4
Ex. Hy., in.	10 1/4	11 1/4	12 1/4	14	15 1/4
*Thickness of flanges, in.	Stand., in. 1 1/4	1 1/2	1 1/2	1 1/2	1 1/2
Ex. Hy., in.	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4
Face to face, screw, in.	Stand., in. 10 1/4	11 1/4	12 1/4	13 1/4	14 1/4
Ex. Hy., in.	12 1/4	13 1/4	14 1/4	15 1/4	16 1/4
Center of body to top of cap bolts, in.	Stand., in. 7 1/4	7 1/4	8 1/4	9 1/4	10 1/4
Ex. Hy., in.	7 1/4	8 1/4	9 1/4	10 1/4	11 1/4

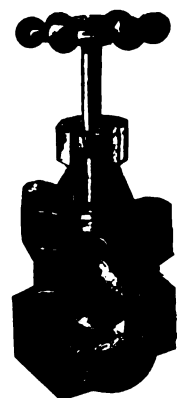
*Extra heavy flanges have 1/4-in. raised face, which is included in dimensions.

Iron Body "Clip" Gate Valves.

Materials—Body and bonnet of "Valve-iron"; bearing parts of "Valve-bronze."

Patterns—Screw or flange ends. Inside screw pattern for 100 lbs. working steam pressure; quick opening pattern, with lever, for 50 lbs. working steam pressure.

Features—Wedge disc, double seated, permitting pressure to be taken from either side; steel clip, surrounding body, facilitates taking apart for cleaning or repairing and adds strength to the body; short face to face dimensions of body; few parts.



"CLIP" GATE VALVE

DATA, "CLIP" GATE VALVES

Size, in.	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2
Face to face, flanged, in.	3 1/4	3 3/4	3 3/4	4	4 1/4	4 1/4	4 1/4
Diam. of flanges, in.	4	4 1/4	4 1/4	5	5	6	7
Thickness of flanges, in.	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Face to face, screw, in.	2	2 1/4	2 1/4	2 1/4	3 1/4	3 1/4	4
Center of body to top of stem, open, in.	4 1/4	5 1/4	6 1/4	7 1/4	8 1/4	9 1/4	12 1/4

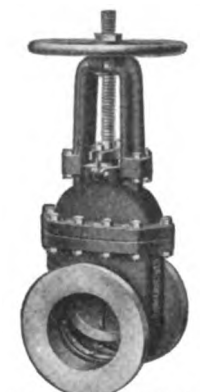
DATA, "CLIP" GATE VALVES—Continued

Size, in.	3	3½	4	4½	5	6
Face to face, flanged, in.	5 1/4	5 1/2	6 1/4	7 1/4	7 3/4	8 3/4
Diam. of flanges, in.	7 1/2	8 1/2	9	9 1/2	10	11
Thickness of flanges, in.	3/4	1	1 1/4	1 1/2	1 3/4	2
Face to face, screw, in.	4 3/4	5	5 3/4	6 3/4	6 3/4	7 1/4
Center of body to top of stem, open, in.	15 1/4	17	18 3/4	20 3/4	22 1/2	25 3/4

Iron Body "Victor" Gate Valves.

Materials—Body, bonnet or yoke of "Valve-iron"; bearing parts of "Valve-bronze." Can be procured with seat and disc of "Valve-nickel," or body, yoke or bonnet of cast steel.

Patterns—Standard pattern, sizes 2 to 8 in. inclusive, for 125 lbs. working steam pressure, and sizes 10 to 24 in. inclusive, for 100 lbs. working steam pressure; medium pattern, sizes 2 to 24 in. inclusive, for 125 lbs. working steam pressure; heavy pattern, sizes 2 to 16 in. inclusive, for 175 lbs. working steam pressure; extra heavy pattern, sizes 1½ to 16 in. inclusive, for 250 lbs. working steam pressure. Flange ends in all sizes. Can be had with by-pass in 5-in. and larger sizes. Made with inside screw stationary stem and outside screw rising stem. Can be procured in sliding stem pattern for quick opening and closing; with angle outlet; stationary stem pattern with indicator to show degree of opening; with gear, hydraulic or electrical control.



OUTSIDE SCREW AND YOKE



INSIDE SCREW STATIONARY STEM

Features—Wedge disc, double seated, permitting pressure to be taken from either end; all parts renewable, including the seats and disc; stuffing box repackable under pressure when valve is wide open.

DATA, "VICTOR" GATE VALVES

Size, in.	1½	2	2½	3	3½	4	4½	5	6	7	8
*Face to face, flanged, in.	Stand., in.	5	5 1/2	5 3/4	6 1/4	7 1/4	7 3/4	8 1/4	9 1/4	9 3/4	10 3/4
	Medium, in.	5 1/4	5 1/2	5 3/4	6 1/4	7 1/4	7 3/4	8 1/4	9 1/4	9 3/4	10 3/4
	Heavy, in.	6 1/4	6 1/2	6 3/4	7 1/4	8 1/4	8 3/4	9 1/4	10 1/4	10 3/4	11 3/4
	Ex. Hy., in.	5 3/4	6 1/4	6 3/4	7 1/4	8 1/4	8 3/4	9 1/4	10 1/4	10 3/4	11 3/4
Diam. of flanges, in.	Stand. and Med., in.	6	7	7 1/2	8 1/2	9	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2
	Hy. and Ex. Hy., in.	6	7	7 1/2	8 1/2	9	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2
	Stand. and Med., in.	6	7	7 1/2	8 1/2	9	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2
	Hy. and Ex. Hy., in.	6	7	7 1/2	8 1/2	9	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2
*Thickness of flanges, in.	Stand., in.	1 1/4	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
	Medium, in.	1 1/4	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
	Heavy, in.	1 1/4	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
	Ex. Hy., in.	1 1/4	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
Face to face, screw, in.	Stand., in.	4 1/4	4 1/2	4 3/4	5 1/4	5 3/4	6 1/4	6 3/4	7 1/4	7 3/4	8 1/4
	Medium, in.	4 1/4	4 1/2	4 3/4	5 1/4	5 3/4	6 1/4	6 3/4	7 1/4	7 3/4	8 1/4
	Heavy, in.	4 1/4	4 1/2	4 3/4	5 1/4	5 3/4	6 1/4	6 3/4	7 1/4	7 3/4	8 1/4
	Ex. Hy., in.	4 1/4	4 1/2	4 3/4	5 1/4	5 3/4	6 1/4	6 3/4	7 1/4	7 3/4	8 1/4
Center of body to top of stem, open, outside screw and yoke, in.	Stand., in.	12 1/4	14 1/4	16 1/4	18 1/4	19 1/4	21 1/4	22 1/4	25 1/4	29 1/4	33 1/4
	Medium, in.	12 1/4	14 1/4	16 1/4	18 1/4	19 1/4	21 1/4	22 1/4	25 1/4	29 1/4	33 1/4
	Heavy, in.	12 1/4	14 1/4	16 1/4	18 1/4	19 1/4	21 1/4	22 1/4	25 1/4	29 1/4	33 1/4
	Ex. Hy., in.	12 1/4	14 1/4	16 1/4	18 1/4	19 1/4	21 1/4	22 1/4	25 1/4	29 1/4	33 1/4
Center of body to top of stem, inside screw, in.	Stand., in.	9 1/4	11 1/4	13 1/4	15 1/4	17 1/4	18 1/4	20 1/4	22 1/4	25 1/4	28 1/4
	Medium, in.	10 1/4	12 1/4	14 1/4	16 1/4	18 1/4	19 1/4	21 1/4	24 1/4	27 1/4	30 1/4
	Heavy, in.	10 1/4	12 1/4	14 1/4	16 1/4	18 1/4	19 1/4	21 1/4	24 1/4	27 1/4	30 1/4
	Ex. Hy., in.	10 1/4	12 1/4	14 1/4	16 1/4	18 1/4	19 1/4	21 1/4	24 1/4	27 1/4	30 1/4

Size, in.	10	12	14	15	16	18	20	22	24
*Face to face, flanged, in.	Stand., in.	10 1/4	11 1/4	13 1/4	14 1/4	16 1/4	17 1/4	18 1/4	19 1/4
	Medium, in.	14 1/4	15 1/4	16 1/4	17 1/4	18 1/4	19 1/4	20 1/4	21 1/4
	Heavy, in.	15 1/4	16 1/4	17 1/4	18 1/4	19 1/4	20 1/4	21 1/4	22 1/4
	Ex. Hy., in.	19 1/4	21 1/4	23 1/4	24 1/4	25 1/4	26 1/4	27 1/4	28 1/4
Diam. of flanges, in.	Stand. and Med., in.	16	19	21	22 1/2	23 1/2	25	27 1/2	29 1/2
	Hy. and Ex. Hy., in.	17 1/2	20 1/2	22 1/2	24 1/2	25 1/2	27 1/2	29 1/2	32
	Stand. and Med., in.	16	19	21	22 1/2	23 1/2	25	27 1/2	29 1/2
	Hy. and Ex. Hy., in.	17 1/2	20 1/2	22 1/2	24 1/2	25 1/2	27 1/2	29 1/2	32
*Thickness of flanges, in.	Stand., in.	1 1/4	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
	Medium, in.	1 1/4	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
	Heavy, in.	1 1/4	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
	Ex. Hy., in.	1 1/4	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
Center of body to top of stem, open, outside screw and yoke, in.	Stand., in.	45 3/4	53 3/4	61 3/4	64 3/4	69	75 3/4	83 3/4	90 3/4
	Medium, in.	47	54 3/4	62 3/4	66 3/4	70 3/4	77 3/4	85 3/4	92 3/4
	Heavy, in.	47	54 3/4	62 3/4	66 3/4	70 3/4	77 3/4	85 3/4	92 3/4
	Ex. Hy., in.	47	54 3/4	62 3/4	66 3/4	70 3/4	77 3/4	85 3/4	92 3/4
Center of body to top of stem, inside screw, in.	Stand., in.	30 3/4	34 3/4	38 3/4	39 3/4	41 3/4	46 3/4	51 3/4	56 3/4
	Medium, in.	30 3/4	34 3/4	38 3/4	39 3/4	41 3/4	46 3/4	51 3/4	56 3/4
	Heavy, in.	30 3/4	34 3/4	38 3/4	39 3/4	41 3/4	46 3/4	51 3/4	56 3/4
	Ex. Hy., in.	30 3/4	34 3/4	38 3/4	39 3/4	41 3/4	46 3/4	51 3/4	56 3/4

*Heavy and extra heavy valves have 1/4-in. raised face on flange ends, which is included in dimensions.

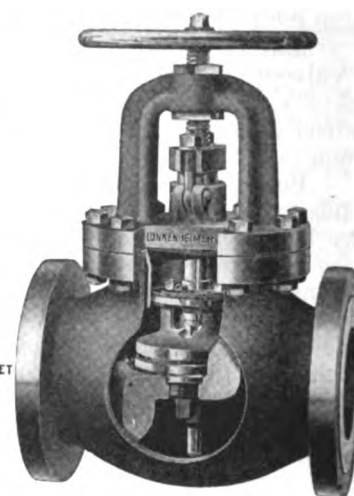
SWEET'S CATALOGUE

Iron Body Balanced Throttle Valves.

Materials—Body and yoke of "Valve-iron"; bearing parts of "Valve-bronze." Can be procured with seat and disc of "Valve-nickel," or body and yoke can be had of cast steel.

Patterns—Globe or angle patterns with flange ends only, sizes 4 to 8 in., for 250 lbs. working steam pressure.

Features—Simplicity of construction combined with efficiency make these valves particularly adapted for engine throttling purposes. Interior by-pass facilitates operation; spring seating surfaces accommodate themselves to any slight distortions caused by expansion and contraction; seating surfaces regrindable; all parts renewable, including seat and disc; can be connected with stem pointing vertically upward or horizontally.



BALANCED THROTTLE VALVE

DATA, BALANCED THROTTLE VALVE

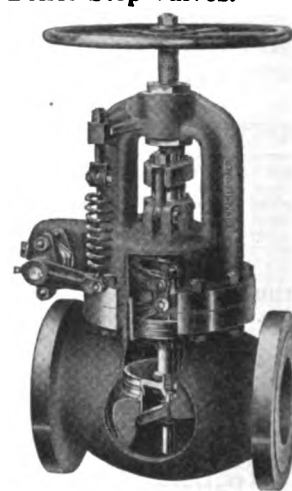
Size, in.	4	4½	5	6	7	8
Face to face, flanged globe, in.	14	15	15 1/4	17 1/2	19 1/4	21 3/4
Center to face, flanged angle, in.	7	7 1/2	7 3/4	8 3/4	9 3/4	10 1/2
Diam. of flanges, in.	10	10 1/2	11	12 1/2	14	15
Thickness of flanges, in.	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Center of body to top of stem, open, in.	17 1/2	18 3/4	19 3/4	21 3/4	23 1/4	26 1/4

Iron Body Safety Non-return Boiler Stop Valves.

Materials—Body and yoke of "Valve-iron"; bearing parts of "Valve-bronze." Can be procured with seat and disc of "Valve-nickel," or body and yoke can be had of cast steel.

Patterns—Globe or angle patterns with screw ends in sizes 3 to 4 in., inclusive, or flange ends in sizes 3 to 10 in., inclusive, for 250 lbs. working steam pressure.

Features—Will automatically close and instantly cut out the boiler in battery to which it is connected should the pressure within the boiler suddenly drop below that in the header; permits continued operation of other boilers in battery; will not open until pressure in boiler equals that in header; can be connected with stem pointing vertically upward or horizontally; self-cleansing seating surfaces; seating faces regrindable; all parts renewable, including seat and disc.



SAFETY NON-RETURN BOILER STOP VALVE

DATA, SAFETY NON-RETURN BOILER STOP VALVES

Size, in.	3	3½	4	4½	5	6	7	8	10
Face to face, flanged globe, in.	12 1/2	13 1/2	14	15	15 1/4	17 1/2	19 1/4	21 3/4	25 3/4
Center to face, flanged angle, in.	6 1/4	6 1/4	7	7 1/2	7 3/4	8 3/4	9 3/4	10 1/2	12 1/2
Diam. of flanges, in.	8 1/2	9	10	10 1/2	11	12 1/2	14	15	17 1/2
Thickness of flanges, in.	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Face to face, screw globe, in.	11 1/4	12 1/4	13	14	14 1/4	16 1/4	18 1/4	20 1/4	24 1/4
Center to face, screw angle, in.	5 1/4	6 1/4	6 1/4	7	7 1/4	8 1/4	9 1/4	10 1/4	12 1/4
Center of body to top of stem, open, in.	18 1/2	20 1/2	22 1/2	23 1/2	25 1/2	27 1/2	31 1/2	33 1/2	40 1/2

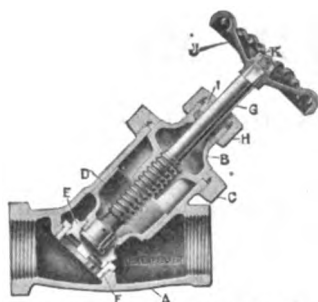
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Bronze "Renewo" Straightway Blow-off Valves.

Materials—Seat and disc of "Valve-nickel"; hand wheel of iron; other trimmings and body of "Valve-bronze."

Patterns—Medium with screw ends for 200 lbs. and "B-H" flange ends for 150 lbs. working steam pressure; extra heavy with screw ends for 300 lbs. and "B-X" flange ends for 250 lbs. working steam pressure.

Features—Self-cleansing seating surfaces; re-grindable seating surfaces; all parts renewable, including nickel seat and disc; stuffing box repackable under pressure when valve is wide open.



"RENEWO" STRAIGHTWAY BLOW-OFF VALVE

DATA, "RENEWO" STRAIGHTWAY BLOW-OFF VALVE

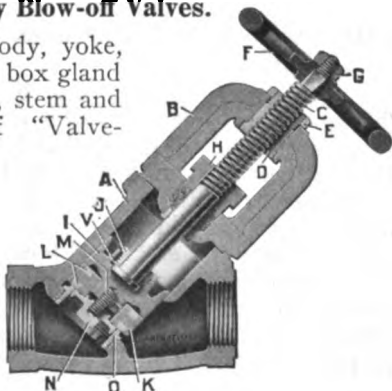
Size, in.	¾	1	1½	2	2½
Face to face, flanged.	Medium, in. 6¼	6¾	7½	8¼	10
	Ex. Hy., in. 7¼	7¾	8½	9½	10¾
Diam. of flanges.	Medium, in. 4	4½	5	6	7
	Ex. Hy., in. 4½	5	6	6½	7½
Thickness of flanges.	Medium, in. ¾	¾	1	1½	1½
	Ex. Hy., in. ¾	¾	1	1½	1½
Face to face, female, screw.	Medium, in. 3½	4½	5½	7	8
	Ex. Hy., in. 3½	4½	5½	7	8
Face of female screw end to end of handwheel, open.	Medium, in. 3¾	3¾	3¾	4½	6
	Ex. Hy., in. 3¾	3¾	3¾	4½	6
Center of body to top of stem, open.	Medium, in. 5¼	6¼	7¼	8	9½
	Ex. Hy., in. 5¼	6¼	7¼	8	9½

Iron Body Straightway Blow-off Valves.

Materials—Body, yoke, disc-guide and stuffing box gland of "Valve-iron"; seat, stem and stem bushings of "Valve-bronze"; iron disc with alloy faces.

Patterns—Standard for 125 lbs. and extra heavy for 250 lbs. working steam pressures. Screw or flange ends.

Features—Self-cleansing seating surfaces, reversible disc provided with two seating faces; disc face alloy can be renewed when worn; all parts including the seat are renewable.



IRON BODY STRAIGHTWAY BLOW-OFF VALVE

DATA, IRON BODY STRAIGHTWAY BLOW-OFF VALVES

Size, in.	2	2½
Face to face, flanged, standard, in.	10½	11½
Diam. of flanges, standard, in.	6	7
Thickness of flanges, standard, in.	¾	1
Face to face, screw, standard, in.	7½	9½
Center of body to top of hand wheel, open, standard, in.	12	13½

Iron Body "Duro" Blow-off Valves.

Materials—Body and yoke of "Valve-iron"; bearing parts of "Valve-bronze."

Patterns—Screw or flange ends for 250 lbs. working steam pressure.

Features—Self-cleansing seating surfaces; disc reversible and pro-



"DURO" BLOW-OFF AND "VICTOR" GATE VALVE COMBINATION

vided with two alloy faces, which can be melted out and new alloy inserted; all parts renewable, including seat.

A combination extensively used is that of the "Duro" with a "Victor" gate valve bolted between it and the boiler. The gate valve serves as a safety device in event of accident to the blow-off valve and enables re-pairing of the latter while the boiler is under pressure.

DATA, "DURO" BLOW-OFF VALVES

Size, in.	1½	1½	2	2½
Center to face, flanged, in.	3¾	4	4¾	5¼
Diam. of flanges, in.	5	6	6½	7½
Thickness of flanges, in.	¾	¾	¾	1
Center to face, screw, in.	2¾	2¾	4¾	4¾
Center of body to top of stem, open, in.	12	13½	15	18



"DURO" BLOW-OFF VALVE

Iron Body "Vigilant" Safety Water Columns.

Materials—Body and cap of "Valve-iron"; float of seamless copper, and trimmings of "Valve-bronze."

Patterns—Made in various sizes to suit connections for all types of boilers. For 250 lbs. working steam pressure.

Features—Will notify the attendant by automatically blowing a whistle when the water within the boiler approaches the low or high danger limits; aids in keeping the water level within the proper limits, thereby prolonging the life of the boiler and effecting an appreciable saving in fuel; simple in design and exceptionally durable; provided with a sediment chamber to trap scale or dirt, preventing same from being carried to water gage and gage cocks and interfering with their proper operation; only one float used, made of seamless copper and warranted to withstand a pressure greatly in excess of 250 lbs.; all parts renewable.



"VIGILANT" WATER COLUMN

DATA, "VIGILANT" SAFETY WATER COLUMNS

Number.	4	5	6	7	8	9	11	12
Height over all, in.	30½	35½	35½	40½	51½	49½	43½	43½
Center to center of water gage connections, in.	12	15	15	18	24	20	18	16
Center to center of gage cock connection, in.	3	4	4	5	7½	4	4	4
Size of steam and water connections, Nos. 4 to 8, in.	1	1¼	1¼	1¼	1½	.....	.....	.....
Diam. of flanges, water and steam connections, in. ....	.....	.....	.....	.....	.....	6	6	6
Water gage connections, in.	¾	¾	¾	¾	¾	¾	¾	¾
Gage cock connections, in.	¾	¾	¾	¾	¾	¾	¾	¾

ESTABLISHED 1854

INCORPORATED 1871

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Manufacturers of Valves and Fittings, Etc.

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The quality of the materials used in the manufacture of McNab & Harlin brass and iron valves and fittings is determined by daily chemical and physical analysis, and these tests furnish invaluable data for the production of a uniform product.

Steam metal, or hard brass, used in the manufacture of these valves, valve seats and disks, has a tensile strength of 33,000 lbs. per sq. in., and is particularly adapted for high pressure and unusually severe service.

Equipment and Facilities.

The installation of modern machinery and efficient methods enable this company to manufacture valves and fittings in the most satisfactory manner and with the least possible delay. A large and complete stock of all staple goods is carried at the factory at Paterson, N. J., insuring prompt shipments of all orders.

McNab & Harlin Patented Improved 1916 Type of Iron Body Gate Valve.

Furnished in sizes 2 to 14 in. inclusive, for 125 lbs. pressure, either inside screw or outside screw and yoke pattern.

For 250 lbs. pressure, outside screw and yoke pattern only.

These valves are of the double disk parallel seat type which has been designed and patented by this company after exhaustive research and experimental work.

Instead of having one central wedge to spread the disks against the seats at time of closing, they have two wedges, which more effectively transmit the lateral pressure exerted on the faces of the disks at the point of closing, thus insuring an absolutely tight valve. The design of the disk is such as to prevent warping or getting out of shape, due to temperature changes; they are equipped with lugs on the side, which operate in guides cast in the body of the valve, eliminating wear on the disks and seats due to friction in the operation of opening and closing, thus insuring a valve of longer life in service.

The disk rings and seat rings of these valves are made of Aterite metal, which is a patented non-corrosive alloy of great strength and density. This metal



TRADE-MARK

is approximately twice as strong as brass or bronze compositions at present used in the manufacture of disk rings and seat rings in gate valves. In addition to this, Aterite is proof against the corrosive action of most of the common acids and alkalis.

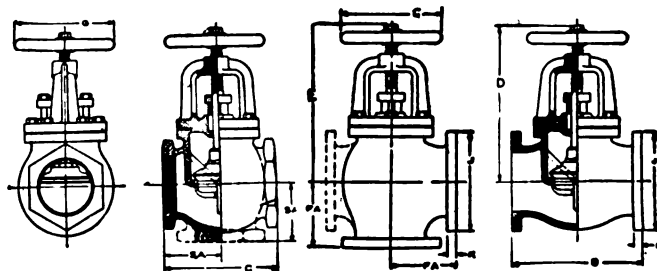
Valves equipped with disk rings and seat rings of this metal are particularly adapted for oil refinery work, as Aterite is proof against the corrosive action of sulphur and sulphurous compounds occurring in crude oil. Thousands of these valves are being furnished to different oil refining companies in this country and the valves are giving perfect satisfaction.

A special booklet, giving a detailed and complete description of these valves, as well as all Aterite valves, cocks and fittings, is issued by this company and will be sent on request.

Extra Heavy Iron Body Globe, Angle and Straightway Valves.

Constructed from a new line of patterns for 250 lbs. per sq. in. steam working pressure. Disk and seat rings are made of special hard metal faced true. All these valves are made to open by turning to the left. Wearing parts can be renewed, and seats can be easily and quickly reground. Valves can be packed when open without any escape of flow.

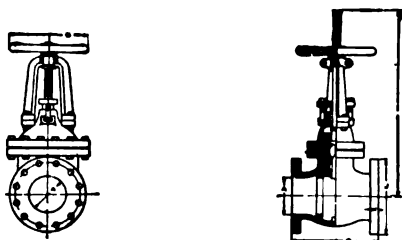
Diameters of flanges, thickness, bolt circle, size and number of bolts, of extra heavy valves and flanged fittings, are the standard adopted by all leading manufacturers on Jan. 1, 1915.



EXTRA HEAVY IRON BODY, GLOBE, ANGLE AND CROSS VALVES, BOLTED BONNET

Size, in.	B	C	FA	SA	D	E	G	J	K	Turns to open	Size by-pass
2	10 1/2	9 1/2	5 1/4	4 3/4	11 1/4	11 1/4	7 1/2	6 1/2	3/8	4	..
2 1/2	11 1/2	10 1/2	5 3/4	5 1/4	12 1/4	12 1/4	7 1/2	7 1/2	1	4 1/2	..
3	12 1/2	11 1/2	6 1/4	5 3/4	14 1/4	14 1/4	9	8 1/2	1 1/4	4	..
3 1/2	13 1/2	12 1/2	6 3/4	6 1/4	16	16	9	9	1 1/4	4 1/2	..
4	14	13	7	6 1/2	17 1/4	17 1/4	10	10	1 1/2	5	..
4 1/2	15	14	7 1/2	7	17 1/2	17 1/2	10	10 1/2	1 1/2	6	..
5	15 1/2	15	7 3/4	7 1/2	19	19	12	11	1 1/2	7	..
6	17 1/2	16 1/2	8 1/4	8 1/4	21 1/4	21 1/4	14	12 1/2	1 1/2	8	1 1/2
7	19 1/2	..	9 1/4	..	23 1/4	23 1/4	16	14	1 1/2	9	1 1/2
8	21	..	10 1/2	..	26 1/4	26 1/4	18	15	1 1/2	10 1/2	1 1/2
10	24 1/2	..	12 1/4	..	30	30	20	17 1/2	1 1/2	12	1 1/2
12	28	..	14	..	33 1/2	33 1/2	20	20 1/2	2	10 1/2	2

For steam working pressures up to 250 lbs. Valves 6 in. and larger made with by-pass to order at special prices.



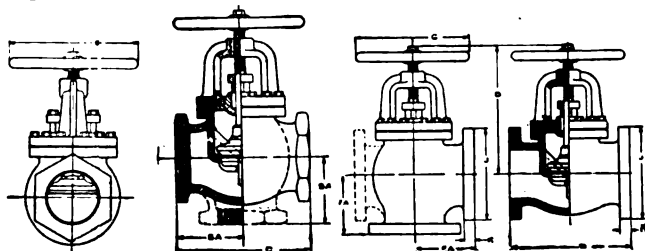
EXTRA HEAVY IRON BODY STRAIGHTWAY VALVES, BOLTED BONNET, DOUBLE GATE

Size, in.—A	B	C	G	I	J	K	Turns to open	Size by-pass
2	8½	7	6½	14½	6½	¾	15	.....
2½	9½	8	7½	16½	7½	1	15	.....
3	11½	9	9	19½	8½	1½	13	.....
3½	11½	10	11	21½	9	1½	16	.....
4	12	11	12	24½	10	1½	17	.....
4½	13½	12½	12	26½	10½	1½	20	.....
5	15	13½	14	28½	11	1½	22	.....
6	15½	15½	16	32½	12½	1½	25	1½
7	16½	16½	18	35½	14	1½	30	1½
8	16½	16½	20	41½	15	1½	33	1½
10	18	18	22	50½	17½	1½	36	1½
12	19½	24	24	57½	20½	2	44	2

End to end—screwed.
For steam working pressures up to 250 lbs. Valves 6 in. and larger made with by-pass to order at special prices.

Medium Iron Body Valves.

This new line takes the place of the old style throttle valve and is carefully designed to meet all requirements of 175 lbs. steam working pressure.



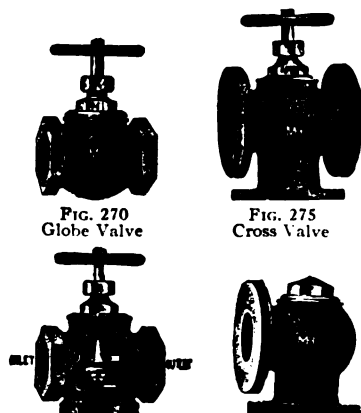
MEDIUM IRON BODY ENGINE THROTTLE VALVES, GLOBE OR ANGLE, BOLTED BONNET

Size, in.	B	C	FA	SA	D	G	J	K
2	9	7¾	4½	3¾	10¾	7½	6½	¾
2½	10	8	5	4½	11½	7½	7½	1
3	11	8½	5½	4½	12½	7½	8½	1½
3½	12	9½	6	4½	14½	9	9	1½
4	13	10½	6½	5½	15½	9	10	1½
4½	13½	11½	6½	5½	16½	9	10½	1½
5	14½	12½	7½	6½	17½	10	11	1½
6	16	14	8	7	19½	12	12½	1½
7	17½	15	8½	8½	22½	14	14	1½
8	20	18½	10	9½	24½	16	15	1½
10	22½	22½	11½	11½	27½	18	17½	1½
12	25½	25½	12½	12½	31½	20	20½	2

For steam working pressures up to 175 lbs.

Standard Iron Body Brass Mounted Valves.

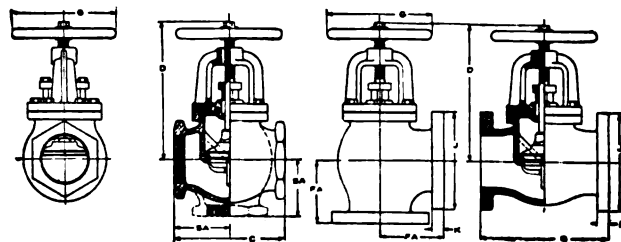
For steam working pressures up to 125 lbs. Construction is such that they can be packed when open without any escape of flow, a fact that all practical users can appreciate. To do so, the valve must be wide open.

FIG. 270
Globe ValveFIG. 275
Cross ValveFIG. 276
3-way Valve
STANDARD IRON BODY VALVES
For steam working pressures up to 125 lbs.FIG. 302
Angle Check

DIMENSION DIAGRAM
For standard iron body, brass mounted, screw bonnet, globe, angle, cross and check valves

DIMENSIONS, STANDARD IRON BODY BRASS MOUNTED GLOBE, ANGLE, CROSS AND CHECK VALVES

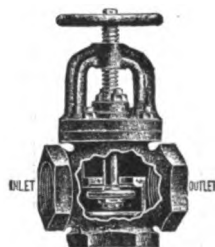
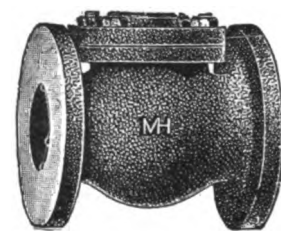
Size, in.	B	C	FA	SA	D	G	J	K
1½	4½	4½	3½	2½	5½	3½	4½	½
1½	5½	5½	3½	2½	6½	3½	5	½
2	6	6½	4	3½	7½	4½	6	¾
2½	8½	7	4½	3½	8½	6	7	¾
3	9½	8	4½	4	9½	7	7½	¾



STANDARD IRON BODY GLOBE, ANGLE AND CROSS VALVES, BOLTED BONNET

Size, in.	B	C	FA	SA	D	G	J	K	Turns to open
2	8	6½	4	3½	10½	6½	6	¾	4½
2½	8½	7	4½	3½	11	6½	7	¾	4½
3	9½	8	4½	4	12½	7½	7½	¾	5
3½	10½	9	5½	4½	13½	7½	8½	¾	5
4	11½	10	5½	5	15½	9	9	¾	6
4½	12	10½	5½	5½	16½	9	9½	¾	6
5	13	11½	6½	5½	17½	10	10	¾	8
6	14	13	7	6½	17½	12	11	¾	9
7	16	14½	8	7½	21½	14	12½	1½	10½
8	17	16	8½	8	23	16	13½	1½	12
10	20	18½	10	9½	26½	18	16	1½	14
12	24	21½	12	10½	30	20	19	1½	14

For steam working pressures up to 125 lbs. Valves 6 in. and larger made with by-pass to order at special price.

FIG. 287
3-way Valve
FIG. 288. FlangedFIG. 305
Horizontal Check Valve

STANDARD IRON BODY VALVES, BOLTED BONNET

FIG. 287

Size, in.	2	2½	3	3½	4	5	6	8	10
End to end, screwed.....	6¾	7	7½	8¾	11	11	12¾	15	17
Center to bottom outlet, screwed.....	3½	3½	3½	4½	5½	5½	6½	8	10

FIG. 288

Diam. of flgs.....	6	7	7½	8½	9	10	11	13½	16
Face to face, figd.....	6	7½	8	9½	11	12	13½	16½	20
Center to face, bottom outlet, figd.....	4½	5	5½	6½	7	7½	7¾	9½	10

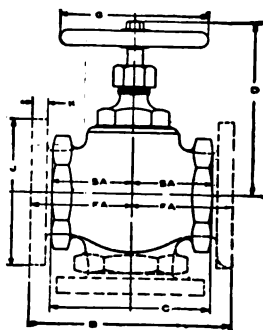
FIG. 305

Diam. of flgs.....	6	7	7½	8½	9	9½	10	11	12½	13½	16	19
Horiz. face to face.....	8	8½	9½	10½	11½	12	13	14	16	17	20	24
Angle center to face.....	4	4½	4¾	5½	5¾	6	6½	7	8	8½	10	12

"Jenkins Type" Disk Valves.FIG. 277
"JENKINS TYPE" DISK GLOBEFIG. 278
ANGLE VALVE

DIMENSIONS, STANDARD JENKINS TYPE DISK IRON BODY GLOBE, ANGLE AND CROSS VALVES

Size, in.	1½	1½	2	2½	3
B	4½	4½	7½	9½	10
C	4½	4½	6½	8½	8½
FA	2½	2½	3½	4½	5
SA	2½	2½	3½	4½	4½
D	7½	7½	8½	9½	11
G	3½	3½	4½	6	7
J	6	6	7	7½	7½
K	¾	¾	¾	¾	¾



DIMENSION DIAGRAM
For "Jenkins Type" disk I. B. brass mounted, screwed bonnet globe, angle, cross and check valves

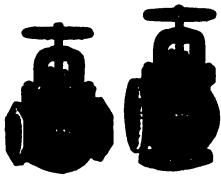
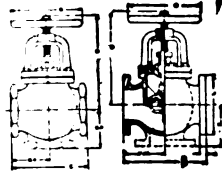


FIG. 289 FIG. 290
For steam pressures up to 125 lbs.



Dimension Diagram

"JENKINS TYPE" DISK IRON BODY VALVES

Size, in.—A	B	Flgd.	C	Serd.	FA	SA	D	G	J	K
2½	7½	7½	4½	4½	4½	4½	11½	6½	7	1½
3	9½	9½	4½	4½	4½	4½	12½	7½	7½	1½
3½	10	10	5½	5½	5½	5½	13	8½	8½	1½
4	11½	11½	5½	5½	5½	5½	14½	9	9	1½
5	13½	13½	6½	6½	6½	6½	16½	10	10	1½
6	16	16	7	7	7	7	18	12	11	1½
7	16½	16½	8½	8½	8½	8½	20½	14	12½	1½
8	18½	18½	9½	9½	9½	9½	22½	16	13½	1½

Standard Straightway Valves.

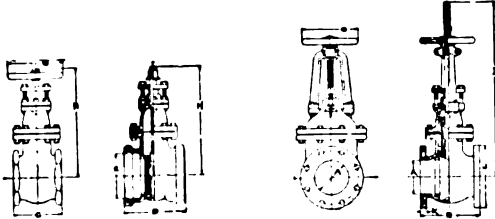


FIG. 325 FIG. 343 FIG. 328
For steam working pressures up to 125 lbs.

STANDARD IRON BODY STRAIGHTWAY VALVES

Size, in.—A	B	C	D	E	G	H	I	J	K
2	7	5½	8½	3½	6½	11	13½	6	1½
2½	7½	5½	9½	4½	7½	11½	15½	7	1½
3	8	6½	9½	4½	7½	12	16½	7½	1½
3½	8½	6½	10½	5½	8½	12½	17½	8½	1½
4	9	7½	10½	5½	9	13	18½	9	1½
4½	9½	7½	11½	6½	10	13½	19½	9½	1½
5	10	7½	11½	6½	11	14	20½	10	1½
6	10½	8½	12½	7½	12	15	21½	11	1½
7	11	9½	13½	8½	13	16	23½	12½	1½
8	11½	10½	14½	9½	14	17	24½	13½	1½
10	13	12	16½	11	16	19	28½	15	1½
12	14	13½	18½	12½	18	21	31½	17	1½
14	15	14½	20½	14	20	23	34½	19	1½

Standard Iron Body Swing Check Valves.

Iron body, brass seat. For steam working pressures up to 125 lbs. So constructed that by removing the bonnet, the disk can be taken out at same time. Thickness of body, metal and flanges correspond with other standard valves for 125 lbs. steam working pressures. Valves made to order with by-pass. Furnished with leather disk, when desired, at special price.

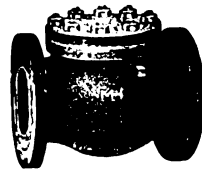


FIG. 297. STANDARD SWING CHECK VALVE, IRON BODY BRASS SEAT

DIMENSIONS, IRON BODY SWING CHECK VALVES

Size, in.	2½	3	3½	4	4½	5	6	8
Serd., end to end	7	8	9	10	10½	11½	13	16
Flgd., face to face	8½	9½	10½	11	12	13	14	17
Diam. of flgs.	7	7½	8½	9	9½	10	11	13½
Hub, end to end				13			15½	20
Hub end, depth hub				3			3	3½

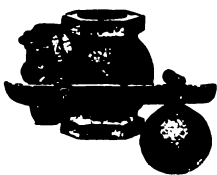


FIG. 317
IRON BODY BACK PRESSURE VALVE

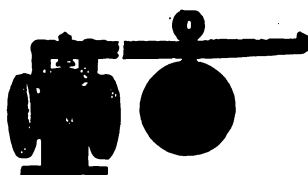


FIG. 320
IRON BODY SAFETY VALVE
Special graduations, extra

DIMENSIONS, IRON BODY BACK PRESSURE VALVES (FIG. 317)

Size, in.	2	2½	3	3½	4	4½	5	6	7	8	10	12
End to end	5½	6½	7½	8½	9½	10½	11	12½	14	16	18½	22

Valves are weighted for back pressures up to 5 lbs.

DIMENSIONS, IRON BODY SAFETY VALVES (FIG. 320)

Size, in.	2	2½	3	3½	4	4½	5	6	8
Diam. of flgs.	6	7	7½	8½	9	9½	10	11	13½
Face to face, sides	6	7½	8	9½	11	11	12	13½	16½
Center to bottom of flg.	4½	5	5½	6½	7	7	7½	7½	9½

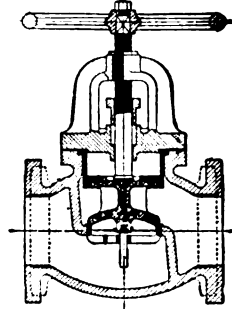


FIG. 426
EXTRA HEAVY AUTOMATIC STOP AND CHECK VALVE



FIG. 618
BRASS STANDARD STRAIGHTWAY VALVE

DIMENSIONS, STOP AND CHECK VALVES

Size, in.	2	2½	3	3½	4	4½	5	6	7	8	10	12
Face to face, in.	10½	11½	12½	13½	14	15	15½	17½	19½	21	24½	28
Diam. of flgs., in.	6½	7½	8½	9	10	10½	11	12½	14	15	17½	20½

DIMENSIONS, STANDARD BRASS STRAIGHTWAY VALVES

Size, in.	½	¾	1	1½	1¾	2	2½	3
Serd., end to end	2	2½	2½	2½	3¼	3¼	4¼	4¾
Flgd., face to face	2	2½	2½	3¼	3¼	4	4¼	5¼
Diam. of flgs.	¾	1	1	1½	1¾	2	2½	3

Screwed and flanged patterns, rising stem, steam metal double gate.



FIG. 526
Globe, Serd.

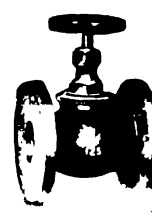


FIG. 529
Globe, Flgd.

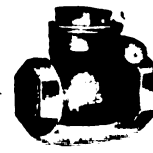


FIG. 538
Swing Check



FIG. 540
Horiz. Check

NEW STANDARD BRASS VALVES

DIMENSIONS, GLOBE AND HORIZONTAL CHECK VALVES, SCREWED AND FLANGED

Size, in.	½	¾	1	1½	1¾	2	2½	3	3½	4
End to end, serd.	1½	1½	2	2½	2½	3	3½	4	4½	5
Face to face, flgd.	3	3½	4	4½	5	5	6	6½	7½	8½

DIMENSIONS, SWING CHECK VALVES, SCREWED

Size, in.	½	¾	1	1½	1¾	2	2½	3
End to end	2½	2½	3	3½	4½	5½	5½	6½

DIMENSIONS, MEDIUM BRASS GLOBE, ANGLE, CROSS AND CHECK VALVES

Size, in.	½	¾	1	1½	1¾	2	2½	3
Diam. of flgs.	3	3	3½	4	4½	5	6	6½
Face to face, flgd.	3	3	3½	4	4½	5	6	7
Center to out. let.	1½	2	2½	2½	3½	3½	4	4
Center to in. let.	2½	3	3½	3½	4½	4½	5	5

DIMENSIONS, STANDARD SOLID WEDGE GATE VALVES

Size, in.	½	¾	1	1½	1¾	2	2½	3
End to end, serd.	2	2½	2½	2½	3	3½	4½	4½
Face to face, flgd.	3½	4	4	4½	4½	5½	6½	6½

DIMENSIONS, STANDARD SPLIT WEDGE GATE VALVES

Size, in.	½	¾	1	1½	1¾	2	2½	3
End to end, serd.	2	2½	2½	2½	3	3½	4½	4½
Face to face, flgd.	3½	4	4	4½	4½	5½	6½	6½



564
MEDIUM FLANGED CROSS VALVE



FIGS. 622 AND 624
STANDARD SOLID OR SPLIT WEDGE GATE VALVE

Fig. 606
EXTRA HEAVY
GLOBE VALVEFig. 609
EXTRA HEAVY
ANGLE CHECK
VALVEFig. 612
COMBINATION
STOP AND CHECK
VALVE

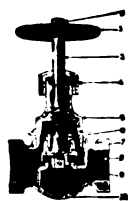
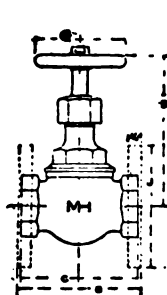
EXTRA HEAVY GLOBE VALVES (STEAM METAL)

Size, in.	1	1½	2	2½	3	3½	4	4½
Diam. of flgs.	4½	5	6	6½	7½	8½	9	10½
Face to face, flgd.	4	4½	5	6	7	8½	10	11½

EXTRA HEAVY ANGLE CHECK VALVES (STEAM METAL)

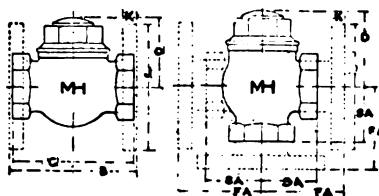
Size, in.	1	1½	2	2½	3	3½	4	4½
Diam. of flgs.	4½	5	6	6½	7½	8½	9	10½
Center to outlet	2½	3½	3¾	4	4½	4¾	5½	6
Center to inlet	2½	3½	3¾	4	4½	4¾	5½	6

"Jenkins Type" Disk Brass Valve.

Fig. 554
SECTIONAL VIEW
"JENKINS TYPE"
DISK BRASS
VALVEDIMENSION DIAGRAMS "JENKINS
TYPE" DISK BRASS GLOBE, ANGLE
AND CROSS VALVES
For steam working pressures up to 150 lbs.

DIMENSIONS, "JENKINS TYPE" DISK BRASS VALVES

Size, in.	B	C	FA	SA	D	E	G	J	K
½	1	1	1	1	2	2	1	1	1
¾	2	2	2	2	3	3	2	2	2
1	3	3	3	3	4	4	3	3	3
1½	4	4	4	4	5	5	4	4	4
2	5	5	5	5	6	6	5	5	5
2½	6	6	6	6	7	7	6	6	6
3	7	7	7	7	8	8	7	7	7



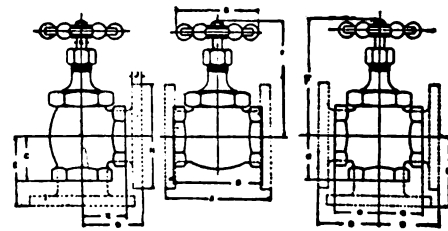
"JENKINS TYPE" DISK BRASS HORIZONTAL AND ANGLE CHECK VALVES

Size, in.	B	C	FA	SA	D	J	K
½	1	1	1	1	2	1	1
¾	2	2	2	2	3	2	2
1	3	3	3	3	4	3	3
1½	4	4	4	4	5	4	4
2	5	5	5	5	6	5	5
2½	6	6	6	6	7	6	6
3	7	7	7	7	8	7	7

For steam working pressures up to 150 lbs.

Regrinding Valves.

McNab & Harlin regrinding valves are made of steam metal with screwed or flanged ends, in medium or extra heavy patterns, for working pressures of 200 lbs. and 300 lbs. respectively.

Fig. 566
Globe Valve

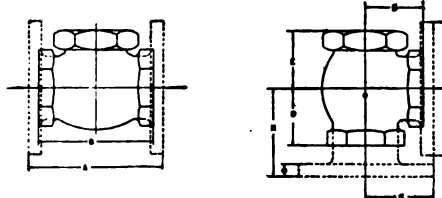
Dimension Diagrams

REGRINDING GLOBE, ANGLE AND CROSS VALVES WITH OR WITHOUT HARD BRONZE OR NICKEL RENEWABLE DISK AND SEAT
For 200 lbs. working pressure

Size, in.	A	B	C	D	E	F	G	H	J	K
½	1	1	1	1	1	1	1	1	1	1
¾	2	2	2	2	2	2	2	2	2	2
1	3	3	3	3	3	3	3	3	3	3
1½	4	4	4	4	4	4	4	4	4	4
2	5	5	5	5	5	5	5	5	5	5
2½	6	6	6	6	6	6	6	6	6	6
3	7	7	7	7	7	7	7	7	7	7

EXTRA HEAVY TYPE
For 300 lbs. working pressure

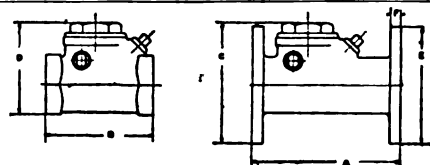
Size, in.	A	B	C	D	E	F	G	H	J	K
½	1	1	1	1	1	1	1	1	1	1
¾	2	2	2	2	2	2	2	2	2	2
1	3	3	3	3	3	3	3	3	3	3
1½	4	4	4	4	4	4	4	4	4	4
2	5	5	5	5	5	5	5	5	5	5
2½	6	6	6	6	6	6	6	6	6	6
3	7	7	7	7	7	7	7	7	7	7

REGRINDING HORIZONTAL AND ANGLE CHECK VALVES
For 200 lbs. working pressure

Size, in.	A	B	C	D	E	F	G	H
½	1	1	1	1	1	1	1	1
¾	2	2	2	2	2	2	2	2
1	3	3	3	3	3	3	3	3
1½	4	4	4	4	4	4	4	4
2	5	5	5	5	5	5	5	5
2½	6	6	6	6	6	6	6	6
3	7	7	7	7	7	7	7	7

EXTRA HEAVY PATTERN
For 300 lbs. working pressure

Size, in.	A	B	C	D	E	F	G	H
½	1	1	1	1	1	1	1	1
¾	2	2	2	2	2	2	2	2
1	3	3	3	3	3	3	3	3
1½	4	4	4	4	4	4	4	4
2	5	5	5	5	5	5	5	5
2½	6	6	6	6	6	6	6	6
3	7	7	7	7	7	7	7	7

REGRINDING SWING CHECK VALVES
For 200 lbs. working pressure

Size, in.	A	B	C	D	E	F
½	1	1	1	1	1	1
¾	2	2	2	2	2	2
1	3	3	3	3	3	3
1½	4	4	4	4	4	4
2	5	5	5	5	5	5
2½	6	6	6	6	6	6
3	7	7	7	7	7	7

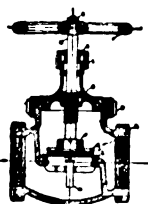
DIMENSIONS, REGRINDING SWING CHECK VALVES (Continued)
EXTRA HEAVY PATTERN
For 300 lbs. working pressures

Size, in.	A	B	C	D	E	F
$\frac{1}{2}$	3	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	3	$\frac{3}{4}$
$\frac{3}{4}$	3 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	3	$\frac{3}{4}$
1	4 $\frac{1}{2}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$	2 $\frac{1}{2}$	4 $\frac{1}{2}$	$\frac{3}{4}$
1 $\frac{1}{2}$	5 $\frac{1}{2}$	4 $\frac{1}{2}$	4 $\frac{1}{2}$	3 $\frac{1}{2}$	5	$\frac{3}{4}$
2	6 $\frac{1}{2}$	5 $\frac{1}{2}$	5 $\frac{1}{2}$	4 $\frac{1}{2}$	6 $\frac{1}{2}$	$\frac{3}{4}$
2 $\frac{1}{2}$	7 $\frac{1}{2}$	6 $\frac{1}{2}$	6 $\frac{1}{2}$	5 $\frac{1}{2}$	7 $\frac{1}{2}$	$\frac{3}{4}$
3	8 $\frac{1}{2}$	7 $\frac{1}{2}$	8 $\frac{1}{2}$	6 $\frac{1}{2}$	8 $\frac{1}{2}$	$\frac{3}{4}$

Semisteel Regrinding Valves.

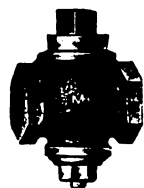
Size, in.	1	1 $\frac{1}{4}$	1 $\frac{1}{2}$	2	2 $\frac{1}{2}$	3
Face to face, flgd.	4	4 $\frac{3}{8}$	5 $\frac{1}{8}$	8	8 $\frac{1}{2}$	9 $\frac{1}{2}$
End to end, scrd.	4	4 $\frac{3}{8}$	5 $\frac{1}{8}$	6 $\frac{1}{2}$	7	8

For working pressures up to 200 lbs.
Made in globe, angle and cross types. Also horizontal and angle check valves.



**FIG. 309
REGRINDING
VALVE**
Semisteel body and
bronze, nickel
bronze or monel
metal trimming

Iron and Brass Cocks.



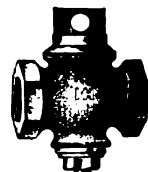
**FIG. 375
STANDARD
IRON COCK**
Screwed
Sizes $\frac{1}{8}$ to 6 in.



**FIG. 678
FLANGED
STEAM COCK**
Steam metal



**FIG. 683
PACKED
PLUG COCK**
Bolted gland
Sizes $\frac{1}{8}$ to 4 in.



**FIG. 674
SERVICE COCK**
Flat head
Sizes $\frac{1}{4}$ to 3 in.

DIMENSIONS, FLANGED STEAM COCKS (FIG. 678)

Size, in.	1	1 $\frac{1}{4}$	1 $\frac{1}{2}$	2	2 $\frac{1}{2}$	3	3 $\frac{1}{2}$	4	5	6
Diam. of flgs.	4	4 $\frac{1}{2}$	5	6	7	7 $\frac{1}{2}$	8 $\frac{1}{2}$	9	10	11
Face to face, flgd. Standard	4	4 $\frac{1}{2}$	5	6	7	8	9	10	11	12
Face to face, flgd. Three-way	4 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$	7 $\frac{1}{2}$	8 $\frac{1}{2}$	9 $\frac{1}{2}$	10 $\frac{1}{2}$	11 $\frac{1}{2}$	12 $\frac{1}{2}$	13 $\frac{1}{2}$
Center to side outlet. Three-way	2 $\frac{1}{2}$	3	3 $\frac{1}{2}$	4	4 $\frac{1}{2}$	5	5 $\frac{1}{2}$	6	6 $\frac{1}{2}$	7

Hydraulic Valves and Fittings.



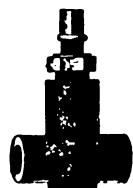
**FIG. 750
HYDRAULIC TEE**
Sizes. $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$,
 $\frac{3}{4}$, 1, 1 $\frac{1}{4}$, 1 $\frac{1}{2}$, 2 in.



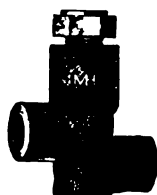
**FIG. 757
HYDRAULIC UNION**
Sizes. $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$,
 $\frac{3}{4}$, 1, 1 $\frac{1}{4}$, 1 $\frac{1}{2}$, 2 in.



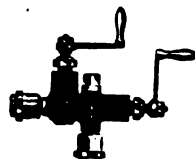
**FIG. 758
FLANGE UNION**
Sizes. $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$,
1 $\frac{1}{4}$, 1 $\frac{1}{2}$, 2, 2 $\frac{1}{2}$, 3 in.



**FIG. 743
STOP VALVE**
Sizes. $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$,
 $\frac{3}{4}$, 1, 1 $\frac{1}{4}$, 1 $\frac{1}{2}$, 2 in.



**FIG. 744
CHECK VALVE**
Sizes. $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$,
 $\frac{3}{4}$, 1, 1 $\frac{1}{4}$, 1 $\frac{1}{2}$, 2 in.
For pressures up to 10,000 lbs.



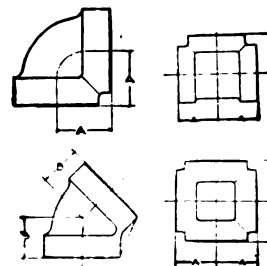
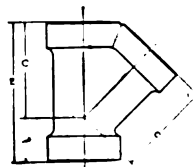
**FIG. 746
HYDRAULIC
VALVE**
Size. $\frac{1}{4}$ -in.

Cast Iron Screwed Fittings.

This line of cast iron standard, medium and extra heavy screwed fittings is complete for 125 lbs., 175 lbs. and 250 lbs. working steam pressure. All fittings tapped to Briggs standard gage and carefully inspected before shipment.

The 175-lb. fittings are especially adapted for oil lines and car heating.

125 Lbs. Working Pressure—



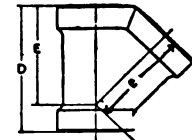
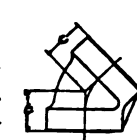
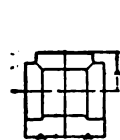
CAST IRON SCREWED FITTINGS

DIMENSIONS, MH STANDARD FITTINGS

Size, in.	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	1 $\frac{1}{4}$	1 $\frac{1}{2}$	2	2 $\frac{1}{2}$	3
A	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{7}{8}$	1	1 $\frac{1}{4}$	1 $\frac{3}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$
B	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{7}{8}$	1	1 $\frac{1}{4}$	1 $\frac{3}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$
C	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{7}{8}$	1	1 $\frac{1}{4}$	1 $\frac{3}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$
E	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{7}{8}$	1	1 $\frac{1}{4}$	1 $\frac{3}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$

Size, in.	$\frac{3}{4}$	1	1 $\frac{1}{4}$	1 $\frac{1}{2}$	2	2 $\frac{1}{2}$	3	4	5	6	8	10	12
A	3 $\frac{3}{4}$	4 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$	8 $\frac{1}{2}$	9 $\frac{1}{2}$	11 $\frac{1}{2}$	13 $\frac{1}{2}$	15 $\frac{1}{2}$	17 $\frac{1}{2}$	21 $\frac{1}{2}$	25 $\frac{1}{2}$	29 $\frac{1}{2}$
B	3 $\frac{3}{4}$	4 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$	8 $\frac{1}{2}$	9 $\frac{1}{2}$	11 $\frac{1}{2}$	13 $\frac{1}{2}$	15 $\frac{1}{2}$	17 $\frac{1}{2}$	21 $\frac{1}{2}$	25 $\frac{1}{2}$	29 $\frac{1}{2}$
C	3 $\frac{3}{4}$	4 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$	8 $\frac{1}{2}$	9 $\frac{1}{2}$	11 $\frac{1}{2}$	13 $\frac{1}{2}$	15 $\frac{1}{2}$	17 $\frac{1}{2}$	21 $\frac{1}{2}$	25 $\frac{1}{2}$	29 $\frac{1}{2}$
E	3 $\frac{3}{4}$	4 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$	8 $\frac{1}{2}$	9 $\frac{1}{2}$	11 $\frac{1}{2}$	13 $\frac{1}{2}$	15 $\frac{1}{2}$	17 $\frac{1}{2}$	21 $\frac{1}{2}$	25 $\frac{1}{2}$	29 $\frac{1}{2}$

175 Lbs. Working Pressure—



MEDIUM CAST IRON SCREWED FITTINGS

DIMENSIONS, MH MEDIUM FITTINGS

Size, in.	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	1 $\frac{1}{4}$	1 $\frac{1}{2}$	2	2 $\frac{1}{2}$	3
A	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{7}{8}$	1	1 $\frac{1}{4}$	1 $\frac{3}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$
B	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{7}{8}$	1	1 $\frac{1}{4}$	1 $\frac{3}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$
C	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{7}{8}$	1	1 $\frac{1}{4}$	1 $\frac{3}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$
E	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{7}{8}$	1	1 $\frac{1}{4}$	1 $\frac{3}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$

Size, in.	$\frac{3}{4}$	1	1 $\frac{1}{4}$	1 $\frac{1}{2}$	2	2 $\frac{1}{2}$	3	4	5	6	8	10	12
A	4 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$	7 $\frac{1}{2}$	9 $\frac{1}{2}$	10 $\frac{1}{2}$	12 $\frac{1}{2}$	14 $\frac{1}{2}$	16 $\frac{1}{2}$	18 $\frac{1}{2}$	22 $\frac{1}{2}$	26 $\frac{1}{2}$	30 $\frac{1}{2}$
B	4 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$	7 $\frac{1}{2}$	9 $\frac{1}{2}$	10 $\frac{1}{2}$	12 $\frac{1}{2}$	14 $\frac{1}{2}$	16 $\frac{1}{2}$	18 $\frac{1}{2}$	22 $\frac{1}{2}$	26 $\frac{1}{2}$	30 $\frac{1}{2}$
C	4 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$	7 $\frac{1}{2}$	9 $\frac{1}{2}$	10 $\frac{1}{2}$	12 $\frac{1}{2}$	14 $\frac{1}{2}$	16 $\frac{1}{2}$	18 $\frac{1}{2}$	22 $\frac{1}{2}$	26 $\frac{1}{2}$	30 $\frac{1}{2}$
E	4 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$	7 $\frac{1}{2}$	9 $\frac{1}{2}$	10 $\frac{1}{2}$	12 $\frac{1}{2}$	14 $\frac{1}{2}$	16 $\frac{1}{2}$	18 $\frac{1}{2}$	22 $\frac{1}{2}$	26 $\frac{1}{2}$	30 $\frac{1}{2}$

250 Lbs. Working Pressure—

DIMENSIONS, MH EXTRA HEAVY FITTINGS

Size, in.	$\frac{1}{2}$	$\frac{3}{4}$	1	1 $\frac{1}{4}$	1 $\frac{1}{2}$	2	2 $\frac{1}{2}$	3	3 $\frac{1}{2}$	4	4 $\frac{1}{2}$	5	6	7	8	10	12
A	1 $\frac{1}{2}$	1 $\frac{3}{4}$	2	2 $\frac{1}{4}$	2 $\frac{1}{2}$	3	3 $\frac{1}{4}$	3 $\frac{1}{2}$	4	4 $\frac{1}{4}$	4 $\frac{1}{2}$	5	5 $\frac{1}{4}$	5 $\frac{1}{2}$	6 $\frac{1}{4}$	7 $\frac{1}{4}$	8 $\frac{1}{4}$
B	1 $\frac{1}{2}$	1 $\frac{3}{4}$	2	2 $\frac{1}{4}$	2 $\frac{1}{2}$	3	3 $\frac{1}{4}$	3 $\frac{1}{2}$	4	4 $\frac{1}{4}$	4 $\frac{1}{2}$	5	5 $\frac{1}{4}$	5 $\frac{1}{2}$	6 $\frac{1}{4}$	7 $\frac{1}{4}$	8 $\frac{1}{4}$
C	1 $\frac{1}{2}$	1 $\frac{3}{4}$	2	2 $\frac{1}{4}$	2 $\frac{1}{2}$	3	3 $\frac{1}{4}$	3 $\frac{1}{2}$	4	4 $\frac{1}{4}$	4 $\frac{1}{2}$	5	5 $\frac{1}{4}$	5 $\frac{1}{2}$	6 $\frac{1}{4}$	7 $\frac{1}{4}$	8 $\frac{1}{4}$
D	1 $\frac{1}{2}$	1 $\frac{3}{4}$	2	2 $\frac{1}{4}$	2 $\frac{1}{2}$	3	3 $\frac{1}{4}$	3 $\frac{1}{2}$	4	4 $\frac{1}{4}$	4 $\frac{1}{2}$	5	5 $\frac{1}{4}$	5 $\frac{1}{2}$	6 $\frac{1}{4}$	7 $\frac{1}{4}$	8 $\frac{1}{4}$
E	1 $\frac{1}{2}$	1 $\frac{3}{4}$	2	2 $\frac{1}{4}$	2 $\frac{1}{2}$	3	3 $\frac{1}{4}$	3 $\frac{1}{2}$	4	4 $\frac{1}{4}$	4 $\frac{1}{2}$	5	5 $\frac{1}{4}$	5 $\frac{1}{2}$	6 $\frac{1}{4}$	7 $\frac{1}{4}$	8 $\frac{1}{4}$

Flanged Fittings.

We have a full line of patterns and up-to-date equipment for the manufacture of standard and extra heavy regular and long sweep flanged fittings, also special patterns for reducing sizes and special shapes used extensively on power plant work.

The dimensions and drilling of all flanged fittings conform with the American Standard adopted Jan. 1, 1915, by Committee on Standardization of Fittings and Valves.

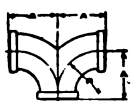
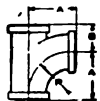
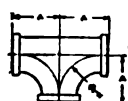
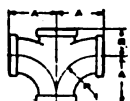
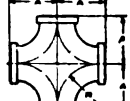


**FIG. 217
FLANGED BASE
ELBOWS**



**FIG. 219
REDUCING
FLANGED TEE**

Cast Iron Long Sweep Water and Sprinkler Fittings.

Fig. 150
ELBOWFig. 151
DOUBLE
BRANCH ELBOWFig. 152
SINGLE
SWEEP TEEFig. 153
LONG DOUBLE
SWEEP TEEFig. 154
SINGLE
SWEEP CROSSFig. 155
DOUBLE
SWEEP CROSSFig. 156
Elbow
LONG SWEEP
SPRINKLER FITTINGSFig. 157
Tee

DIMENSIONS, CAST IRON LONG SWEEP WATER FITTINGS

For 150 lbs. water working pressure

Size, in.	A	B	R	Center to base, in., Tees and Ells	Diam. round or square base, in.	J	K	Diam. of bolt circle, in.	Number of bolts	Diam. of bolts, in.
1	2 1/2	1 1/2	1 1/2			4	1 1/2	3	4	1/2
1 1/2	3	1 1/2	2			4 1/2	1 1/2	3 1/2	4	1/2
2	3 1/2	1 1/2	2 1/2			5	1 1/2	3 1/2	4	1/2
2 1/2	4	2 1/2	3			6	1 1/2	4 1/2	4	1/2
3	4 1/2	2 1/2	3 1/2	5 1/2	5	7	1 1/2	5 1/2	4	1/2
3 1/2	5	3	4			7 1/2	1 1/2	6	4	1/2
4	5 1/2	3 1/2	4 1/2	6 1/2	6	8 1/2	1 1/2	7 1/2	4	1/2
4 1/2	6	3 1/2	5	6 1/2	6	9 1/2	1 1/2	8 1/2	8	1/2
5	6 1/2	3 1/2	5 1/2	7	7	10 1/2	1 1/2	9 1/2	8	1/2
6	7 1/2	4 1/2	6	7 1/2	7	11 1/2	1 1/2	10 1/2	8	1/2
7	8 1/2	4 1/2	7	8 1/2	8	12 1/2	1 1/2	11 1/2	8	1/2
8	9 1/2	5 1/2	8	9 1/2	9	13 1/2	1 1/2	12 1/2	12	1/2
9	10 1/2	5 1/2	9	10 1/2	9	14 1/2	1 1/2	13 1/2	12	1/2
10	11 1/2	6 1/2	10	11 1/2	10	15 1/2	1 1/2	14 1/2	12	1/2
12	13 1/2	7 1/2	12	13 1/2	11	17 1/2	1 1/2	16 1/2	12	1/2

Drainage Fittings.

These fittings are made with a shoulder, the same size inside diameter as the pipe. When the pipe is screwed up to the shoulder, the continuous passage thus formed leaves no opportunity for solid matter to collect and choke the pipe. A large stock enables prompt shipment.



Fig. 162



Fig. 163



Fig. 164



Fig. 165



Fig. 166



Fig. 167



Fig. 168



Fig. 171

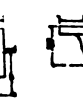


Fig. 176



Fig. 186



Fig. 187

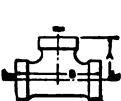


Fig. 188

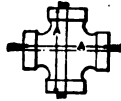


Fig. 189

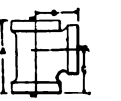


Fig. 190

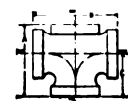


Fig. 192

CAST IRON RECESSED DRAINAGE FITTINGS

DIMENSIONS, REDUCING TEE (Fig. 187)

Size, in.	2x1 1/2	2 1/2x2	3x2	4x2	4x3	5x2	5x3
A	2 1/4	3	3	3 1/2	3 3/4	4 1/2	4 3/4
B	4 1/2	4 1/2	5 1/2	6	7	6	6 1/2

DIMENSIONS, BASIN TEES (Fig. 188)

Size, in.	1 1/2	1 1/2	1 1/2x1 1/4	2	2x1 1/4	2x1 1/2	2 1/2
A	2 1/2	2 1/2	2 1/2	3 1/2	3 1/2	3 1/2	4 1/2
B	4 1/2	5 1/2	5 1/2	7	6 1/2	6 1/2	8 1/2



Fig. 194

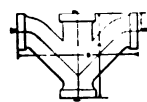


Fig. 196

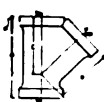


Fig. 198

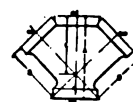


Fig. 200



Fig. 183

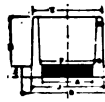


Fig. 184

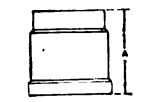


Fig. 185

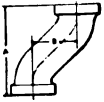


Fig. 208

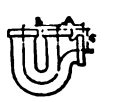


Fig. 209



Fig. 210

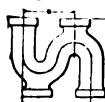


Fig. 211

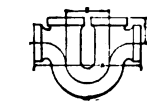


Fig. 212

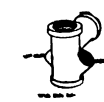


Fig. 204



Fig. 205



Fig. 202

CAST IRON RECESSED DRAINAGE FITTINGS

Fittings dimension, in.	1 1/2	1 1/2	2	2 1/2	3	4	5	6	7	8	10
Fig. 162. 90° Short Turn Elbows.....	A 1 1/2	2 1/2	2 1/2	2 1/2	3 1/2	3 1/2	4 1/2	5 1/2	5 1/2	6 1/2	7 1/2
Fig. 163. 90° Long Turn Elbows.....	A 2 1/2	2 1/2	3 1/2	3 1/2	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9	11
Fig. 164. 60° Short Turn Elbows.....	A 1 1/2	1 1/2	2	2 1/2	2 1/2	3 1/2	3 1/2	4 1/2	4 1/2	5 1/2	6 1/2
Fig. 165. 60° Long Turn Elbows.....	A 2	2 1/2	2 1/2	2 1/2	3 1/2	4					
Fig. 166. 45° Short Turn Elbows.....	A 1 1/2	1 1/2	1 1/2	2 1/2	2 1/2	2 1/2	3 1/2	3 1/2	3 1/2	4 1/2	4 1/2
Fig. 167. 45° Long Turn Elbows.....	A 1 1/2	1 1/2	2 1/2	2 1/2	2 1/2	3 1/2	4 1/2	4 1/2	5 1/2	6	7 1/2
Fig. 168. 22 1/2° Elbows.....	A 1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3 1/2	3 1/2
Fig. 169. 11 1/2° Elbows.....	A 1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3 1/2	3 1/2
Fig. 170. 5 1/2° Elbows.....	A 1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3 1/2	3 1/2
Fig. 171. Three-Way Elbow.....	A 4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	10 1/2	12 1/2	14 1/2	16 1/2	18 1/2	20 1/2
Fig. 176. Closet Elbow.....	A 1 1/2	2 1/2	2 1/2	3 1/2	3 1/2	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2
Fig. 186. Tee.....	A 1 1/2	2 1/2	2 1/2	2 1/2	3 1/2	3 1/2	4 1/2	5 1/2	5 1/2	6 1/2	7 1/2
Fig. 190. 90° Short Turn Y-Branch.....	A 1 1/2	2 1/2	2 1/2	2 1/2	3 1/2	3 1/2	4 1/2	5 1/2	5 1/2	6 1/2	7 1/2
Fig. 192. Double 90° Short Turn Y-Branches.....	A 3 1/2	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	10 1/2	11 1/2	12 1/2	13 1/2	15 1/2
Fig. 194. 90° Long Turn Y-Branch.....	A 4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	11 1/2	12 1/2	13 1/2	14 1/2	16 1/2
Fig. 196. Double 90° Long Turn Y-Branches.....	A 4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	11 1/2	12 1/2	13 1/2	14 1/2	16 1/2
Fig. 198. 45° Y-Branch.....	A 3 1/2	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	10 1/2	11 1/2	12 1/2	13 1/2	15 1/2
Fig. 200. 45° Double Y-Branches.....	A 3 1/2	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	10 1/2	11 1/2	12 1/2	13 1/2	15 1/2
Fig. 184. Roof Connection.....	A 1 1/2	2 1/2	2 1/2	2 1/2	3 1/2	3 1/2	4 1/2	5 1/2	5 1/2	6 1/2	7 1/2
Fig. 185. Tucker Connection.....	A 1 1/2	2 1/2	2 1/2	2 1/2	3 1/2	3 1/2	4 1/2	5 1/2	5 1/2	6 1/2	7 1/2
Fig. 209. 1/2 S Traps.....	A 2 1/2	2 1/2	2 1/2	2 1/2	3 1/2	3 1/2	4 1/2	5 1/2	5 1/2	6 1/2	7 1/2
Fig. 210. 1/2 S Traps.....	A 2 1/2	2 1/2	2 1/2	2 1/2	3 1/2	3 1/2	4 1/2	5 1/2	5 1/2	6 1/2	7 1/2
Fig. 211. Full S Traps.....	A 2 1/2	2 1/2	2 1/2	2 1/2	3 1/2	3 1/2	4 1/2	5 1/2	5 1/2	6 1/2	7 1/2
Fig. 212. Running Trap.....	A 2 1/2	2 1/2	2 1/2	2 1/2	3 1/2	3 1/2	4 1/2	5 1/2	5 1/2	6 1/2	7 1/2
Fig. 202. Upright Y-Branch.....	A 2 1/2	2 1/2	2 1/2	2 1/2	3 1/2	3 1/2	4 1/2	5 1/2	5 1/2	6 1/2	7 1/2

DIMENSIONS, BASIN CROSSES (Fig. 189)

Size, in.	1 1/2	1 1/2	2	2x1 1/2
A	4 1/2	5 1/2	7	6 1/2

DIMENSIONS, INCREASERS (Fig. 183)

Size, in.	3x2	4x2	4x3	5x2	5x3	5x4	6x4	6x5	7x6	8x4	8x6	10x8
A	9	9	9	9	9	9	9	9	9	9	9	9

DIMENSIONS, OFFSETS (Fig. 208)

Size, in.	2	2	2	2	3	3	3	3	4	4	4
Offset B	4	6	8	10	4	6	8	10	4	6	8
Length A	7 1/2	9 1/2	11 1/2	13 1/2	8 1/2	10 1/2	12 1/2	14 1/2	9 1/2	11 1/2	13 1/2
Size, in.	4	4	5	5	5	5	6	6	6	6	6
Offset B	10	12	6	8	10	12	6	8	10	12	12
Length A	15 1/2	17 1/2	12 1/2	14 1/2	16 1/2	18 1/2	13 1/2	15 1/2	17 1/2	19 1/2	19 1/2

NELSON VALVE COMPANY

Manufacturers of Valves for Power Plant and General Industrial Service

CHESTNUT HILL, PHILADELPHIA, PA.

BRANCH SALES OFFICES

ATLANTA, GA. (Southern Territory), 1320 Healey Building
 BOSTON, MASS., 131 State Street
 BUFFALO, N. Y., 582 Ellicott Square
 CHICAGO, ILL. (Branch Store), 61 West Lake Street
 CLEVELAND, OHIO, 550 Kirby Building
 DETROIT, MICH. (Branch Store), 242-4 Larned Street, West

LOS ANGELES, CAL., 310 Hibernian Building
 NEW YORK, N. Y., 90 West Street
 PITTSBURGH, PA., 517 Liberty Avenue
 SAN FRANCISCO, CAL. (Branch Store), 918 Hearst Building
 SYRACUSE, N. Y., 504 City Bank Building

Products.

NELSON VALVES: Gate, Globe, Angle, Cross, Swing-check, Stop-check, Non-return, Seatless Blow-off, Quick Opening Blow-off.

Expansion Joints: brass and iron, for all pressures.

Scope.

These valves are made for standard, medium and extra heavy pressures, for saturated and superheated steam, water, air, oil and special service.

There is a Nelson valve for almost every purpose, ranging in sizes from $\frac{1}{8}$ in. to 42 in. The valves illustrated on these pages are a few representative types.

A catalogue of the complete Nelson line will be sent on request.

Nelson Quality.

An exceptionally high quality standard is maintained for Nelson valves. Materials are carefully selected, workmanship is of the skilled character produced by ideal shop conditions, and inspection and test are thorough.

As a result, 26 years' service of Nelson valves has firmly established them in the confidence and favor of engineers and valve users generally. Nelson valves are a *safe valve investment*.

Special Nelson Features.

Nelson valves are designed in accordance with the most advanced and approved engineering practice. They are of heavy construction, with metal distributed to give maximum strength and service. Their lines are carefully determined for clear openings and smooth flow. Each valve must stand test pressures two or three times its rated working pressure.

Nelson bronze valves have liberal weight of metal wherever strength is required. Screwed end valves have wide hexes and taper threads. All bronze valves



Section
 Discs travel freely, steadied by guides, and enter and leave seats without scraping or chattering. Stem makes a "pack when open" joint when up



Parts
 Only 3 parts—2 discs and 1 central wedge. Discs rock into position on the seats automatically, insuring perfect closing



Disc Ring
 Disc ring rolled into disc under hydraulic pressure, forming tongue and groove joint which can not be loosened
SPECIAL FEATURES OF NELSON VALVES

are fitted with the new Nelson non-heating hand wheel.

An important feature of Nelson gate valves is the double disc mechanism. This provides a simple flexible gate, insuring easy travel and perfect seating in spite of presence of dirt or possible distortion of valve body. The discs travel freely to their lowest point and then spread into position, eliminating scraping or scoring of seats.

Nelson Bronze Valves.

Gates—Nelson bronze gate valves include standard, medium and extra heavy patterns, screwed and flanged ends. They embody the Nelson double disc principle, insuring a tight valve under any line conditions.

Stems are tough manganese bronze, with generous acme threads. Medium and extra heavy valves are gland packed.

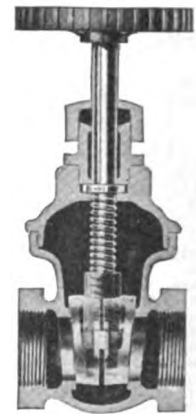
All valves have non-heating hand wheel.

In addition to regular inside screw valves, there are quick opening and rising stem types with bronze or monel mountings.

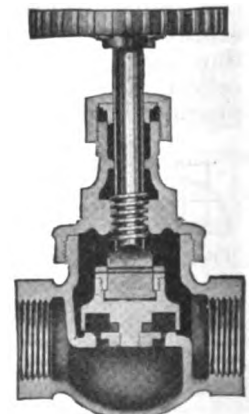
Globes—Nelson bronze globe and angle valves are made in both screwed and union bonnet patterns, screwed and flanged ends. They may be fitted with regrinding or *Nelsonite* renewable composition discs, both interchangeable on the same stem. They have tapered seats to prevent scoring. Stems are tough manganese bronze.

All valves have non-heating hand wheel.

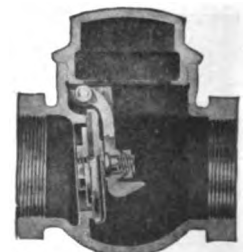
Checks—Nelson bronze check valves include standard swing checks with regrinding or leather discs; extra heavy regrinding swing checks; horizontal globe and angle type cup checks and vertical check valves.



No. 101
STANDARD BRONZE GATE VALVE
 Inside screw, screwed ends



No. 3
MEDIUM BRONZE GLOBE VALVE
 Screwed ends, regrinding or hard rubber disc



No. 85
STANDARD BRONZE SWING CHECK VALVE, LEATHER DISC
 Screwed ends, regrinding or leather disc

Continued on next page

Nelson Iron Body Valves.

Gates—The Nelson iron gate line offers a valve for practically every condition. There are standard, medium and extra heavy patterns, with inside screw and outside screw and yoke types in each weight, and with screwed and flanged ends. Large, medium and extra heavy valves are also furnished with by-passes.

In addition to these regular types, there are quick opening types, hub end valves; motor, chain wheel and hydraulically operated gates.

Nelson gate valves are mounted with screwed-in bronze seat rings and rolled-in bronze rings on the discs. The double disc and wedge construction insures positive closing and long satisfactory service. Medium and extra heavy valves have raised faces on end flanges.

Nelson gate valves may be ordered all-iron trimmed for acid and similar service.

Globes—Nelson iron globe and angle valves include standard, medium and extra heavy patterns.

The standard valves may be fitted with either regrinding or *Nelsonite* renewable composition discs, interchangeable on the same stem. The bonnets have through bolts.

Extra heavy Nelson globe valves are made with either cast yoke or Navy type yoke.

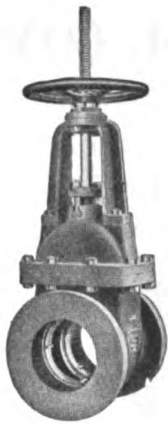
Checks—Nelson iron body check valves include swing checks in standard and extra heavy pressures, and extra heavy globe and angle cushioned check valves.

The standard swing check valve may be equipped with a leather disc or bronze regrinding disc.

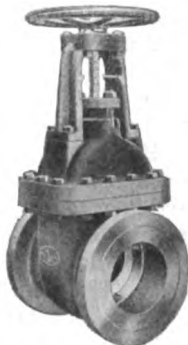
Nelson-Erwood—The Nelson-Erwood valve is a com-



No. 501
STANDARD
IRON BODY GATE
VALVE
Inside screw, bronze
mounted, screwed
ends



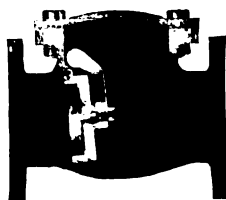
No. 510
STANDARD
IRON BODY
GATE VALVE
Outside screw
and yoke, bronze
mounted, flanged
ends.



No. 530
EXTRA HEAVY IRON
BODY GATE VALVE
Outside screw and yoke,
bronze mounted, flanged ends



No. 602
STANDARD IRON
BODY GLOBE VALVE
Bronze mounted,
flanged ends



No. 704
STANDARD IRON
BODY SWING CHECK
VALVE
Bronze mounted,
flanged ends

bination swing check and gate valve. The swing check disc is contained within the gate and is adjustable for back pressure up to 5 lbs. They have numerous applications on exhaust and discharge lines.

Nelson Steel Valves.

Gates—Nelson steel gate valves represent the highest standard in steel valve construction. Close grained annealed castings of exceptionally heavy section are used in their manufacture and the trimmings are of monel metal throughout, adapting them to pressures of 350 lbs. and temperatures of 800°. Various specifications are supplied for different temperatures and working conditions.

They have extra heavy bonnet and stuffing box, with a long condensing chamber and test cock for packing under pressure. Swing bolts are used on the stuffing box. Cork grips are provided on the hand wheel. Motor operation is frequently furnished on the larger sizes.

Globes—Nelson steel globe and angle valves are of heavy construction, monel mounted for superheated steam or composition mounted for other conditions.

They are built with either cast yokes or Navy type yokes. They can be repacked when open and under pressure. Shelves are provided on yoke for holding the gland.

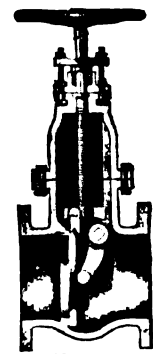
Non-returns—Nelson steel cushioned non-return stop and check valves are noted for their simplicity of construction.

The disc is cast in one piece of monel or nickel bronze, thereby avoiding the danger of parts shaking loose and becoming inoperative. The dashpot is cast on the bonnet and the disc guide insures accurate seating.

Success of Nelson Valves.

Nelson valves are giving successful service in the best known power plants throughout the country, and are specified by leading engineers. They are a safe investment where first quality work is desired.

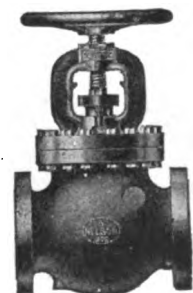
Reference book of Nelson valves giving details, specifications and dimensions will be mailed on request.



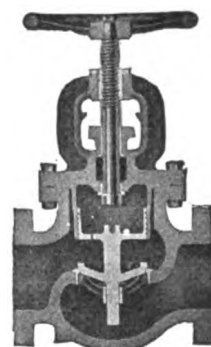
No. 708
NELSON-ERWOOD
SWING GATE VALVE
Iron body, bronze
mounted, flanged ends



No. 1554
EXTRA HEAVY CAST
STEEL GATE VALVE
With by-pass, outside
screw and yoke, monel
mounted



No. 1300
EXTRA HEAVY
CAST STEEL GLOBE
VALVE
Monel or composition
mounted



No. 1370
EXTRA HEAVY CAST
STEEL NON-RETURN
STOP AND CHECK
VALVE
Monel or composition
mounted

THE MERRILL COMPANY

Manufacturers of Merco Nordstrom Plug Valves

121 Second Street
SAN FRANCISCO, CAL.

CHICAGO OFFICE, Monadnock Building.

Products.

MERCO NORDSTROM PLUG VALVE, Screwed or Flanged, in cast iron; SPECIAL VALVES, to order, in malleable iron and steel, bronzes, atterite, monel metal, etc.

MERCO LUBRICANTS, specially compounded for use in Merco Nordstrom Plug Valves.



TRADE-MARK

Non-tainting Lubricants—Any objections to even minute qualities of graphite and similar ingredients can be taken care of. For food products, as an example, we supply lubricants that are odorless, tasteless, colorless, and non-injurious.

Handy Lubricant—The cartridge form of lubricant is ideal for convenience and cleanliness. The removal of the lubricant screw, inserting of the cartridge, and replacing of the screw are a matter of a few moments, even when the line is under extreme working pressure.

Shows Right Turn—A visible lug, cast as an integral part of the valve cover and fitting into a recess in the shank of the plug, not only indicates the right turn but blocks all effort to turn the plug otherwise.

Positive Cut-off—The arrangement described above positively prevents the lubricant ducts being exposed to the contents of the pipe line, and overcomes the danger of escape of the line contents through the lubricant ducts.

100% Opening—The opening through the plug in all valves and in all cases is an honest 100% of the pipe area.

High Hydraulic Efficiency—The flanged types of the valve are especially designed with correct flow lines, thereby insuring high hydraulic efficiency.

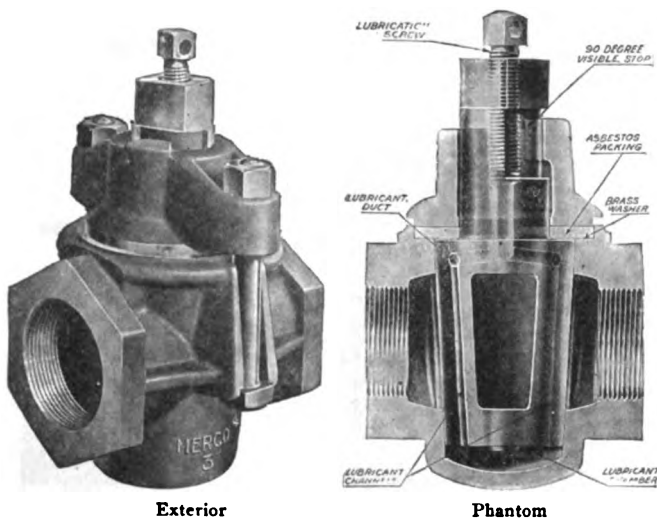
Adjustable Packing Pressure—Strong and deep cover bolts on sizes from 3 in. down apply pressure to an asbestos packing faced with antifriction metal. Sizes above 3-in. have a special gland which applies pressure to a braided asbestos packing between the cover and the shank of the plug.

Ruggedness and Simplicity—The valve is substantially built and has few parts. Its simplicity and strength contribute to its long life.

Merco Nordstrom Plug Valve.

A radical departure from established plug valve design. Some advantages achieved are:

No Sticking; No "Freezing"—Forcible unseating of the plug and simultaneous lubrication of the bearing surfaces by external pressure applied at will by means of a lubricant screw.



TYPE OF MERCO NORDSTROM PLUG VALVE; 3-IN. AND UNDER

Easy to Turn—Durable lubrication permits turning, with a 24-in. wrench, valves up to 6 and 8 in.

No Corrosion—Effective lubrication by resistant lubricants prevents pitting and corrosion of the seating surfaces and also prevents scale adhesion. This lubrication renders the seating surfaces immune to the attacks of hot or cold, acid or alkaline solutions.

No Leaks—The preservation of the seating surfaces almost like new by lubrication makes the valve proof against leaks even under high pressure.

Versatility—The perfect lubrication of the valve renders it fit for service under diametrically opposite conditions. Gases and solids, fluids and semifluids, acids and alkalis, solutions hot and cold, pressure and vacuum, and all stages between are being acceptably served by the valve.

Special Alloys—In many cases where, heretofore, expensive alloys have been resorted to as a means of preventing corrosion, cast iron Merco Nordstrom plug valves, because of their unfailing lubrication, are serving satisfactorily. However, special valves of bronzes, atterite, monel metal, etc., can be supplied on special order.

Merco Lubricants.

The proper lubricant is of such vital importance that users of Merco Nordstrom plug valves are urged to state, when ordering, the conditions under which the valves are expected to serve. Wide variations in the makeup of the lubricants make each grade especially valuable in its particular field.

Merco Lubricants are supplied in cartridge form to fit the lubricant chambers of the respective sizes of valves. This method is quick, clean, simple, and safe, as the lubricant can be renewed even when the valve is under full pressure.

Special Information.

Because of the exceptional uses to which Merco Nordstrom valves almost invariably are put, THE MERRILL COMPANY is usually applied to for suggestions covering each installation where unusual conditions exist. The nearest office is always ready to furnish helpful information and all additional details necessary for the placing of orders. The more completely conditions are described the more thoroughly will the information requested cover the inquiry.

PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

26th Street and Allegheny Valley R. R.

P. O. Box 1016

PITTSBURGH, PA.

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PHILADELPHIA, PA., 1323 Widener Building
CLEVELAND, OHIO, 1250 Rockefeller Building
BOSTON, MASS., 19 Milk Street

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DENVER, COLO., MOUNTAIN STATES MACHINERY CO.

SAN FRANCISCO, CAL., E. A. KEITHLEY, Rialto Building
DETROIT, MICH., DETROIT POWER PIPING CO., 82 Griswold
Street
TORONTO, CANADA, M. A. CAMPBELL, 32 Albany Street

Products.

VALVES: Accumulator, Aiken Hydraulic Operating, Aiken Stop, Atmospheric Relief, Back Pressure, Blow-off, Butterfly, Check, Chronometer, Critchlow Hydraulic Operating, Exhaust Relief, Float, Foot, Gate, Globe, Angle and Cross, Hydraulic, Non-return, Plug, Register, Relief, Shock, Stuart Hydraulic Operating, Tanner Hydraulic Operating, Throttle, and Transfer, for high and low pressures, in all sizes, for all services.

VALVE FITTINGS and APPLIANCES.

Specialists in HYDRAULIC PIPING and OPERATING VALVES, and in PIPING SYSTEMS for high pressure superheated steam. PIPE, PIPE BENDS, PIPE FITTINGS and PIPING SUPPLIES.

STEAM SEPARATORS.

Also, Expansion Joints, Swivel Joints, Exhaust Heads, Cocks and Drip Pockets.

Services.

Complete piping contracts executed, designed by experienced engineers, manufactured by skilled workmen under competent supervision, and erected by expert fitters.

The engineering department makes a specialty of unusual conditions, and is prepared to design or estimate



TRADE-MARK

any piping layout or special valves upon receipt of specifications.

Engineers are invited to submit their piping and valve problems, and a satisfactory solution is assured.

Standard Specifications.

Our standard specifications have been adopted by the leading high pressure concerns in the United States, a copy of which will be furnished on request.

Guarantee.

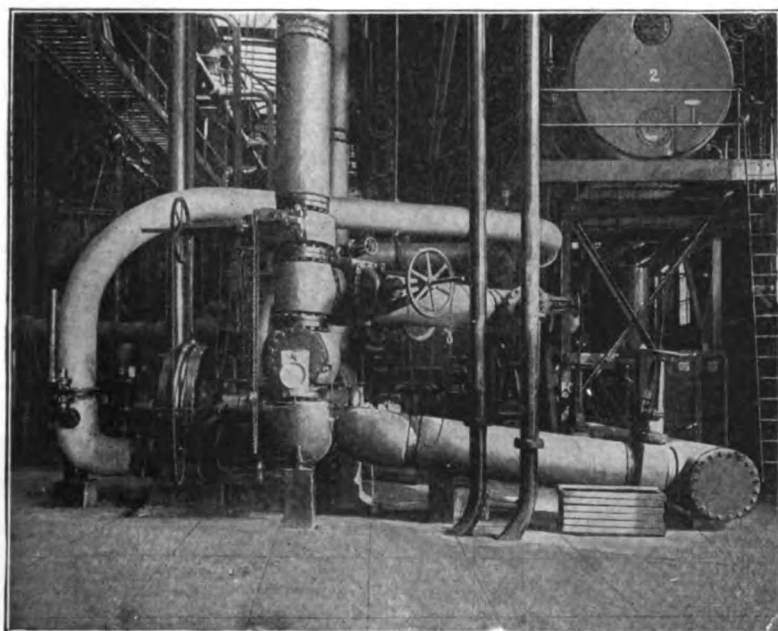
Our trade-mark is on all goods made by us, and we believe in maintaining its reputation. We fully guarantee our goods for the service sold.

Carefully conducted destruction tests of valves and fittings up to 36 in. have been made, and the data secured is an invaluable aid in making new designs.

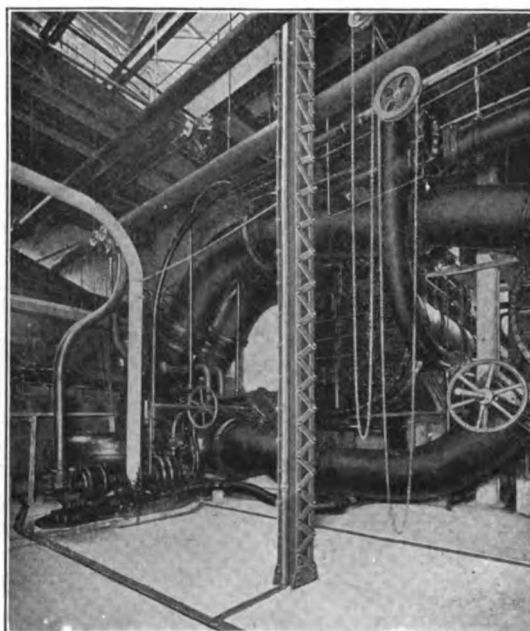
Gate Valves.

Made in parallel and taper seat types. For exhaust, water, air and gas, the parallel seat type is recommended; while for medium and high pressure steam and hydraulic service, the taper seat type is recommended.

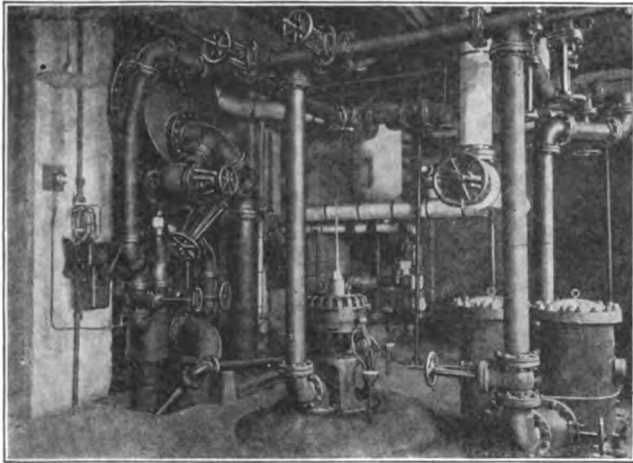
All types and sizes made either outside screw and yoke, or inside screw. Patterns are so arranged that valves can be made all iron or with bronze, monel or special mountings.



MISCELLANEOUS PIPING



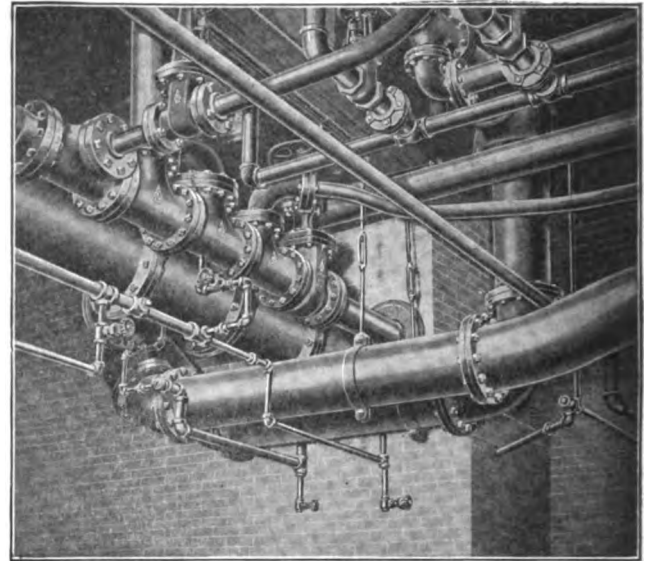
CONDENSER PIPING



MISCELLANEOUS PIPING AT CLEVELAND POWER PLANT OF PENNSYLVANIA LINES WEST OF PITTSBURGH

Motor Operated Gate Valves—We have applied motor drives to gates for various classes of work, using either direct or alternating current. Gearing for our motor operated gate valve is designed to meet the requirements of strength and compactness. All gear teeth are cut. Motors fitted with metaline bearings which require no oiling or other attention.

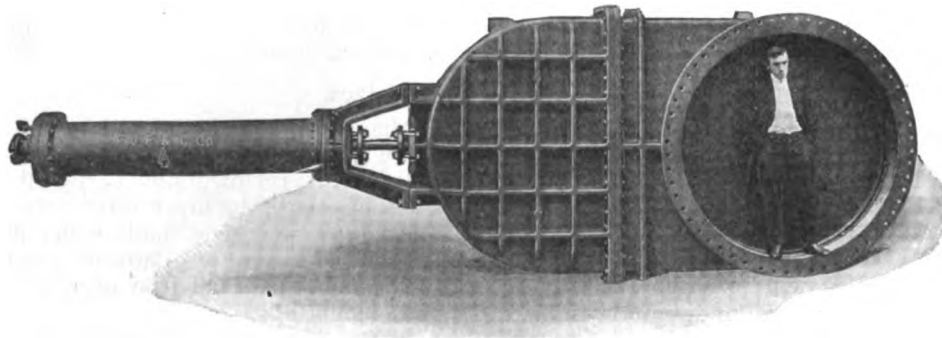
Unless otherwise specified, Stuart limit controller is used exclusively for this service, consisting of two automatic circuit breakers, mechanically operated, and incased in a box mounted on the gate yoke and out of reach of the operator, thus making it impossible for him to interfere with their proper functioning.



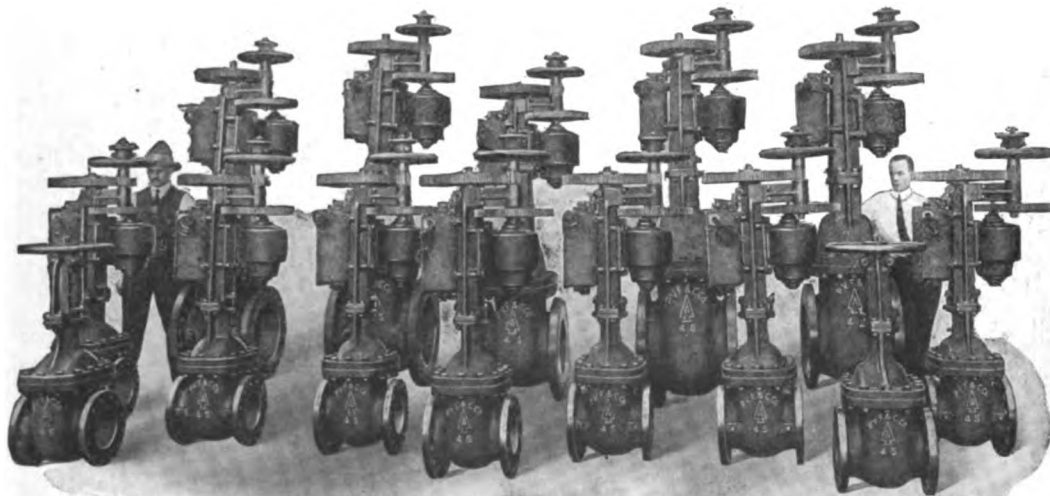
MISCELLANEOUS PIPING IN BRIDGEPORT PLANT OF REMINGTON ARMS AND AMMUNITION CO.
STONE & WEBSTER ENGINEERING CORP., Engineers

Underwriters' specifications have been met in all our designs.

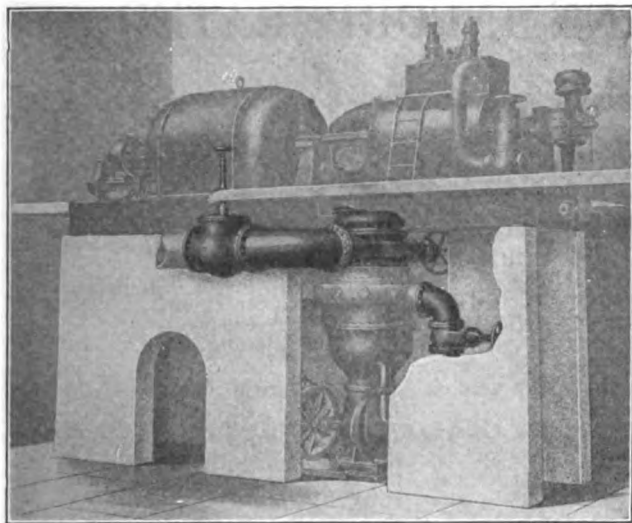
Cylinder Operated Gate Valves—Built for any pressure or service. Motive fluid may be water, air or steam. If the fluid is gaseous, as steam or air, placing the cylinder in a horizontal position is recommended. If, however, a vertical position can not be avoided, special attachments to meet conditions will be furnished.



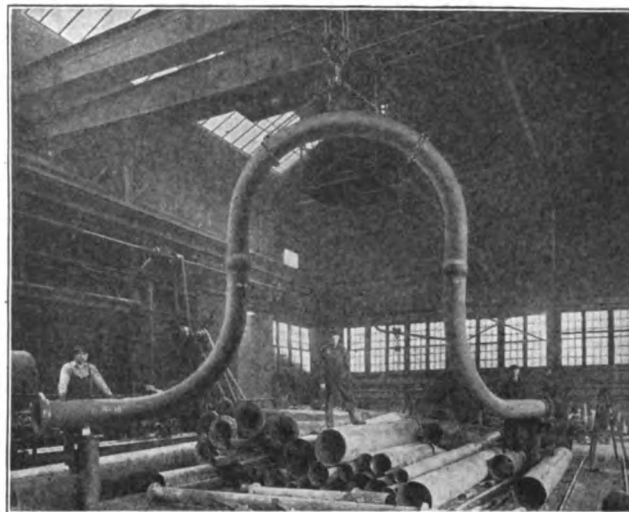
72-INCH CYLINDER OPERATED GATE VALVE



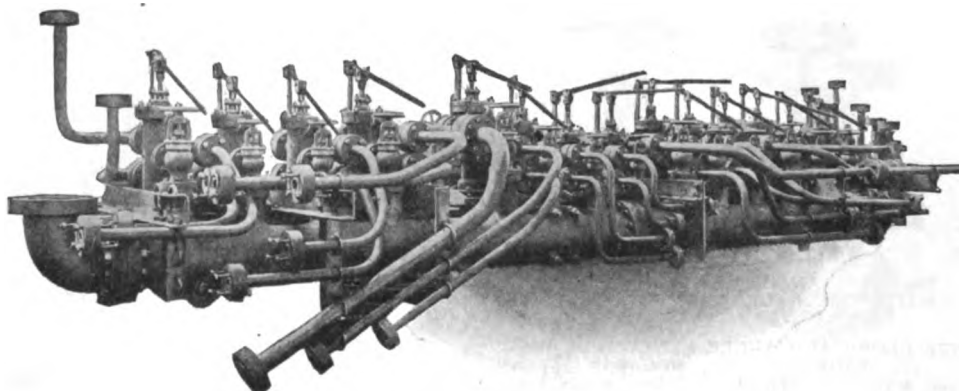
GROUP OF MOTOR OPERATED CAST STEEL VALVES—PART OF AN ORDER FROM THE PUBLIC SERVICE ELECTRIC COMPANY OF NEW JERSEY

**ATMOSPHERIC OUTLET GATE VALVE**

Valve serves the purpose of a gate valve and a tee. Arrangement reduces depth of basement required for installation of condenser. Valve is of single disc and single seat type. Disc held against seat when valve is closed. Furnished either inside screw or outside screw and yoke. May be equipped with either bevel, spur or special gearing

**PIPE BEND**

Contains 53 ft. of 14-in. pipe. The three lengths were connected by the Atwood line weld. On account of its size, it could not be shipped by rail. A river barge was used to deliver it to the Aliquippa plant of the Jones & Laughlin Steel Co.

**Rear View****Front View****HYDRAULIC MANIFOLD FOR JONES & LAUGHLIN STEEL CO., BESSEMER DEPARTMENT**

Fitted up complete in our shop and shipped as shown

Stuart Two-pressure Operating Valves.

Used extensively by the largest rubber manufacturers for operating heaters and presses with high and low pressure water.

Supply of high pressure water is controlled automatically, and can not be turned on at the wrong time, nor can either the high or low pressure be turned into the waste.

Operation is very simple. Moving lever up or down will raise or lower the press, using low pressure water only. When moulds come against the

**STUART TWO-PRESSURE OPERATING VALVE**

3/4-in. high pressure; 2-in. low pressure; 2 1/2 in. to cylinder; 2 1/2-in. waste. Lever furnished if so ordered

head of heater, or top of press, high pressure water is automatically turned on to squeeze moulds and low pressure is automatically cut off. After curing process is complete, lever is pulled as far as possible, which shuts off high pressure water and waste water in press.

This valve saves high pressure water; increases output; is foolproof; saves money and annoyance.

Steam Separators.

In these separators, every condition for good separation is met.

The standard horizontal, vertical and angle separators are made with cast iron bodies and wells.

Receiver type separators are made of semisteel bodies and wrought steel wells. They are constructed upon the same general principles as the smaller separators.

The welded receiver type separators have necks welded in by the "interlock" method. This type is guaranteed to be absolutely tight and has proved its reliability under the most severe service.

PRATT & CADY COMPANY INCORPORATED

Manufacturers of Valves and Cocks

HARTFORD, CONN.

BRANCH HOUSES

BOSTON, MASS., 130 High Street
CHICAGO, ILL., 604 West Lake Street
CLEVELAND, OHIO, 1597 St. Clair Avenue
DETROIT, MICH., 85 Jefferson Street
HOUSTON, TEX., 323 Chronicle Building

NEW YORK, N. Y., 259 Canal Street
MINNEAPOLIS, MINN., 712 Plymouth Building
PHILADELPHIA, PA., 529 Arch Street
PITTSBURGH, PA., 321 Third Avenue
SAN FRANCISCO, CAL., 505 Mission Street

SELLING AGENTS

HAVANA, CUBA., LAMBORN & Co. HAVRE, FRANCE, E. ISBECQUE & Co. LONDON, ENG., EDW. LE BAS & Co.

Products.

ANGLE, GLOBE, CHECK, GATE, BLOW-OFF and RADIATOR VALVES, in Bronze and Iron; ASBESTOS PACKED COCKS, in Bronze and Iron.

Also manufacturers of Stop and Check Valves, Electrically and Hydraulically Operated Gate Valves, Indicator Posts, Floor Stands.

Bronze Renewable Disc Valves.

Equipped with asbestos, bronze or special metal discs that are quickly removable and replaceable.

Union Bonnet Valves.

Complete line of Union bonnet valves for 200 and 300 lbs. working steam pressure.

Body of highest grade bronze, designed with long, easy curves.

Stem of cast manganese bronze, having tensile strength of mild steel.

Disc is of swivel regrinding type and is removable and replaceable.



UNION BONNET
SCREW END
GLOBE VALVE
200 lbs. pressure

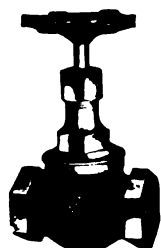


FIG. 1. GLOBE VALVE, SCREWED, ASBESTOS DISC

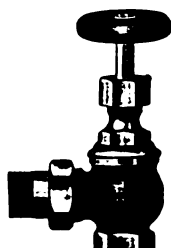


FIG. 8. ANGLE VALVE WITH UNION FOR RADIATOR

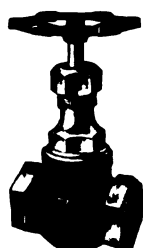


FIG. 31. EXTRA HEAVY GLOBE VALVE, SCREWED, BRASS DISC

DIMENSIONS, BRONZE GLOBE AND ANGLE RENEWABLE DISC VALVES

FIG. 1. ASS. DISC, GLOBE, SCRD. FIG. 3. ASS. DISC, ANGLE, SCRD.
FIG. 2. ASS. DISC, GLOBE, FLGD. FIG. 4. ASS. DISC, ANGLE, FLGD.

For 150 lbs. working steam pressure

Size, in.	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3
End to end, globe, scrd.	1 1/4	2	2 1/4	3 1/4	3 3/4	4 1/4	4 1/2	5 1/4	6 1/4	7 1/4
Face to face, globe, flgd.	1 1/4	2	2 1/4	3 1/4	3 3/4	4 1/4	4 1/2	5 1/4	6 1/4	7 1/4
Center to end, angle, scrd.	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Center to face, angle, flgd.	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Diam. of flanges	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4

FIG. 5. ASS. DISC, RADIATOR GLOBE, NO UNION. FIG. 7. ASS. DISC, UNION, RADIATOR GLOBE.
FIG. 6. ASS. DISC, RADIATOR ANGLE, NO UNION. FIG. 8. ASS. DISC, UNION, RADIATOR ANGLE.

Size, in.	1/2	3/4	1	1 1/4	1 1/2	2
End to end, globe, no union	2 1/4	3 1/4	3 3/4	4 1/4	4 1/2	5 1/4
Center to end, angle, no union	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
End to end, globe, inc. union nipple	4 1/4	4 1/4	5 1/4	6 1/4	6 1/4	8 1/4
Center to inlet, angle	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Center to end of union nipple	2 1/4	2 1/4	3 1/4	3 1/4	4 1/4	4 1/4

FIG. 31. EX. Hvy. GLOBE, SCRD., BRONZE DISC. FIG. 33. EX. Hvy. ANGLE, SCRD., BRONZE DISC.
FIG. 32. EX. Hvy. GLOBE, FLGD., BRONZE DISC. FIG. 34. EX. Hvy. ANGLE, FLGD., BRONZE DISC.

For 250 lbs. working steam pressure

Size, in.	3/4	1	1 1/4	1 1/2	2	2 1/2	3
End to end, globe, scrd.	3 1/4	3 3/4	4 1/4	4 1/2	5 1/4	6 1/4	8 1/4
Face to face, globe, flgd.	3 1/4	3 3/4	4 1/4	4 1/2	5 1/4	6 1/4	8 1/4
Center to end, angle, scrd.	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Center to face, angle, flgd.	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Diam. of flanges	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4



UNION BONNET ANGLE VALVE 200 lbs. pressure



UNION BONNET ANGLE VALVE 300 lbs. pressure



UNION BONNET SCREW END GLOBE VALVE 300 lbs. pressure

DIMENSIONS, UNION BONNET GLOBE AND ANGLE VALVES

FIG. 9. 200-lb. GLOBE SCRD. FIG. 27. 300-lb. GLOBE SCRD.
FIG. 10. 200-lb. GLOBE FLGD. FIG. 28. 300-lb. GLOBE FLGD.
FIG. 11. 200-lb. ANGLE SCRD. FIG. 29. 300-lb. ANGLE SCRD.
FIG. 12. 200-lb. ANGLE FLGD. FIG. 30. 300-lb. ANGLE FLGD.

For 200 lbs. working steam pressure

Size, in.	1/2	3/4	1	1 1/4	1 1/2	2
End to end, globe	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4
Center to end, angle	1	1	1	1	1	1

For 300 lbs. working steam pressure

Size, in.	1/2	3/4	1	1 1/4	1 1/2	2
End to end, globe	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4
Center to end, angle	1	1	1	1	1	1

Iron Body Renewable Disc Globe and Angle Valves.

Regular weight, Figs. 40, 41, 44 and 45 are equipped with iron discs, into which asbestos rings are inserted to serve as the faces.



FIG. 40. GLOBE SCREWED, WITH YOKE

IRON BODY GLOBE AND ANGLE VALVES

For 150 lbs. pressure

FIG. 40. ASB. DISC, YOKED, GLOBE, SCRD.

FIG. 44. ASB. DISC, YOKED, ANGLE SCRD.

FIG. 41. ASB. DISC, YOKED, GLOBE, FLGD.

FIG. 45. ASB. DISC, YOKED, ANGLE FLGD.

These four styles made in all sizes from 1½ to 8 in., inclusive

Size, in.	1½	2	2½	3	3½	4	4½	5	6	7	8
End to end, globe, scrd.	5	6	7½	8½	9½	10½	10¾	11½	13½	14½	16½
Face to face, globe, flgd.	5½	6½	8	8½	10½	10¾	11½	12	15½	15½	17
Center to end, angle, scrd.	2½	3	4½	4½	4½	5½	5½	5½	7	7½	8½
Center to face, angle, flgd.	2½	4½	4½	4½	5½	5½	5½	6½	7½	7½	8½
Diam. of flanges.	5	6	7	7½	8½	9	9½	10	11	12½	13½

Iron Body Globe and Angle Valves.

For 150 and 250 lbs. steam pressure.

Yoke and bonnet is of one-piece type. Deep stuffing box.

Stem, sizes 2 in. to 6 in., made of cast manganese bronze; in sizes 7 in. and larger, of cold rolled steel.

Sizes 2 in. to 5 in. have solid bronze disc; sizes 6 in. and larger have cast iron disc with rolled-in-bronze ring. Solid bronze disc nut in all sizes.

Seat ring is made of bronze and screwed into body; can be renewed whenever necessary.



FIG. 47. GLOBE FLANGED



FIG. 49. ANGLE FLANGED

STANDARD IRON BODY GLOBE AND ANGLE VALVES

For 150 lbs. pressure

FIG. 46. GLOBE SCRD.

FIG. 48. ANGLE SCRD.

FIG. 47. GLOBE FLGD.

FIG. 49. ANGLE FLGD.

Size, in.	2	2½	3	3½	4	4½	5	6	7	8
Diam. of wheel.	6	7	8	8	9	11	11	12	14	16
Face to face.	8	8½	9½	10½	11½	12	13	14	16	17
Diam. of flanges.	6	7	7½	8½	9	9½	10	11	12½	13½
Thickness of flanges.	6	8	8	8	8	8	8	8	8	8
Center to top of stem, open globe.	10½	11½	12½	13½	15½	16½	16½	18½	20	22
Center to top of stem, open angle.	9½	10½	11½	12½	14½	15½	15½	17½	18	19
Center to end, scrd.	3½	3½	4	4½	5	5½	5½	6½	7½	8
Center to face, flgd.	4	4½	4½	5½	5½	6	6½	7	8	8½
End to end, scrd.	6½	7	8	9	10	10½	11½	13	14½	16



FIG. 51. EXTRA HEAVY FLANGED GLOBE

EXTRA HEAVY GLOBE AND ANGLE VALVES

For 250 lbs. pressure

FIG. 50. EX. Hvy., COPPER DISC, YOKED, GLOBE, SCRD.

FIG. 52. EX. Hvy., COPPER DISC, YOKED, ANGLE, SCRD.

FIG. 51. EX. Hvy., COPPER DISC, YOKED, GLOBE, FLGD.

FIG. 53. EX. Hvy., COPPER DISC, YOKED, ANGLE, FLGD.

Size, in.	2	2½	3	3½	4	5	6	7	8
End to end, globe, scrd.	7	8	9½	10	11	13½	15½	15½	16½
Face to face, globe, flgd.	9	10	10½	11½	12½	14½	15½	17½	18
Center to end, angle, scrd.	3½	4½	4½	5½	5½	6½	7½	7½	8½
Center to face, angle, flgd.	5½	5½	6½	6½	7	7½	8½	9½	10½
Diam. of flanges.	6½	7½	8½	9	10	11	12½	14	15

Bronze Renewable Seat Gate Valves.

In these valves the seats are separate rings, made of asbestos, bronze or special metal. These seat rings are held in the body of the valve by retaining rings that screw into the body. This construction makes it simple to renew the seat rings, when they become worn or scored, *without having to remove the valve from the pipe line.*



FIG. 101. SCREWED 150 lbs. pressure

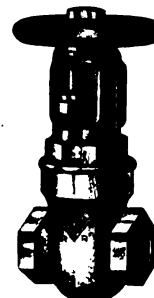
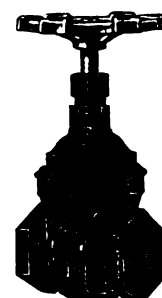


FIG. 118. SCREWED RISING SPINDLE 250 lbs. pressure



SHOWING RENEWABLE RING FEATURE

BRONZE GATE VALVES, WITH RENEWABLE SEAT RINGS

For 150 lbs. pressure

FIG. 101. INSIDE SCREW, SCRD.

FIG. 102. INSIDE SCREW, FLGD.

Made in sizes ¼ to 4 in. inclusive

Size, in.	¼	½	¾	1	1½	2	2½	3	3½	4
End to end, scrd.	2½	2½	2½	2½	3½	4½	4½	5½	6½	7½
Face to face, flgd.	3	3	3	3	4½	5½	5½	6½	7½	8½
Diam. of flanges.	3	3	3	3	4	5	6	7	8½	9

FIG. 118. EX. Hvy., INSIDE SCREW, SCRD.

FIG. 118A. EX. Hvy., RISING SPINDLE, SCRD.

FIG. 119. EX. Hvy., INSIDE SCREW, FLGD.

FIG. 118B. EX. Hvy., RISING SPINDLE, FLGD.

Made in sizes ½ to 3 in.

Made in sizes ½ to 2 in.

For 250 lbs. pressure

Size, in.	½	¾	1	1½	2	2½	3
End to end, scrd.	2½	3	3½	4	4½	5½	6½
Face to face, flgd.	4½	4½	5½	5½	6½	7½	8½
Diam. of flanges.	4½	5	5	5	6	7½	8½

FIG. 120. HYDRAULIC, INSIDE SCREW, SCRD.

FIG. 121. HYDRAULIC, INSIDE SCREW, FLGD.

For 800 lbs. working water pressure

Size, in.	½	¾	1	1½	2
End to end, scrd.	3½	3½	4½	4½	5
Face to face, flgd.	4½	4½	5½	5½	6
Diam. of flanges.	3½	3½	4½	5	6

Iron Body Renewable Seat Gate Valves.

The method of holding the seat rings in place is identical with that employed in the bronze valves.



FIG. 146. SCREWED STATIONARY SPINDLE
150 lbs. pressure



FIG. 156. FLANGED STATIONARY SPINDLE
200 lbs. pressure



FIG. 164. FLANGED RISING SPINDLE
250 lbs. pressure

DIMENSIONS, IRON BODY GATE VALVES

FIG. 146. INSIDE SCREW, SCRD.

FIG. 147. INSIDE SCREW, FLGD.

FIG. 148. OUTSIDE SCREW, SCRD.

FIG. 149. OUTSIDE SCREW, FLGD.

Made in sizes 2 to 12 in.

Made in sizes 2 to 16 in.

For 150 lbs. pressure

Size, in.	2	2½	3	3½	4	4½	5	6	7	8	9	10	12	14	15
End to end, scrd.	5	6	6½	7	7½	8	8½	9	10	11	12	13	14	16	17½
Face to face, flgd.	6½	7½	8½	9	9½	10½	10½	11	11½	12	12½	14	16	17½	19
Diam. of flanges	6	7	7½	8½	9	9½	10	11	12½	13½	15	16	19	21	23½

FIG. 155. HEAVY, INSIDE SCREW, SCRD.

FIG. 156. HEAVY, INSIDE SCREW, FLGD.

FIG. 157. HEAVY, OUTSIDE SCREW, SCRD.

FIG. 158. HEAVY, OUTSIDE SCREW, FLGD.

Made in sizes 2 to 12 in. with or without by-pass

Made in sizes 2 to 16 in. with or without by-pass

For 200 lbs. pressure

Size, in.	2	2½	3	3½	4	4½	5	6	7	8	9	10	12	14	16
End to end, scrd.	6½	6½	8	8½	8½	9½	10	10½	11	12	12	14	17		
Face to face, flgd.	7½	8½	9	10	10½	10½	11	11½	12½	13½	15	16	17	18	20
Diam. of flanges	6½	7½	8½	9	10	10½	11	12½	14	15	16½	17½	20½	23	25½

FIG. 161. EX. HVY., INSIDE SCREW, SCRD.

FIG. 162. EX. HVY., INSIDE SCREW, FLGD.

FIG. 163. EX. HVY., OUTSIDE SCREW, SCRD.

FIG. 164. EX. HVY., OUTSIDE SCREW, FLGD.

Made in sizes 2 to 12 in. with or without by-pass.

For 250 lbs. pressure

Size, in.	2	2½	3	3½	4	4½	5	6	7
End to end, scrd.	6½	8	8½	9	9½	10	10½	11	12
Face to face, flgd.	8½	9½	10½	11½	12	12	12½	14	14½
Diam. of flanges	6½	7½	8½	9	10	10½	11	12½	14

Size, in.	8	9	10	12	14	16	18	20	24
End to end, scrd.	13	12	15	17½					
Face to face, flgd.	15	15½	17½	20	22	23½	24½	26½	31
Diam. of flanges	15	16½	17½	20½	23	25½	28	30½	36

Bronze Swing Check Valves with Renewable, Rotating Bronze Discs and Regrindable Seats.

A valve of this type is easily reground. By removing the cap, inserting a screwdriver blade into the slot in the disc head, the disc may be rotated on the seat until the damaged surface of the seat is restored to perfect shape. Should the disc become badly worn, it is the work of an instant to substitute a new one by unscrewing the side plugs and removing the interior parts.



BRONZE SWING CHECK VALVE

DIMENSIONS, BRONZE SWING CHECK VALVES

FIG. 201. HORIZONTAL OR VERTICAL PATTERN, SCRD.

FIG. 202. HORIZONTAL OR VERTICAL PATTERN, FLGD.

For 150 lbs. pressure

Size, in.	¼	¾	1½	2	2½	3	3½	4	4½	5	6	7	8	9
End to end, horizontal or vertical patt., scrd.	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½
Face to face, vertical patt., flgd.	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½
Diam. of flanges	3	3½	4	4½	5	6	7	8	9	10	11	12	13	14

FIG. 205. HORIZONTAL OR VERTICAL PATTERN, SCRD.

WITH ROTATING ASBESTOS RING DISC

For 150 lbs. working steam pressure

Size, in.	¼	¾	1	1½	1½	2
End to end, horizontal or vertical patt., scrd.	2½	3½	3½	4½	4½	5½

FIG. 212. EX. HVY., HORIZONTAL OR VERTICAL PATTERN, SCRD.

For 250 lbs. working steam pressure

Size, in.	¼	¾	1½	2	2½	3
End to end, horizontal or vertical patt., scrd.	2½	2½	2½	3½	3½	4
	4	4½	5½	7½	8½	9

FIG. 217. HYDRAULIC, HORIZONTAL OR VERTICAL PATTERN, SCRD.

For 800 lbs. working water pressure

Size, in.	¼	¾	1	1½	1½	2
End to end, horizontal or vertical patt., scrd.	4	4½	5½	6	6½	7½

Iron Body Swing Check Valves, Underwriters' Pattern with Rotating Discs and Renewable Bronze Seats

Sizes 7-in. and smaller have solid bronze discs. The 8-in. to 24-in. sizes have iron discs with bronze faces.

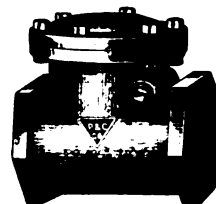


FIG. 219. HORIZONTAL OR VERTICAL PATTERN, SCREWED IRON BODY SWING CHECK VALVE

FIG. 219. HORIZONTAL OR VERTICAL PATTERN, SCRD.

Made in sizes 2 to 12 in.

FIG. 220. HORIZONTAL OR VERTICAL PATTERN, FLGD.

Made in sizes 2 to 24 in.

FIG. 223. HORIZONTAL PATTERN, HUB ENDS

Made in sizes 2 to 24 in.

For 150 lbs. working water pressure

Size, in.	2	2½	3	3½	4	5	6	7
End to end, horizontal or vertical patt., scrd.	5½	7½	8	9½	10	12	13½	15
Face to face, vertical patt., flgd.	8½	9½	10½	12	12½	13½	15	16½
End to end of hubs, horizontal patt.	9½	12½	12½	16½	17½	19	20½	21½
Diam. of flanges	6	7	7½	8½	9	10	11	12½

Size, in.	8	10	12	14	16	18	20	24
End to end, horizontal or vertical patt., scrd.	16½	18½	21½	25	27½	30½	32½	38
Face to face, vertical patt., flgd.	18	21½	23½	25	27½	30½	32½	38
End to end of hubs, horizontal patt.	21½	24½	26½	29	31½	34½	41	
Diam. of flanges	13½	16	19	21	23½	25	27½	32

FIG. 226. EX. HVY. HORIZONTAL OR VERTICAL PATTERN, SCRD.

FIG. 227. EX. HVY. HORIZONTAL OR VERTICAL PATTERN, FLGD.

Made in sizes 2 to 10 in.

For 300 lbs. working water pressure

Size, in.	2	2½	3	3½	4	5	6	7	8	10
End to end, scrd.	7½	9½	9½	13½	14	14½	16½	16½	17	19½
Face to face, flgd.	9	11½	12½	14	15½	17	19	19½	19½	23
Diam. of flanges	6½	7½	8½	9	10	11	12½	14	15	17½

Continued on next page

Iron Asbestos Packed Cocks, Groove Packed Pattern.

Cocks of this design are packed with loose asbestos in U-shaped grooves in the body. This packing is done by hand, and afterwards the entire cock is subjected to a special vulcanizing process. This vulcanizing process makes the cock very serviceable and well able to withstand higher pressure and temperature.

These cocks give unexcelled service as blow-off valves on boilers where no other type of valve has given satisfaction.



FIG. 247. SCREWED
125 lbs. pressure



FIG. 259. WORM AND GEAR
Flanged End Cock

IRON ASBESTOS PACKED COCKS

FIG. 247. STRAIGHTWAY, SCRD. FIG. 269. WORM AND GEAR, FLGD.
FIG. 249. STRAIGHTWAY, FLGD. FIG. 261. EXTRA HEAVY WORM AND GEAR, FLGD.

For 125 lbs. working steam pressure

SCREWED

Size, in.	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6
End to end	2 5/8	2 7/8	3	3 3/4	4	4 5/8	5 1/8	6	7	8 1/4	9 1/2	11 1/2

FLANGED

Size, in.	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6
Face to face	5 1/2	5 3/4	5 7/8	7 1/8	8 1/4	9 1/4	10 1/4	11 1/2	13 1/4	16
Diam. of flanges	4	4 1/2	5	6	7	8 1/2	9 1/2	10 1/2	12 1/2	14 1/2

FIG. 251. HEAVY, STRAIGHTWAY, SCRD. FIG. 253. HEAVY, STRAIGHTWAY, FLGD.

For 150 lbs. working steam pressure

SCREWED

Size, in.	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4
End to end	3 1/4	3 3/4	3 5/8	4 1/8	4 3/4	5 1/8	5 7/8	6 7/8	7 3/4	10

FLANGED

Size, in.	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4
Face to face	5 1/2	5 3/4	5 7/8	6 1/4	7 1/8	8 1/4	10 1/4	11 1/2
Diam. of flanges	4 1/2	5	6	6 1/2	7 1/2	8 1/2	10 1/2	12 1/2

FIG. 255. EXTRA HEAVY STRAIGHTWAY, SCRD. FIG. 257. EXTRA HEAVY STRAIGHTWAY, FLGD.

For 250 lbs. working steam pressure

SCREWED

Size, in.	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4
End to end	3 3/4	4 1/8	4 3/4	5 3/8	5 7/8	6 7/8	8 3/8	10 7/8	12	15

FLANGED

Size, in.	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4
Face to face	5 1/2	5 3/4	5 7/8	6 1/4	7 1/8	8 1/4	10 1/4	12 1/2
Diam. of flanges	4 1/2	5	6	6 1/2	7 1/2	8 1/2	10 1/2	12 1/2

Iron Asbestos Packed Cocks, Three-way Pattern.

This type of cock is found extremely useful for controlling the flow through branch lines. It has U-shaped grooves in the body, into which loose asbestos is driven and then vulcanized.

There are two designs in this type: one has two openings in the central plug, and the other has three openings.

For many years these cocks have been used with unparalleled success for air, ammonia, gas, steam and water.



FIG. 272
THREE OPENINGS IN PLUG
All three ports can be open; any two can be open and the third closed

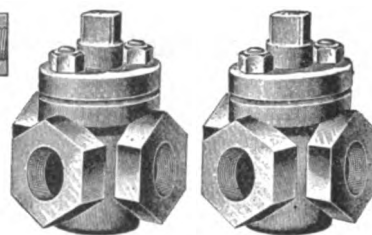


FIG. 273
TWO OPENINGS IN PLUG
Side port and either line port can be connected; all three ports can be closed

IRON ASBESTOS PACKED COCKS, THREE-WAY PATTERNS

Size, in.	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5
End to end of run	3 3/8	4	4 5/8	5 1/8	6	7	8 1/8	8 3/4	9 1/2	11 1/2	11 1/2
Center of run to end of side opening	1 5/8	2	2 1/4	2 1/2	3	3 1/2	4 1/8	4 3/4	5 1/4	5 3/4	6

Automatic Stop and Check Valve.

Design is based primarily on simplicity and ruggedness with full regard to the exacting requirements of the service. The generous length of the piston and cylinder provides an ample dashpot and eliminates the possibility of hammer or chatter of disc.

The piston and disc are of one piece and provide perfect alignment at the only two points where such is required. The absence of a stuffing box prevents any hindrance to free movement of all the reciprocating parts.

The metal thickness of the piston and the dashpot walls is the same; expansion under various temperatures will, therefore, be the same. This, taken in conjunction with the large steam chamber surrounding the outside of the dashpot which insures equal temperatures, prevents the possibility of binding or sticking, which is liable to occur where the dashpot and piston walls are of unequal thickness, or where the outside of the dashpot is in close proximity to the body shell.



FIG. 326. GLOBE
PATTERN

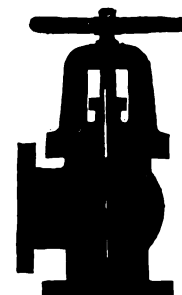


FIG. 328. ANGLE
PATTERN

EXTRA HEAVY AUTOMATIC STOP AND CHECK VALVES

For 250 lbs. pressure

GLOBE PATTERN

Size, in.	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7	8
Face to face	9	10	10 3/4	11 3/4	12 1/2	13 1/2	14 1/2	15 1/2	17 1/2	18
Diam. of flanges	6 1/2	7 1/2	8 1/4	9	10	10 1/2	11	12 1/2	14	15
Thickness of flanges	3/8	1	1 1/8	1 1/4	1 1/2	1 3/4	1 7/8	2 1/8	2 1/2	2 3/4
Center to top of wheel (closed)	11	12 1/8	14 1/8	15 3/8	16	18 5/8	19 3/8	22 1/4	25 1/4	26 7/8

ANGLE PATTERN

Size, in.	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7	8
Center to face of flange	5 1/4	5 3/4	6 1/4	6 3/8	7	7 1/2	7 7/8	8 3/4	9 5/8	10 1/2
Diam. of flanges	6 1/2	7 1/2	8 1/4	9	10	10 1/2	11	12 1/2	14	15
Thickness of flanges	3/8	1	1 1/8	1 1/4	1 1/2	1 3/4	1 7/8	2 1/8	2 1/2	2 3/4
Center to top of wheel (closed)	10 1/2	11 3/4	12 1/2	14 1/4	15 1/2	16 3/4	18	20	22 1/4	25

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Also manufacturers of Angle, Globe, Cross, Air, Hose, Yoke, Heavy and Extra Heavy Valves; Gauge Cocks (Boiler, Steam); Water Gauges; Steam and Oil Separators; Steam Traps; Grease Cups; Oil Cups; Oil Pumps; Steam Engine and Gas Engine Lubricators; Brass Fittings; Iron and Brass Flanges; Expansion, Swing and Swivel Joints; Unions; etc.

Special Goods, of all varieties, made to order from sample, sketch or blue print.

Identification Marks.

The name "Williams" is cast in sunken or raised gothic letters on all valves, traps, separators, etc., while the complete firm name and address (and trade-name if any) are stamped on finished and polished articles in order to identify genuine Williams products from undesirable substitutes.

Facilities and Co-operation.

Modern equipment and long experience enable this company to manufacture practically any product made from brass, bronze, nickel, aluminum, iron or steel, either cast or stamped, including necessary machining operations, assembling, etc.; and the construction of standard goods can be modified to suit local requirements. The plant is operated on a highly economical basis and all quotations are based on an accurate cost system. Write for Catalogue No. 10 which shows complete line.

Advantages of Williams Regrinding Valves.

The use of these durable and efficient regrinding valves (Fig. 107-B) adds to economical operation of any power plant, due chiefly to following advantageous features: (1) Design, simplicity and liberal proportions of valve—smallest area in body is larger than nominal diameter of pipe, permitting no reduction in pressure of steam, water, oil, air or gas. (2) Valves made with screwed or flanged ends for these steam pressures: medium pattern, 200 lbs.; extra heavy, 350 lbs. (3) Made of best quality of metal. (4) Regrinding disc and seat eliminates *all leakage and incidental waste of fuel.*

(5) Cheap light valves are always liable to leakage, frequent renewals and waste of fuel, time, labor and patience. (6) Stems made of special bronze composition as hard as steel; are durable, larger in diameter and heavier than other valve stems; will, therefore, not bend or break. When valve is closed and under greatest strain, every thread on stem is utilized, none being idle, thus preventing unequal wear and "stripping." (7) Valve has a steamtight joint at base of stem ("C"

when raised up) and seating against bottom of hub (B);

and *when wide open valve can be repacked under full pressure with absolute safety.*

(8) Stuffing box packed with special moulded ring packing, not requiring renewal for several years; has drive gland and heavy packing nut, and is readily accessible for repacking. (9) Discs and seats are of bronze, to stand high pressures and temperatures, year after year, without being affected. No extra discs or seats are necessary. In case seat or disc is marred by reason of gritty water or otherwise, regrinding seating surface within a few minutes *without expense or disconnecting pipes* is a simple operation. (10) Note union ring (L), making strong non-corroding connection between hub and body.

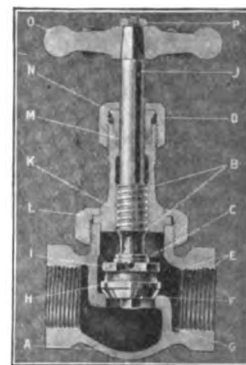


FIG. 107-B
INTERIOR VIEW OF
WILLIAMS REGRINDING
VALVE

A, thickness and curve of body. B, all threads utilized, when valve closed. C, when valve wide open (stem) seat forms a tight bearing on bottom of bonnet, preventing steam, etc., from blowing through, and enabling repacking under pressure with safety. D, heavy, durable, hexagon packing nut. E, threads on pipe end, conforming to U. S. Briggs standard. F, radial seat, can be reground any number of times. G, showing area of valve in excess of nominal diameter of pipe. H, disc, of hard bronze, can be reground any number of times, is renewable at nominal cost and stands highest temperatures and pressures. I, bronze hexagon lock nut, securing disc to stem. J, long stem, of tough bronze composition, large in diameter and very heavy. K, strong substantial hub—long, to properly support stem; bottom is machined to insure tight joint with seat C while repacking, when valve open wide. L, union ring, screwing over hub and neck of body (threads not exposed), makes steamtight joint. M, special, moulded, asbestos ring packing. N, packing gland follower (in all Williams valves above ½-in. size). O, japanned hand wheel with ball at end of each spoke. P, brass lock nut



FIG. 107
MEDIUM TYPE
Screw- Flanged
Fig. 107
107 Globe 280
108 Angle 281
106 Cross 282



FIG. 107-E
Applying oil and emery, which is always at hand, when new discs are not. Contrast this with costly method of inserting new discs which are not always available when needed

Different Types of Williams Valves.

In addition to the union bonnet ring construction and inside screw stem (Fig. 107) described above, the screwed yoke type (with outside screw stem) has been developed (Fig. 119), in the globe, angle and cross valves; designed for places where fluid may cause

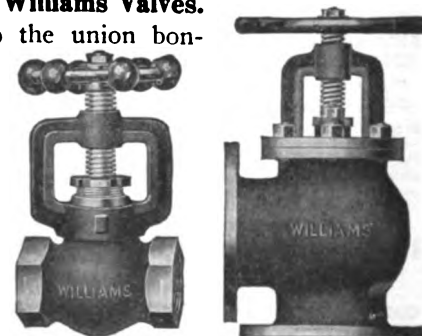


FIG. 119. MEDIUM SCREWED YOKE TYPE
Screw- Flanged
Fig. 119
119 Globe 409
407 Angle 410
408 Cross 411
FIG. 397. MEDIUM FLANGED YOKE TYPE
Screw- Flanged
Fig. 397
393 Globe 396
394 Angle 397
395 Cross 398

corrosion of threads on stem or where valve must be inserted in pipe with wheel handle *down*; also, the flanged yoke type (Fig. 397), differing only in manner of securing yoke to valve body, threads (accessible) never being in contact with steam. Both yoke types are built with screwed or flanged ends, in medium and extra heavy patterns.

Other styles of Williams valves are described and illustrated on this and succeeding page.

Williams Regrinding Radiator Valves.

Substantially made of best materials, with female and male and female ends. Illustration (Fig. 122) shows a male union on outlet end to facilitate connection to radiator. Discs and seats are of bronze, easily renewed when worn, by regrinding. Furnished with hardwood wheels or lock shields at same price, and can be repacked under pressure, either wide open or closed.

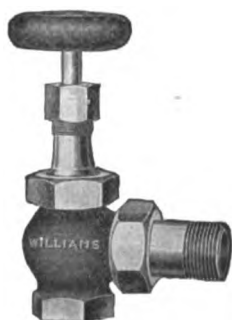


FIG. 122. ANGLE VALVE With male union, Globe, Fig. 358; female ends—Angle, Fig. 120 and Globe, Fig. 335

Williams Regrinding Blow-off Valves.

Made of brass in medium and extra heavy pattern; screwed and flanged ends; union bonnet with inside screw stem; liberal areas for blowing off mud, grit and scale. Disc and seat can be reground. Steam working pressures guaranteed—medium, 200 lbs.; extra heavy, 350 lbs.



SCREWED END BLOW-OFF VALVE
Medium, Fig. 243, male and female
Medium, Fig. 272, female ends
Extra heavy, Fig. 621, male and female
Extra heavy, Fig. 289, female ends

Williams Hydraulic Valves.

Made of brass, with screwed ends; for working pressures up to 2,000 lbs. Used in rubber factories, cotton and linseed oil mills, on cotton and baling presses, etc. Heavily constructed for any high hydraulic pressures. Disc and stem are of one piece; disc and seat can be reground.

These valves are also furnished in check type.



FIG. 581. GLOBE HYDRAULIC VALVE
Angle, Fig. 592
Cross, Fig. 560

Williams Regulating Check Valves.

Made with screwed or flanged ends, in medium and extra heavy pattern, for working steam pressures of 200 and 350 lbs., respectively. Lift of disc controlled by a threaded stem, giving any degree of opening through valve. Valve quickly reground; union bonnet with inside screw stem. Also furnished in globe pattern, either screwed or flanged ends.

These valves are used on boiler feed lines.



ANGLE CHECK VALVE
Medium, Fig. 454
Extra heavy, Fig. 255

Williams Regrinding Check Valves.

Made with screwed and flanged ends, in medium and extra heavy pattern, for 200 and 350 lbs. working steam pressures, respectively. Small wings cast on bottom of disc insure correct alignment, perfect seating, and tight check. Top-heavy wing guides eliminated.

Recommended for use on boiler feed lines.



FIG. 114. SECTIONAL VIEW OF MEDIUM REGRINDING CHECK VALVE

Screwed Fig. 114 Horiz. Fig. 283
Flanged Fig. 115 Angle Fig. 284
Vert. Fig. 118 Fig. 285

Williams Regrinding Swing Check Valves.

Made with screwed and flanged ends, in medium and extra heavy pattern, for 200 and 350 lbs. pressure, respectively; designed for steam, water, oil or gas.

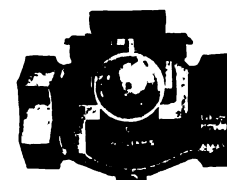
Recommended for use on boiler feed lines, steam trap installations, return systems, control of heavy liquids, etc. Can be installed in either horizontal or vertical position.



FIG. 254. SECTIONAL VIEW OF MEDIUM REGRINDING SWING CHECK VALVE
Screwed, Fig. 254
Flanged, Fig. 296

Williams Ball Check Valves.

Made with screwed ends, in medium pattern, for working pressures up to 200 lbs. Made of best steam bronze, and designed for steam and water service. Ball used is round and spherical as possible, is made of a hard, dense, bronze composition, and is guided in its action by cylindrical extensions on inside of cap.



MEDIUM BALL CHECK VALVE
Horz., Fig. 116
Angle, Fig. 439
Vert., Fig. 440

Williams Needle Valves.

Made of steam bronze; medium pattern, with female ends, for controlling gas, gasoline, oil, liquid, air, etc., where close regulation of volume through valve is required. Long, tapering needle point and seat opening, with fine pitch of threads on stem, permit close degree of opening. Steel stems and union ends furnished, when so ordered.

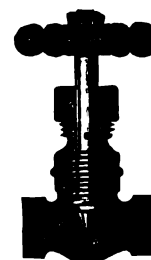


FIG. 606. GLOBE NEEDLE VALVE
Angle, Fig. 607
Cross, Fig. 608

Williams Steam Stop Cocks.

Made of best steam metal, with screwed and flanged ends, in medium pattern, for working pressures up to 200 lbs.

All parts are carefully machined, and keys are ground in by hand to a perfect bearing.

All Williams cocks are *guaranteed steamtight*.

Keys operate easily, will not stick, bind or leak.

Write for further particulars.



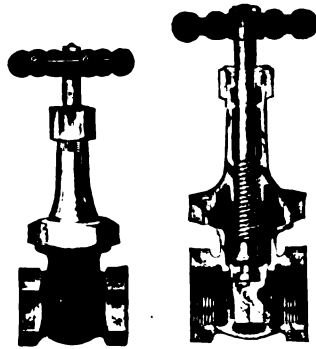
STEAM STOP COCK
Square head; screwed ends,
Medium, Fig. 154; flanged
ends, Medium, Fig. 155

Williams Double Disc Gate Valves.

Made of best bronze composition and heavily built

to stand any excessive strains. Manufactured in two patterns—medium and extra heavy, for 200 and 350 lbs. working pressure, respectively; with screwed and flanged ends.

The construction (shown in Fig. 127) of the double disc mechanism is simple, also flexible, by reason of ball and socket bearing between discs A and B. Discs (tapering) are suspended from stem F. Perfect alignment is secured by means of lugs on either side of disc which travel in a corresponding groove in center line of body; in closing valve, discs automatically drop into position and adjust themselves to same taper of seats. Ball and socket bearing of discs distributes a uniform wedging action to both, causing them to bear tightly to seats, insuring perfect contact at all points. These valves are also furnished with screwed yoke, similar to Fig. 119 shown on a preceding page.



Exterior—Fig. 127—Sectional
MEDIUM DOUBLE DISC GATE
VALVE
Fig. 127 screwed; Fig. 317 flanged

Williams Wedge Disc Gate Valves.

Made with screwed and flanged ends, in medium pattern, for working pressures up to 200 lbs. Stationary, non-rising stem. For steam, water, oil, air or gas.

Construction includes a single brass disc, with its seating surfaces machined and ground to a taper corresponding with angle of valve seats. Disc is held to stationary stem by means of Acme standard thread; is guided by means of lugs cast on either side, similar to double disc type of construction, perfect alignment being thus secured. Operation of valve is entirely frictionless.



MEDIUM WEDGE
DISC GATE VALVE
Hose pattern
Fig. 474 screwed
Fig. 475 flanged

Cino Iron Body Gate Valves.

Made with screwed and flanged ends. Used for steam, water, oil, air or gas.

Guaranteed for working steam pressures up to 100 lbs. Adapted for efficient service in mines, railroad tanks, refineries, paper mills, oil and gas wells, chemical factories, paint or soap factories, distilleries, breweries, water tanks, irrigation purposes, for handling cyanides, acids, etc.

Construction includes two bronze discs having a ball and socket at their center; discs suspended from and held in position by a malleable iron, wedge shaped holder. Wedging action of disc holder, and ball and socket bearing, insure necessary tightness of disc against their seats.



CINO GATE VALVE
IRON BODY, BRASS
MOUNTED
Fig. 300 screwed
Fig. 338 flanged
ALL IRON
Fig. 420 screwed
Fig. 406 flanged

Williams Quick Opening Lever Throttle Valves.

Manufactured of iron and brass, with screwed ends, in medium and heavy patterns, for working steam pressures as follows: Brass, medium, for 100 lbs.; brass, heavy, for 200 lbs.; iron, medium, for 100 lbs.; iron, heavy, for 150 lbs. Heavily constructed throughout; bodies and caps of cast iron, discs, seat rings and packing nuts of best bronze composition. Positive double disc mechanism.



Sectional View
Showing Double
Disc Construction
QUICK OPENING LEVER
THROTTLE VALVES
Iron Medium, Fig. 328
Heavy, Fig. 132

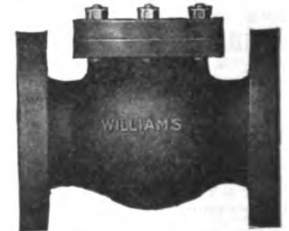
Williams Iron Body Stop and Check Valves.

Stop Valves—Made of a hard, close grained cast iron having great tensile strength, with flanged yoke and outside bronze screwed stem; brass mounted; screwed and flanged ends. Built in medium pattern for 125 lbs. working steam pressure, also in heavy type for 175 lbs. Threads of stem never come in contact with steam or liquids passing through body. Valves can be repacked under pressure, when wide open; discs easily re-ground. Both patterns are fitted with renewable bronze seat rings.



MEDIUM ANGLE STOP
VALVE
Screwed Fig. 180 . . . Globe . . . Fig. 628
Flanged Fig. 181 . . . Angle . . . Fig. 629
Fig. 528 . . . Cross . . . Fig. 529

Check Valves—Made with screwed and flanged ends, in medium and heavy patterns, for 125 and 175 lbs. working steam pressures respectively. Construction includes cast iron body and bolted cap; bronze disc, disc guide and seat, and renewable bronze seat rings. Valves are positive in operation, strong, and durable.



MEDIUM HORIZONTAL
CHECK VALVE
Screwed Fig. 144 . . . Horiz. . . Fig. 631
Flanged Fig. 145 . . . Angle . . . Fig. 632
Fig. 575 . . . Vert. . . Fig. 576

Williams Cookson Steam Trap.

Increased leverage of valve mechanism makes possible a discharging capacity much larger than that of any other similar trap. Few working parts; no stuffing boxes. Body and cap are of cast iron; strainer and float of copper; disc "J" and seat "K" of monel metal; other parts, of best grade of bronze composition.

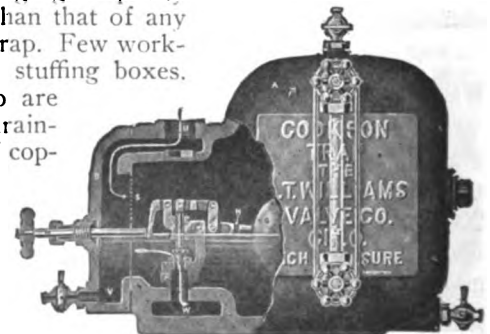


Fig. 500. COOKSON STEAM TRAP
For any pressure up to 200 lbs.

Write for catalogues and further particulars.

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For Chapman Solid Wedge Gate Valves in bronze, semisteel and iron, in all sizes and for all pressures and purposes, and Floor Stands for valves and sluice gates, see pages 942-46.

Chapman Sluice Gates.

Chapman sluice gates are furnished for a variety of services, such as intake gates for penstocks, waste gates for dams, controlling gates for tunnels and canals, inlet and outlet gates for filter plants, sewage disposal plants and reservoirs; distributing gates for reclamation and irrigation projects, etc.

The gates are designed with either circular or rectangular openings. Size of gate denotes the size of clear waterway through the gate.

Gates may be furnished with a standard frame, flanged frame, bell frame or spigot frame. Standard frame type has a wall flange to bolt against the face of the wall, and in addition a short spigot extension around the waterway to be embedded into the concrete. When standard frame type is furnished with top hook wedges, slots must be provided in the wall to permit hook wedges to travel up and down. The short spigot stiffens the frame, assists in carrying the load, and provides a short lining for the waterway. The flanged frame type may be bolted to a flanged pipe or directly



against face of the concrete wall. The spigot frame type is of the same general construction as the standard frame type, but the spigot is much longer and hence provides a superior lining for the waterway.

In the construction of Chapman sluice gates nothing but the best materials are used—cast iron for the gate frame, plug and guides; bronze for the wedges, adjusting screws and lock nuts, also for the faces of the plug and seat. All inside screw gates of standard construction are furnished with a solid bronze spindle and a bronze stem nut. On all gates the plug and seat faces are made of bronze, finished in the most approved manner to form a watertight joint when the gate is closed.

Both outside screw or rising spindle gates and inside screw or non-rising spindle gates are manufactured. The use of the rising spindle type, operated by a floor stand, is recommended, as the rising spindle is a perfect indicator of the position of the plug or gate and the threaded portion can readily be kept clean and properly lubricated.

Sluice gates should be installed so that they will be subject to face pressure, that is, that the pressure will force the plug to its seat on the frame.

Ball bearings are furnished where required or when specified. They are made of the very best materials, the race plates and balls being of tool steel, hardened and ground.

Sluice gates may be operated by hand, hydraulically, electrically or pneumatically. Hand operation is usually employed through the medium of a floor stand; and for electric operation, the motor is usually attached to the floor stand. Hydraulic cylinders may be either attached to the gate frame or mounted on the top of the dam or floor of the gate chamber.



FIG. 474A
Rectangular
Sluice Gate in
Concrete Dam



FIG. 475B
Self-contained or
Stationary
Spindle Circular
Sluice Gate



FIG. 492
Chapman Plug or
Mud Valve



FIG. 487F
Chapman Tide Flap Valve
All sizes furnished, with connections to meet every requirement



FIG. 490
Chapman Shear
Gates with
Bronze Seat

SHOWING PART OF COMPLETE LINE OF GATE VALVES, SLUICE AND SHEAR GATES, MUD VALVES AND FLOOD GATES FOR WATER, SEWAGE, FILTRATION AND IRRIGATION SERVICE

COFFIN VALVE COMPANY

GENERAL OFFICE AND WORKS

NEPONSET, SUBURB OF

BOSTON, MASS.

NEW YORK, N. Y., C. W. BERGEN & Co., 256 Broadway
PHILADELPHIA, PA., DE HUFF & HOPKINS, Morris Building

CHICAGO, ILL., EVANS-BLISS Co., 180 North Dearborn Street
CLEVELAND, OHIO, TOMLINSON STEAM SPECIALTY Co., 1597 St. Clair Avenue

Products.

SLUICE GATES, GATE VALVES, CHECK VALVES, FLAP VALVES, FOOT VALVES, SHEAR SEWER GATES, OPERATING STANDS.

Also manufacturers of Butterfly Valves, Automatic Sewage Regulators, Fire Hydrants, etc.

Service.

This company furnishes designs and prices for all sizes and types of valves for use in connection with water power plants, water works, sewerage systems, irrigation projects, etc.

Coffin Sluice Gates.

Standard sluice gates are made of cast iron with bronze mountings, and are furnished in all regular sizes, either circular or rectangular. They have either spigot frames to embed in masonry or flange frames to bolt to masonry or to flanged pipe. All gates have bronze seat facings, dovetailed into the frames and disks and scraped to form a watertight joint.

There are two general types of sluice gates:

Fixed Wedge Type, Fig. 81, for Light Face Pressures—These gates have bronze faced fixed wedges at the sides and are furnished with rising or non-rising stem. The most common type of fixed wedge gate is the so-called self-contained gate (Fig. 81) having a non-rising bronze stem and bronze stem nut cast into the disk. Such gates can be supplied with extension stem having operating nut, hand wheel or gate stand at top for operation.

Adjustable Wedge Type, Figs. 57 and 76, for All Pressures—This gate is a more expensive type of gate than the fixed wedge type and has solid bronze adjustable wedges at the sides and backwater guides machined to take tongue of disk. Sluice gates should be installed so that the pressure tends to push the disk against its seat, but where it is impossible to install them in this manner they are supplied with adjustable top hooks and bottom wedges as shown in Fig. 57.

Sluice gates should be used where possible with rising stem so that the screw section will be out of water and the stem forms an indicator. These gates can be supplied with a non-rising stem where necessary, by bolting a solid bronze stem nut to the top of the disk, through which the stem threads.



FIG. 81. CIRCULAR SLUICE GATE
Self-contained type; flange frame



FIG. 76. COFFIN CIRCULAR SLUICE GATE
Rising stem; adjustable wedges

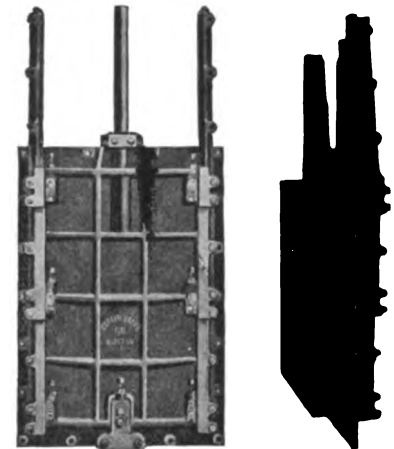


FIG. 57. COFFIN RECTANGULAR SLUICE GATE
Rising stem; spigot end; adjustable wedges

Operation—Sluice gates may be operated by hand, by hydraulic cylinder or by electric motor driven stand. Large sluice gates should be operated hydraulically or electrically, as hand operation is very slow on account of the necessary reduction gearing.

Estimates—When requesting quotations on sluice gates, the following data are essential for close and intelligent prices:

- (1) *Type of Gate*—Circular or rectangular, size of opening, rising or non-rising stem.
- (2) *Frame*—Flanged or spigot end.
- (3) *Pressure*—Maximum on center of gate, tending to force gate towards or away from seat.
- (4) *Stem*—Distance from center of gate to base of operating stand.
- (5) *Operation*—Electric, hydraulic or hand.

We include the necessary stems, stem guides, stem couplings, stop collars, etc., but do not include any anchor bolts, unless so requested.

Coffin Operating Stands.

For small sluice gates or gate valves under light loads, plain (without ball bearings) gate stands with or without gearing are furnished. For heavier loads, ball

bearing stands are furnished having the necessary gear ratio so that one man can easily operate the gate under full head pressure. Where the load is sufficient, 2-speed stands are furnished to lessen the time of operation.

Stands with enclosed gearing furnished where desired. Stands without gears are furnished with hand wheels, and stands with gears are furnished with removable crank handles.

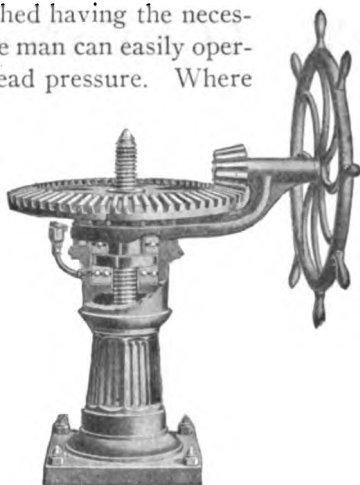


FIG. 72. COFFIN BALL BEARING GATE STAND

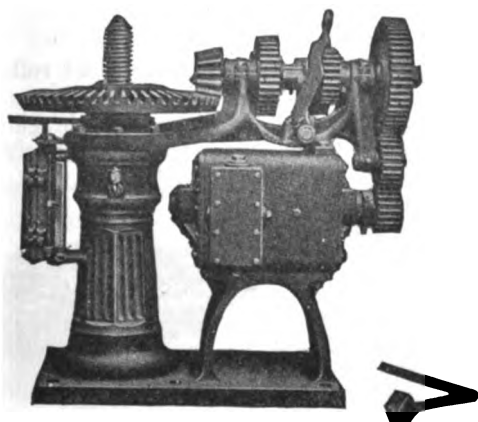


FIG. 390. COFFIN ELECTRICALLY OPERATED GATE STAND

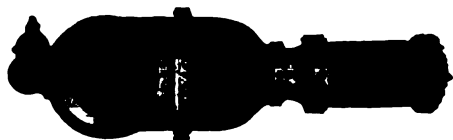


FIG. 234. COFFIN HYDRAULICALLY OPERATED GATE VALVE, WITH BY-PASS

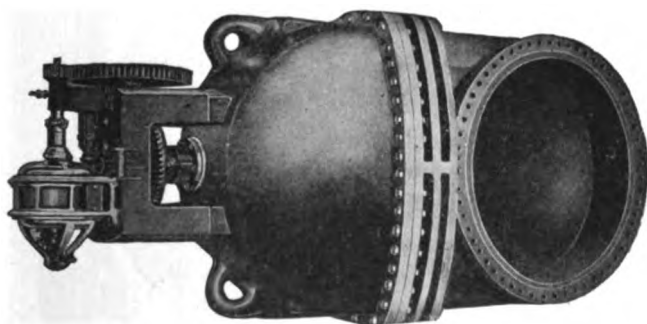


FIG. 517. COFFIN ELECTRICALLY OPERATED GATE VALVE
Ball bearing yoke

Other Products.

Coffin gate valves furnished in all sizes for steam and water, and arranged for hand, hydraulic or electric operation.

Coffin foot valves furnished in all standard sizes with solid bronze flaps and bronze seats, with or without strainers.

Coffin flap valves, bronze mounted, spigot or flange end, single or double pivot.

Coffin check valves, bronze mounted, single or multiport, flange or hub end.

Coffin shear gates, bronze mounted, spigot or flange end, notched lifting handle with wall loop.



FIG. 451. COFFIN FLAP VALVE

Single pivot; flange end; bronze mounted



FIG. 69. COFFIN FOOT VALVE WITH STRAINER



FIG. 51. COFFIN SHEAR SEWER GATE

Bronze seats

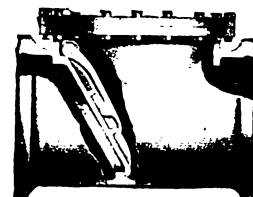


FIG. 10. COFFIN CHECK VALVE

Single flap; hub end

Some Recent Large Installations.

Norfolk Navy Yard Dry Dock—Five 8'x8' and five 7'x9' Sluice Gates, operated by oil cylinders.

Philadelphia Navy Yard Dry Dock—Six 8'x8' Sluice Gates, operated by oil cylinders.

Boston Dry Dock—Six 6'x8' Sluice Gates, operated by oil cylinders.

Oklahoma City Water Works—Four 9'x14' electrically operated Sluice Gates.

Utica Gas & Electric Company—Three 66" hydraulically operated Gate Valves.

Connecticut Light & Power Company—Four 8'6" x 15'6" electrically operated Sluice Gates.

Southern Power Company—Thirteen electrically driven Hoists, for 18'x22', 12'x22' and 10'x15' concrete head gates.

New Orleans Navigation Canal—Eight 6'x10' hydraulically operated Sluice Gates, and eight 8'x8' electrically operated Sluice Gates.

Catskill Aqueduct, N. Y.—30" and 48" Solid Bronze Gate Valves.

U. S. Shipping Board—Electrically operated Sluice Gates and Gate Valves, also Check and Flap Valves for floating dry docks.

COLDWELL-WILCOX COMPANY

Manufacturers of Sluice Gates and Other Water Works Appliances

NEWBURGH, N. Y.

Products.

SQUARE, RECTANGULAR and CIRCULAR SLUICE GATES for all conditions and heads; ROLLER BEARING PEDESTALS and HOISTING STANDARDS.

Also manufacturers of Modern Sluice Gate Appliances, Electric Hoisting Standards (roller bearing), for either single gate hoists or series; Plug Drain Valves; Shear and Flap Valves; Screens and Hoists; Flexible Joints.

Experience.

This company is among the oldest designers and manufacturers of sluice gates and water works appliances in America, and is a leader in quality, design and workmanship.

Sluice Gates.

Frame—Gate frame is cast in one piece, channel shape, for flange connections; flange faces machined to true surface; back flange drilled to bolt direct to masonry, or to special casting or pipe built in the masonry; other flange, bronze mounted, acts as bearing surface of frame and is drilled for guides to be bolted thereto.

Guides—Strong, heavy castings, bolted to gate frame. Guides, fitted with stationary bronze wedges (conforming to gate wedges), extend above gate opening.

Gate—Heavy, well-ribbed casting, finished to receive bronze facing to match that on frame. Adjustable bronze wedges, to match those on guides, bring all bearing surfaces in contact at same time and force gate to its seat. When gate moves up, all wedges are immediately released. A hub to which the stem is keyed is on ribbed side of gate (upper part).

Stem—Stem, stationary or rising, is made of cold rolled steel, or bronze; if longer than 24 ft. is required, it is made in two or more pieces coupled together. Couplings are cross-keyed with taper keys, and keys are drilled at one end to receive cotter pin. Upper part of rising stem is threaded sufficient length to raise gate to full opening; and threaded part is fitted to bronze nut in hoisting standard. The lower part of stationary stem is always bronze and is threaded to engage the bronze nut in gate.

Stem Guide Brackets—Stems over 15 ft. long are provided with bronze lined adjustable guide brackets, to be set true in line with the stem and anchored securely to masonry.

Operation.

Sluice gates are operated by means of roller bearing pedestals. Pedestals are (a) hand wheel, for light sluice gates; (b) geared, for heavy sluice gates, and (c) twin stem, for working two gates with same pedestal.

The compound geared pedestals have two speeds.

They insure (by clutch) either high speed and quick operation, or low speed and great power for starting. Roller bearings (inside pedestal body) reduce friction over 75%.

For further particulars, catalogues will be sent on application.



FIG. 82. TWO-SPEED ROLLER BEARING PEDESTAL

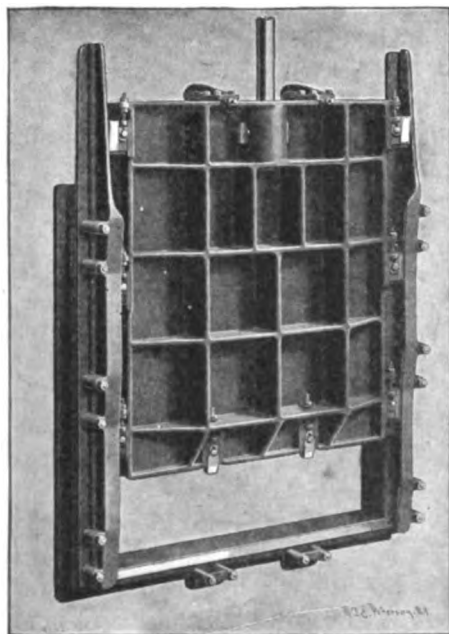


FIG. 6. BACK PRESSURE SLUICE GATE
4 ft. by 4 ft.
Made with adjustable wedges

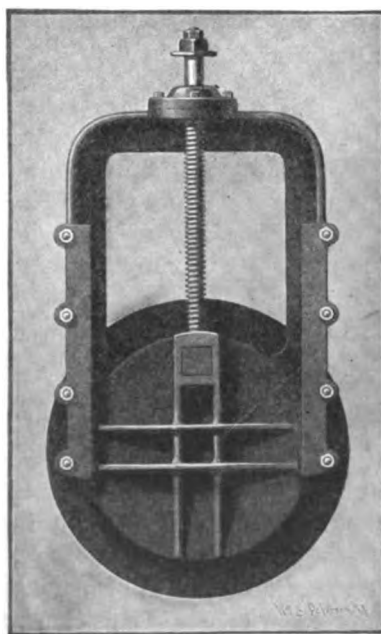


FIG. 10. SELF-CONTAINED SLUICE GATE
12 in. diameter
All gates bronze mounted

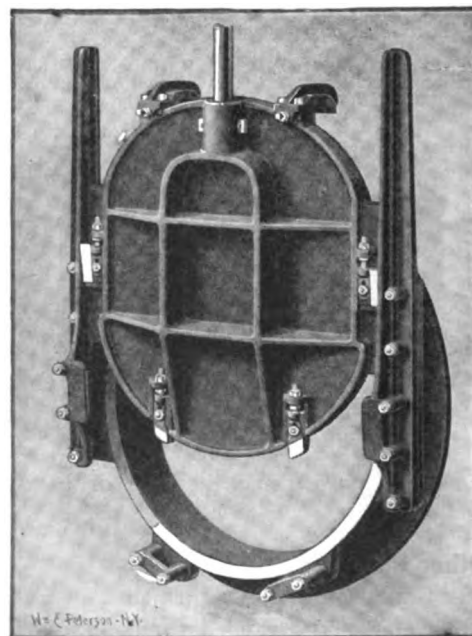


FIG. 48. CIRCULAR SLUICE GATE
42 in.
For back pressure

THE LUDLOW VALVE MANUFACTURING CO.

Manufacturers of Sluice Gates

TROY, N. Y.

For Branch Offices and Foreign Agencies, see pages 964-69

Products.

SLUICE GATES, with Bronze Mountings, Rising and Non-rising Stem, for use in connection with FLOOR STANDS or other similar devices; SHEAR GATES; FLAP VALVES.

For Valves for steam, water, gas, oil, and Hydrants, see pages 964-69.

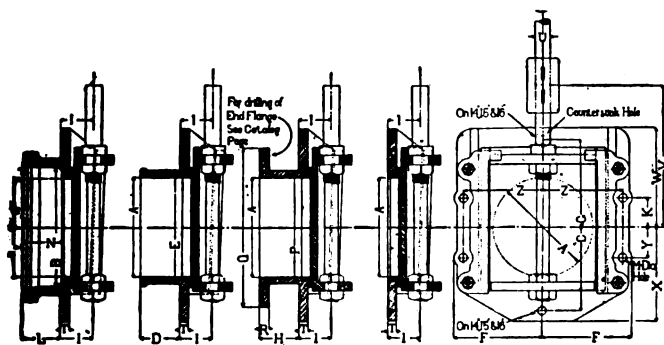
Scope of Use.

The Ludlow sluice gates are designed for use in filtration plants, reservoirs, dams, etc., or places where there is but light or medium pressure. Gates should be so placed that pressure comes on back of gate, forcing same to its seat.

Sluice Gates.

Substantially built and strong in every part, bronze mounted, with bronze gate and seat rings, and with bronze strips on both frame and guide bars. In the non-rising type, threaded stem and stem nut through which stem works are also of bronze.

Gates are constructed with circular, square or rectangular opening, as desired; with flat frame for bolting to wall; with flange neckpiece for bolting to pipe; with hub or spigot neckpiece for calking; or with wall pipe for building into masonry.



DIMENSION DIAGRAM, RISING STEM SLUICE GATES, IRON AND BRONZE MOUNTINGS

Size, in.	4	6	8	10	12	14	15	16	18	20	22	24	28
V	16 1/4	17 3/8	19 1/4	21 1/4	23 1/4	25 1/4	27 1/4	29 1/4	31 1/4	33 1/4	35 1/4	37 1/4	41 1/4
X	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	14 1/2	15 1/2	16 1/2	17 1/2	18 1/2	20 1/2
W	5 1/4	6 1/4	7 1/4	8 1/4	9 1/4	10 1/4	11 1/4	12 1/4	13 1/4	14 1/4	15 1/4	16 1/4	18 1/4
F	5	6	7	8	9	10	11	12	13	14	15	16	18
Z	4 1/4	5 1/4	6 1/4	7 1/4	8 1/4	9 1/4	10 1/4	11 1/4	12 1/4	13 1/4	14 1/4	15 1/4	17 1/4
K	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	14 1/2	15 1/2	16 1/2	17 1/2	19 1/2
Y	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	14 1/2	15 1/2	16 1/2	17 1/2	19 1/2
G	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 7/8	3 1/8	3 3/8	3 5/8	3 7/8	4 1/8
M	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 7/8	3 1/8	3 3/8	3 5/8	3 7/8	4 1/8
U	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 7/8	3 1/8	3 3/8	3 5/8	3 7/8	4 1/8
I	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 7/8	3 1/8	3 3/8	3 5/8	3 7/8	4 1/8
T	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 7/8	3 1/8	3 3/8	3 5/8	3 7/8	4 1/8
L	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 7/8	3 1/8	3 3/8	3 5/8	3 7/8	4 1/8
B	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 7/8	3 1/8	3 3/8	3 5/8	3 7/8	4 1/8
N	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 7/8	3 1/8	3 3/8	3 5/8	3 7/8	4 1/8
D	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 7/8	3 1/8	3 3/8	3 5/8	3 7/8	4 1/8
E	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 7/8	3 1/8	3 3/8	3 5/8	3 7/8	4 1/8
H	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 7/8	3 1/8	3 3/8	3 5/8	3 7/8	4 1/8
O	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 7/8	3 1/8	3 3/8	3 5/8	3 7/8	4 1/8
R	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 7/8	3 1/8	3 3/8	3 5/8	3 7/8	4 1/8
P	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 7/8	3 1/8	3 3/8	3 5/8	3 7/8	4 1/8

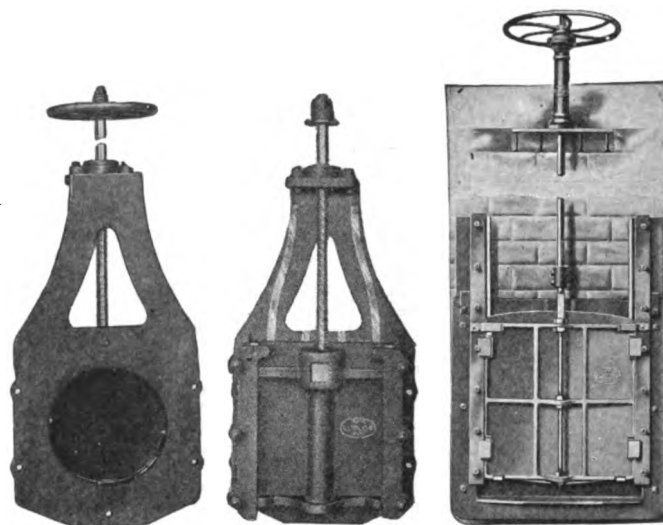


FIG. 215
List No. 21. With Bronze Mountings, Extended Frame and Stationary or Non-rising Stem. Stem can be extended if desired.
Sizes: 8, 10, 12, 14, 15, 16, 18, 20, 24, 28, 30, 36, 40, 42, 44, 48, 50, 54, 60, 72, in.

FIG. 214
Bronze Mountings, Flat Frame and Rising Stem to Bolt to Wall.
*Same sizes as Figs. 215 and 214, and larger

TYPES OF LUDLOW SLUICE GATES

Floor Standards (List No. 20).

Plain standards are used with valves where it is not necessary to know exact position of valve gates (disks). Standards with indicators (Fig. 15) used where it is necessary to know at a glance whether gates are fully or partly opened or closed. Standards with rising stem (Fig. 140) used with sluice gates or slide stem valves.

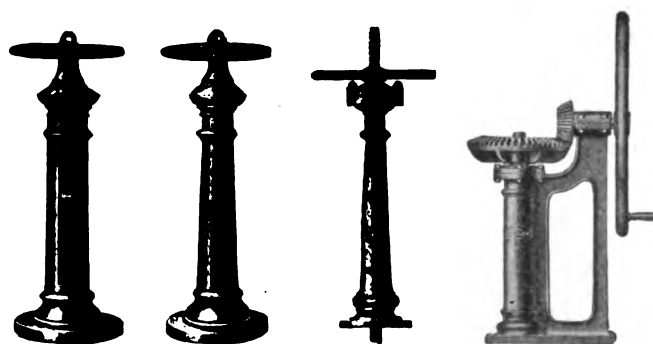


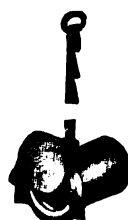
FIG. 15
With Indicator

FIG. 119
Without Indicator

FIG. 140
With Rising Stem

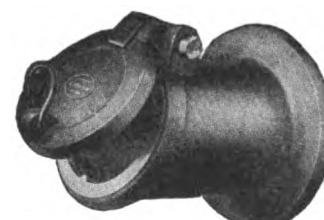
FIG. 203
Geared Operating Standard

FLOOR STANDS



SHEAR GATE

Made all-iron or iron body, bronze mounting. Sizes, 6 to 24 in.



FLAP VALVES

Made all-iron or iron body, bronze mounting. Sizes, 3 to 36 in.

BABBITT STEAM SPECIALTY COMPANY

Manufacturers of Adjustable Valve Operating Mechanism

NEW BEDFORD, MASS.

Products.

BABBITT ADJUSTABLE SPROCKET RIM with CHAIN GUIDE (patented) for opening and closing overhead valves, sash, hoppers, etc.

Rus-go, a Chemical Combination of Rust-eating, Non-acid Oils, for loosening nuts, bolts, joints, and for cleaning rust from metals.

Babbitt Adjustable Sprocket Rim with Chain Guide.

This universally adaptable device has met the demand for a dependable means of operating overhead or inaccessible valves of every make and description.

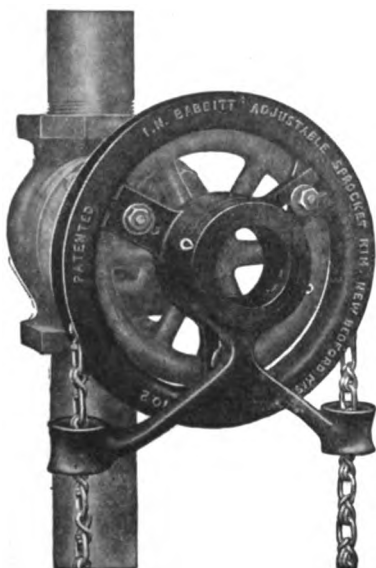
Noteworthy Features of Babbitt Rims—(1) The Babbitt Rim fits *any* valve, *any* style, with either rising or non-rising stems, and does away with all clumsy apparatus and specially made chain wheels.

(2) The use of the Babbitt enables you to install valves where they should be, without worry as to their accessibility.

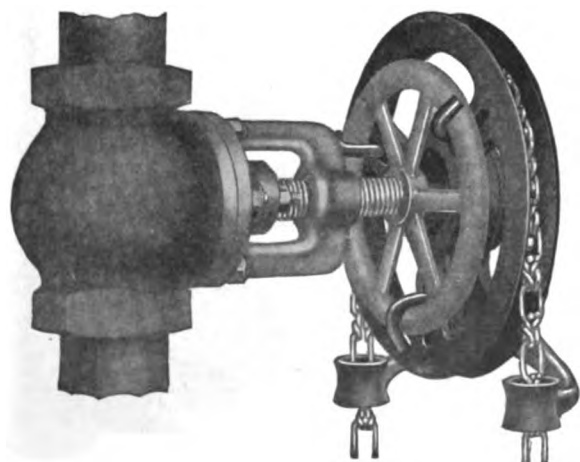
(3) The Babbitt standardization into ten sizes, applicable to the thousands of types and makes of valves has reduced the cost to a minimum.

(4) The Babbitt saves workmen bad falls, claims against yourselves, time, shut-downs and all manner of annoyances.

(5) The Babbitt clamps right onto the



FRONT VIEW OF BABBITT ADJUSTABLE SPROCKET RIM WITH CHAIN GUIDE



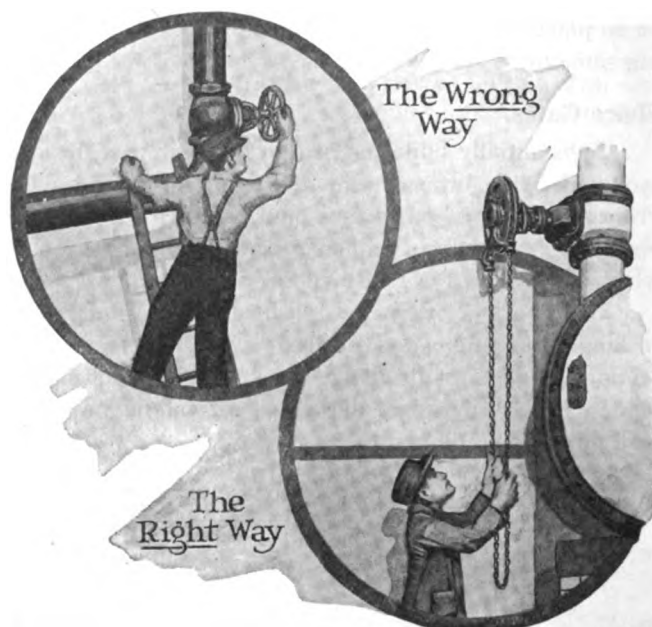
REAR VIEW SHOWING METHOD OF APPLICATION TO WHEEL AND NON-INTERFERENCE WITH RISING STEM

hand wheel now on the valve and can be attached in a few minutes.

(6) The Babbitt chain guide absolutely prevents the chain from coming off the sprocket rim.

Size No.	Diam. sprocket wheel, in.	Diam. valve wheels rim will fit, in.	Size No.	Diam. sprocket wheel, in.	Diam. valve wheels rim will fit, in.
0	4	2 to 3 3/4	3	15 1/2	12 1/2 to 15 1/4
1	5 7/8	4 to 5 3/4	3 1/2	19	15 1/2 to 18 3/4
1 1/2	7 1/2	5 3/4 to 7 1/4	4	22	19 to 21 3/4
2	9	7 1/2 to 8 3/4	4 1/2	26	22 to 25 3/4
2 1/2	12 1/2	9 to 12 1/4	5	30	26 to 30

When ordering, give the diameter of the valve wheel to be fitted and number of feet of chain required.



COMPARATIVE METHODS OF OPERATING OVERHEAD VALVES
A Babbitt brings out-of-the-way valves within easy reach from the floor

Rus-go.

Offers a method of sparing the hammer and saving the part. Comparatively a new product, it is gaining remarkable favor among mechanics and engineers as a saver of time, labor and replacements for breakage.

It is a chemical fusion of rust-eating oils, non-acid in nature, that penetrates the tightest of joints, loosens the rusted nut and removes every trace of rust from metal. A trial will repay the effort. Write for further information.

Put up in pint, quart, one-half gallon and gallon cans.



RUS-GO, THE EFFICIENT RUST SOLVENT

THE CUTLER-HAMMER MFG. CO.

Dean Valve Control
MILWAUKEE, WIS.

WORKS:
MILWAUKEE, WIS.
NEW YORK, N. Y.

DISTRICT OFFICES

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PITTSBURGH, PA., Farmers' Bank Building
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ST. LOUIS, MO., Railway Exchange Building

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SAN FRANCISCO, CAL., H. B. SQUIRES Co., 583 Howard Street

LOS ANGELES, CAL., H. B. SQUIRES Co., 308 East Third Street
SEATTLE, WASH., H. B. SQUIRES Co., 552 First Avenue, South
BIRMINGHAM, ALA., GENERAL MACHINERY Co., Brown-Marx Building

PHILADELPHIA, PA., Commonwealth Building
CLEVELAND, OHIO, Guardian Building
CINCINNATI, OHIO, Gwynne Building
DETROIT, MICH., Kresge Building

DENVER, COLO., H. L. VAUGHAN, 1710 Glenarm Street
SALT LAKE CITY, UTAH, L. BRANDENBURGER, 59 West Broadway
MONTREAL, CANADA, NORTHERN ELECTRIC Co., LTD.
LONDON AND BEDFORD, ENGLAND, IGRANIC ELECTRIC Co., LTD.

Products.

DEAN ELECTRIC VALVE CONTROL SYSTEM.

Also manufacturers of Electric Control for Pumps, Compressors, Machine Tools, etc.

Description.

The Dean Control is a complete electrically operated unit for attaching to new and existing steam and water valves to accomplish closing and opening by power. The whole unit is self-contained and in one casing, consisting of a high torque totally enclosed electric motor, geared to combination worm and planetary reduction gearing together with electrical limit switch.

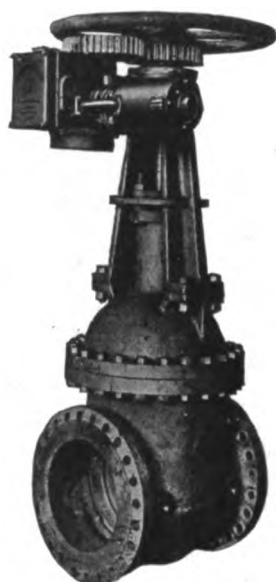
The whole unit is totally enclosed, steamproof and waterproof, to withstand varying weather conditions, and all electrical operating mechanisms are fully protected against moisture.

Four bolts or studs hold the unit onto the valve yoke. Four sizes of Dean Control units are manufactured capable of operating valves from 4 to 72 in. in diameter at low, standard and high pressures.

Operation.

The projecting slow speed shaft carries the gear which meshes into a similar gear attached to the valve stem and is arranged to run at a suitable slow speed to close the valves at the regular rate of 12-in. per minute.

The electrical limit mechanism may be set to stop the valve instantly when it is properly closed and opened and without jamming. Lubrication is automatic, the gear casing being partly filled with oil, while the high speed motor and worm shafts are arranged with ball bearings.



DEAN VALVE CONTROL
INSTALLED ON 18-IN.
CAST STEEL VALVE



APPLICATION OF DEAN
CONTROL TO RISING
STEM WATER VALVE

Dean Valve Control Station.

Control is obtained by a small station which opens and closes the valves, and shows by "red" and "green" indicating bullseyes, the actual position of the gate at the two extreme points.

Distant control is obtained from any number of points.

Adaptability.

The Dean unit may be easily attached to existing valves without shutting down the line. Application to rising stem or outside screw and yoke type necessitates welding two brackets onto the valve yoke to carry the Dean unit or securing a new yoke with the brackets already cast on.

For inside screw or non-rising stem type of valve having gears, a new yoke only is necessary.

All valve manufacturers are prepared to supply complete new parts together with the Dean system necessary for the change over from hand to electrical operation.

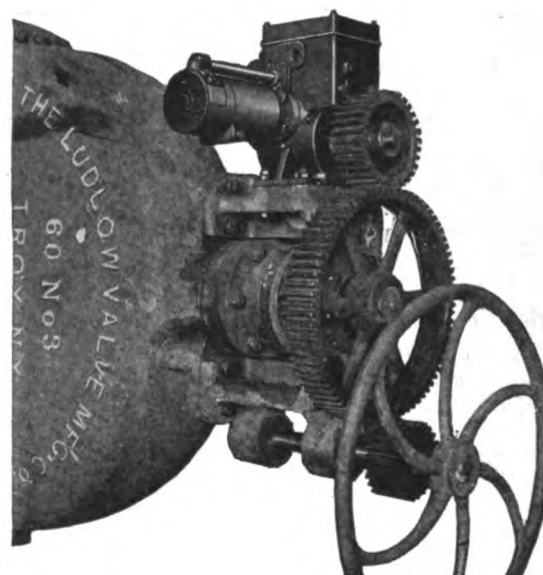
Further Information.

For further information on the Dean system write to nearest district office. Estimates on application.



STANDARD DEAN CONTROL
STATION

Used singly or with any number of like equipments for one or more points of control



METHOD OF MOUNTING DEAN ELECTRICAL VALVE CONTROL
ON INSIDE SCREW VALVE

AMERICAN STEAM GAUGE & VALVE MFG. CO.

ORIGINAL STEAM GAUGE COMPANY

Manufacturers of Steam Specialties

GENERAL OFFICES AND FACTORY

208-220 Camden Street

BOSTON, MASS.

BRANCH OFFICES

PITTSBURGH, PA., Jenkins Arcade Building
NEW YORK, N. Y., 84 Broadway, BrooklynCHICAGO, ILL., 25-27 South Jefferson Street
ATLANTA, GA., Candler Building

Products.

VALVES: Pop Safety; Cylinder; Water and Hydraulic Relief, etc.

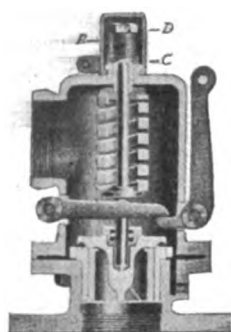
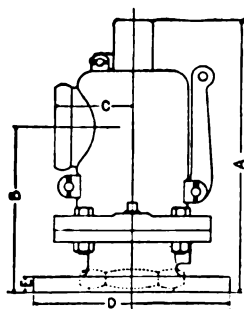
FEED WATER FILTERS; STEAM TRAPS.

For Gauges and Indicators, see pages 1048-50.

American Pop Safety Valve.

For stationary and marine boilers. Fitted with adjustable blow-down ring. Valves are spring-loaded and relieve automatically at any desired pressure. Adjustment is simple; opening and closing are automatic; and the relief, size for size of valve, is greater than any other valve in existence. Least number of parts to maintain.

Reliability, durability and mechanical superiority have been established during many years. (Figs. 367, 369 and other illustrations).

FIG. 367
Inside ViewFIG. 369
Sectional Diagram

POP SAFETY VALVE

DIMENSIONS OF SAFETY VALVES IN INCHES

Size of inlet and outlet, in..	2	2½	3	3½	4	4½	5	6
Extreme height.....	A	13¾	14¾	14½	16½	18½	19½	21¾
Height from face of inlet to center of outlet.....	B	7½	8¾	8½	10¾	11½	11½	13½
Center of valve to face of outlet.....	C	3¼	3½	4	4¾	5	5¼	6½
Diam. inlet flange.....	D	6½	7½	8¾	9	10	10½	12½
Thickness inlet flange.....	E	¾	1	1½	1¾	1¾	1¾	1¾
Diam. neck at bottom.....	F	3¾	4¾	4½	5½	6	6½	8½

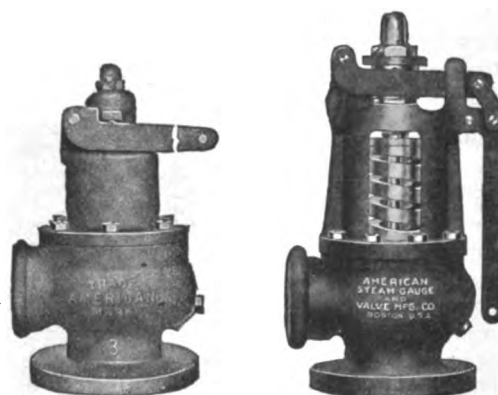
American Pop Safety Valve, Models E and G.

Made of cast iron, semisteel or cast steel.

Constructed with both open and incased spring, and with straight or compound drop levers, as ordered. Incased spring prevents contact of spring with steam. Spindle passes through bottom of spring case, which acts as a guide, and, by reason of small diameter of spindle, friction is eliminated.

Lifting Levers—Leverage of long vertical arm is compounded by short connecting link, which becomes a toggle (as long arm approaches horizontal position)

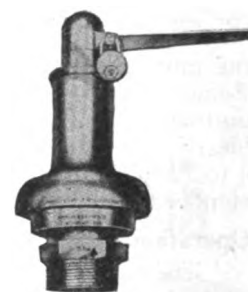
and acts with further leverage upon spindle through top horizontal lever.

Model E, Enclosed Spring Model G, Outside Spring
POP SAFETY VALVE, MODELS E AND G

Designed for working pressures up to 300 lbs., with test pressure of 450 lbs. Adapted for all styles of horizontal and vertical tubular boilers as well as all sectional and water tube boilers

American Brass Pop Safety Valves.

Fig. 425 has top outlet and will be found in very general use on all portable types of boilers.

FIG. 425
PortableFIG. 432
Side OutletFIG. 436
Dist. Police Lock Type

TYPES OF POP BRASS SAFETY VALVES

Fig. 432 is more extensively used for marine work.

Fig. 436 is for heating type boilers only.

American Cylinder Relief Valve.

Designed for use on steam cylinders, feed pumps, fire pumps, jackets, valve chests, condensers, auxiliary exhausts, etc.

Sizes, ½ to 4 in.

Made inlet, if desired.

Flanged ends to order.

FIG. 389
CYLINDER
RELIEF VALVE

American Water Relief Valve.

Made of iron, brass mounted. For pumps, either steam, rotary or plunger.

Valves are accepted by Inspection Department of Associated Factory Mutual Fire Insurance Companies for use on standard underwriter fire pumps. Used by manufacturers of underwriter pumps.

Fig. 405 shows an all-brass valve, of similar design, made in small sizes for small pumps.

Their capacity for relief, size for size, is guaranteed to be far greater than any other valve (Figs. 399 and 405).



FIG. 399. IRON UNDERWRITER WATER RELIEF VALVE



FIG. 405. BRASS WATER RELIEF VALVE



FIG. 408



FIG. 411

AMERICAN WATER RELIEF VALVES

Standard type, all-bronze. For use on tanks, pipe lines, etc. For pressures not exceeding 250 lbs.

American H₂O Grease Extracting Feed Water Filter.

Designed for the efficient removal from feed water of grease which, after slight boiling, adheres in the form of "slugs" to boiler shell and flues.

This filter has a filtering surface many times greater than area of the feed water pipes, and occupies small space.

Operation—Under double filtration, filtering cages are covered with two layers of "Turkish toweling," which cloths are to be changed as often as conditions require. Temporary cleaning, however, may be effected by applying a reverse current of steam and drawing off the oil and grease while filter is in service.

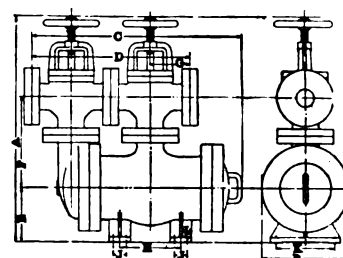
Further particulars sent on request.



GREASE EXTRACTING FEED WATER FILTER

CAPACITIES, GREASE EXTRACTING FEED WATER FILTER

Size pipe, in.	Capacity water, lbs. per hr.
2	18,900
2½	28,300
3	42,000
3½	59,800
4	77,700
5	122,800
6	174,000



DIAGRAM, GREASE EXTRACTING FEED WATER FILTER

DIMENSIONS, GREASE EXTRACTING FEED WATER FILTER

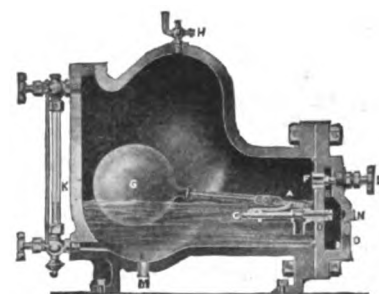
Size	A	B	C	D	E	F	G	H	I	J	K
2"	2' 17"	10"	2' 0 1/8"	18 1/4"	6 1/4"	10 3/8"	4 1/4"	7"	1 1/2"	1 1/2"	6 3/4"
2 1/2"	2' 10 3/4"	14 1/4"	2' 3 3/4"	20"	8 1/2"	13 3/4"	5"	7"	1 1/2"	1 1/2"	8 1/2"
3"	2' 11 3/4"	14 1/4"	2' 7 1/4"	23"	8 1/2"	14 1/4"	5 3/4"	8 3/4"	1 1/2"	1 1/2"	8 1/2"
3 1/2"	3' 5 1/4"	18"	2' 8"	23 1/2"	12"	16 7/8"	5 7/8"	8 3/4"	1 1/2"	1 1/2"	10"
4"	3' 6 1/8"	18"	3' 1 1/8"	2' 4 1/2"	12"	17 1/2"	7 1/8"	11"	1 1/2"	1 1/2"	10"
4 1/2"	3' 10 1/4"	21"	3' 3 1/2"	2' 6"	13"	19 1/2"	7 1/2"	11"	1 1/2"	1 1/2"	11"
5"	4' 0 5/8"	21"	3' 7 1/8"	2' 9 1/4"	13"	20 1/2"	8 3/8"	12 1/4"	1 1/2"	1 1/2"	12"
6"	4' 5 1/4"	2' 1 1/4"	4' 3 1/8"	3' 3"	15"	22 5/8"	9 3/4"	15"	1 1/2"	1 1/2"	14"

American Ideal Steam Trap.

It has been on the market over 10 years. Operates on pressures up to 295 lbs. Has a *patented valve leverage* that permits use of heaviest floats (to withstand heaviest working pressures) ever put into steam traps. Float is seamless copper.

Valve is water sealed and can not leak steam.

Lifting capacity, 2 ft. of water for each pound pressure at trap. Valve discharges against any back pressure less than pressure in trap.



MODEL "C" TRAP

Showing seamless float (made any size), valve, etc.

**IDEAL FLOAT VALVE**

Adapted for any service. Float same as used in steam trap. Water level regulated by changing angle of float at "K"

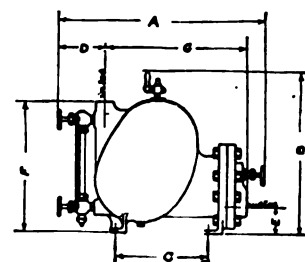


DIAGRAM MODEL "C" TRAP

DATA, MODEL "C" TRAP*

Size	0	1	2	3	4	5
DIMENSIONS IN INCHES						
Pipe connections	1 1/2	1 1/2	2	2 1/2	3	4
A	18 1/2	22 3/4	23 1/4	26 1/4	28 1/4	31 1/4
B	14 1/2	17 1/4	18 3/4	21 1/2	23	25 1/4
C	8	11	11 1/4	13	15	17 1/2
D	4 1/2	5	5	5 1/2	5 3/4	6
E	2 1/4	3 1/8	3 1/4	3 7/8	3 7/8	3 3/4
F	12 1/2	15 1/4	16 1/2	19	19 7/8	22 1/4
G	12	15	16 1/8	19 1/4	21 1/8	23 1/4
Width required	8	10	10 3/4	12 1/8	12 3/4	14

RATED CAPACITIES PER HOUR AT 100 POUNDS

Lbs. water	4402	6853	8320	9986	13486	17616
Lin. ft. 1-in. pipe	7827	12184	14793	17692	23978	31322
Sq. ft. radiation	2609	4062	4931	5898	7993	10441
Net weight h. p. trap, lbs.	85	110	150	210	250	320

* Table based on condensation ratio of 9 oz. per lin. ft. per hour.

Allowance should be made for conditions causing a higher ratio, always selecting trap of sufficient size to care for maximum amount that may come to it at any time.

ATLAS VALVE COMPANY

Manufacturers of Pressure and Temperature Regulators

NEWARK, N. J.

Products.

"ATLAS" REDUCING VALVES; PUMP GOVERNORS, "ATLAS" FAN ENGINE REGULATORS, VACUUM and PRESSURE REGULATORS, BALANCED VALVES, FLOAT VALVES, SWING JOINT FITTINGS and UNIONS.

"VICTOR" TEMPERATURE REGULATORS and DAMPER REGULATORS.

Also manufacturers of Ideal Pump Governors, High Pressure Hydraulic Regulators, "Victor" Industrial Thermostats and Humidity Regulators.

"Atlas" Reducing Valve, Type A, Fig. 104.

Auxiliary operated type in which the main valve is operated by a piston. Recommended for continuous or dead end service, steam or air.

Sizes $\frac{1}{2}$ to 10 in. $\frac{1}{2}$ to 2 in. are all-bronze with union ends. $2\frac{1}{2}$ to 10 in. have cast iron bodies—bronze mounted. Valves above $2\frac{1}{2}$ in. with bronze bodies can also be furnished. Made for any initial pressure up to 300 lbs.

Cast steel valves with monel metal internal parts are furnished for superheated steam.



FIG. 104
REDUCING VALVE

"Atlas" Reducing Valve, Type B, Fig. 104B.

Same type as the "Atlas" Type A, except that the auxiliary mechanism is contained within the valve.

Recommended for marine or other work where space is too limited for the Type A valve.

A cap that can be locked is provided to prevent unauthorized changes in adjustment.

Sizes $\frac{1}{2}$ to 10 in. The $\frac{1}{2}$ to 2 in. are all-bronze, the $2\frac{1}{2}$ to 10 in. have cast iron bodies, bronze mounted. Made for any initial pressure up to 300 lbs.



FIG. 104B
REDUCING VALVE

"Atlas" Lever Operated Reducing Valve, Type C Fig. 104C.

Diaphragm operated, double seated balance valve type.

Recommended for all continuous service where initial pressure does not exceed 125 lbs. This valve is not recommended for dead end or high pressure service.

Sizes $\frac{1}{2}$ to 10 in. Cast iron bodies, bronze mounted. Sizes from $\frac{1}{2}$ to 2 in. have screwed ends, from $2\frac{1}{2}$ to 10 in. have flanged ends.



FIG. 104C
REDUCING VALVE

"Atlas" Pump Governor and Fan Engine Regulator, Type A, Fig. 202.

An auxiliary operated governor, with a limit screw which can be adjusted to limit the speed of the pump or engine.

Recommended for high or low pressure pumping service and fan engine regulation.

Suitable for working steam pressures from 20 to 300 lbs., and made for delivery pressures from atmosphere to 10,000 lbs.

Sizes from $\frac{1}{2}$ to 10 in., all-bronze; or from $2\frac{1}{2}$ to 10 in. with cast iron bodies, bronze mounted.

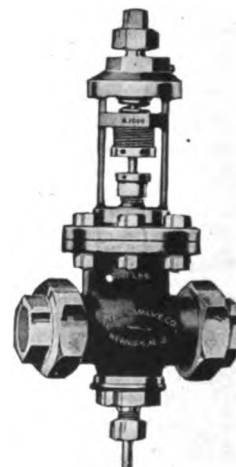


FIG. 202
PUMP GOVERNOR
AND FAN ENGINE
REGULATOR

"Atlas" Vacuum Pump Governor, Type C, Fig. 210.

Diaphragm operated double seated balanced valve type.

Recommended for any service where it is necessary to maintain a uniform vacuum.

Suitable for working steam pressures to 200 lbs. and any vacuum below atmosphere.

Sizes from $\frac{1}{2}$ to 4 in. Iron body, bronze mounted. Can also be furnished all-bronze.

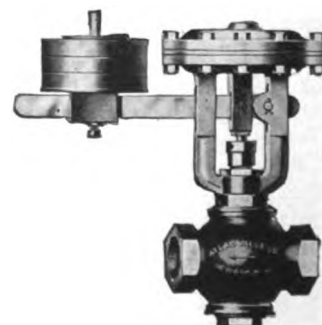


FIG. 210
VACUUM PUMP GOVERNOR

"Atlas" Balanced Valve, Type C, Fig. 604.

This valve is regularly furnished with double beveled seats but can also be furnished with sliding piston seats.

Sizes from $\frac{1}{2}$ to 10 in. Cast iron bodies, bronze mounted; can also be furnished all-bronze.



FIG. 604
BALANCED VALVE

"Atlas" Float Valve, Auxiliary Operated, Fig. 214.

This valve can be installed on the end of the line within the tank or installed in the supply line outside of the tank and operated by a float in the tank. Operation of the valve is smooth and positive and will remain droptight under severe service.

Sizes $\frac{1}{2}$ to 8 in. From $\frac{1}{2}$ to 2 in. all-bronze; from $2\frac{1}{2}$ to 8 in., iron body, bronze mounted, globe or angle, screwed or flanged. All-bronze from $2\frac{1}{2}$ to 8 in. can also be furnished.



FIG. 214
FLOAT VALVE

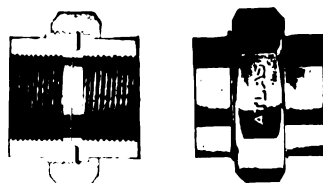
"Atlas" Bronze Unions.

These unions are extra heavy of high grade bronze, each union being individually ground so as to make a perfectly tight joint.

Recommended for the most severe service.

Sizes from $\frac{1}{8}$ to 3 in.

For superheated steam and acids these unions can be furnished of monel metal, or other alloys suitable for the service.



BRONZE UNION

"Atlas" Swing Joint Fittings, Fig. 403.

For steam, water, air or gas up to 200 lbs. working pressure these fittings make swivel connections that are free to turn through any part of a circle, and remain perfectly tight.

Sizes from $\frac{1}{4}$ to 6 in. Elbows or tees of all-bronze, or with cast iron elbows or tees and bronze swivels.

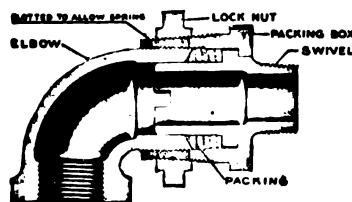


FIG. 403
SWING JOINT ELBOW



SWING JOINT
ELBOW



SWING JOINT
TEE

"Victor" Temperature Regulator, Fig. 12.

This regulator is of all-metal construction and will operate diaphragm control valves of any size from $\frac{3}{8}$ to 14 in. with 1° variation in the temperature, and can be adjusted to operate at any temperature up to 400° Fahr.

Recommended for regulating the temperature of hot water heaters, brine coils, vats, cookers, dry rooms, etc.

Operates with either water or air pressure.

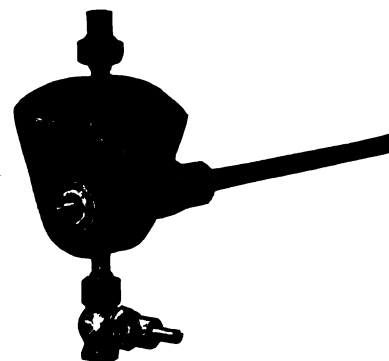


FIG. 12
TEMPERATURE REGULATOR

"Victor" Diaphragm Control Valve, Fig. 14.

This valve is used in connection with the Victor temperature regulator, and can also be used with 3-way cocks or other devices for remote control, using water or air pressure for its operation.

Sizes $\frac{3}{8}$ to 14 in. globe or angle.

Control valves auxiliary operated for pressures up to 300 lbs. and temperatures up to 600° Fahr. can also be furnished.

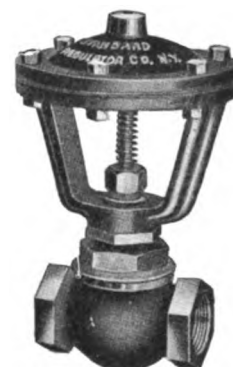


FIG. 14
DIAPHRAGM CONTROL VALVE

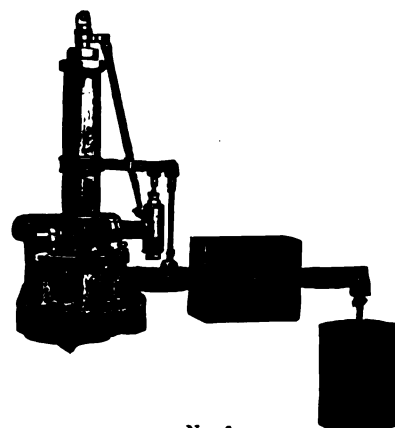
"Victor" Damper Regulators.

The "Victor" damper regulator is furnished in three sizes. The low pressure size is suitable for low pressure heating boilers and can be adjusted to operate from atmosphere to 25 lbs. pressure, the motor cylinder being 2-in. diameter by 6-in. stroke.

The medium pressure size is of heavier construction and is suitable for heating or power boilers, and can be adjusted to operate from 5 to 100 lbs. pressure, the motor cylinder being 2-in. diameter by 10-in. stroke.

The extra high pressure size is of extra heavy construction and is suitable for the largest power boilers. It can be adjusted to operate from 5 to 250 lbs. pressure. This regulator is equipped with a compensating attachment which holds the damper in a balanced position, and fully opens or closes the damper only on extreme pressure variations. The motor cylinder on this regulator is $2\frac{1}{2}$ -in. diameter by 10-in. stroke.

Regulators with larger cylinder and longer strokes can also be furnished.



No. 3
DAMPER REGULATOR

THE ASHTON VALVE COMPANY

Manufacturers of Safety and Relief Valves

MAIN OFFICE AND WORKS

161 First Street, Cambridge 41

BOSTON, MASS.

BRANCHES

NEW YORK, N. Y., 137 Liberty Street

SAN FRANCISCO, CAL., 503 Mission Street

CHICAGO, ILL., 318 West Washington Street

Products.

POP SAFETY and RELIEF VALVES.

For Pressure and Vacuum Gages, see page 1051.

Salient Features of Ashton Pop Safety Valves.

On the market for 50 years. An established reputation for quality, efficiency and durability. Made for those who discriminate for dependable service in preference to low first cost. The salient features in design are as follows:

Ashton Lockup Pop Safety Feature—Pop, or blow back, is controlled by patented hollow screw plug, termed pop regulator. This projects through valve body and is located on the back side opposite outlet. Readily adjustable by means of a wrench, while steam is on boilers, without taking valve apart. This obviates necessity of internal screw rings, which easily clog up and are not handy to operate.

Ashton Knife Edge Lip Wing Valve Feature—An exclusive form of construction, insuring steady and invariable pop, or blow back. Knife edge lip does not extend beyond seat bushing and thereby does not increase lap as seat wears, which creates greater pop. Made to wear down proportionately to valve seat, thus maintaining same relation of inlet to outlet of pop chamber, and requiring minimum adjustment of outside pop regulator.

Base Outlet Construction—Quickly and easily taken apart for inspection, cleaning or regrinding without in any way disturbing outlet pipe.

Connections—Flanged or screwed inlet and outlet connections furnished, at same price. No extra charge for special sizes.

Springs—Of highest grade cast steel, carefully made by hand and tested in factory. Strength maintained throughout life of valve when used under ordinary conditions, at pressures for which designed.

Compound Trip Lever—Makes it possible to lift valve off seat by hand at all times, being sufficiently powerful to accomplish this regardless of whether there may be pressure on boiler or not. May be raised to a vertical position, and held there, for quickly blowing down boiler pressure.

Testing Clamps—Furnished without extra charge. By their use hydrostatic boiler tests can be conducted at any reasonable excess pressure without requiring change of set pressure adjustment of safety valve.

Material—Valve bodies are of best quality cast iron, levers of malleable iron, and interior working parts of high grade composition.

Capacity of Relief—Regularly made with moderate lift of .10 in., which insures ease of operation, greatest durability and lowest cost of maintenance. Furnished, however, with any desired lift and capacity to suit special requirements. When specified, they are made to conform to requirements of new Boiler Code of the American Society of Mechanical Engineers, as well as any state or local regulations.

Styles of Ashton Pop Safety Valves.

For Stationary or Marine Boiler Service—The No. 20 single and No. 20A duplex style valves are those most commonly used. No. 17 is specially adapted for use on superheated steam, with steel body, solid nickel wing valve, and outside spring. Any of these styles made in sizes from 2 to 6 in., inclusive, for pressures up to 300 lbs. maximum.

For Small Service Requirements—Made with composition body, in sizes from $\frac{3}{4}$ to 3 in., inclusive, for pressures up to 250 lbs. Equally adaptable for use on steam or air.

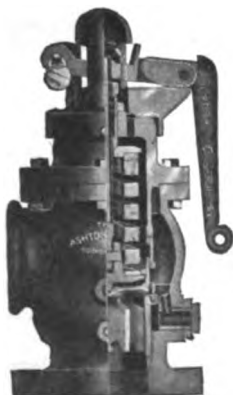
For Water Pressure Service—No. 24 style with composition body, in sizes $\frac{3}{4}$ to 3 in., and No. 22 style with iron body and extra long spring, in sizes 2 to 6 in., are furnished. Both have top wheel adjustment, and are for pressures up to 300 lbs.

For Underwriter Service—No. 21 style is approved by the Associated Factory Mutual Insurance Companies for use on Underwriter fire pumps.

For High Pressure Hydraulic Service—No. 25 style with composition body, or special designs with steel body, for any desired size or pressure.

For Engine Cylinder Relief—No. 10 style.

For Ammonia Relief—No. 23 style.



NO. 20 SINGLE POP SAFETY VALVE



NO. 20A DUPLEX POP SAFETY VALVE



NO. 17 POP SAFETY VALVE FOR SUPERHEAT



NO. 21 UNDERWRITER RELIEF VALVE

THE CHAPLIN-FULTON MFG. CO.

Manufacturers of Steam Specialties

28-34 Penn Avenue
PITTSBURGH, PA.

Products.

VIGILANT FEED WATER REGULATOR; FULTON PUMP GOVERNOR; FULTON TANK GOVERNOR; FULTON STEAM REDUCING VALVE; FULTON EJECTOR.

Also manufacturers of Bingham Gage Cock; Fulton High Pressure or Reducing Regulators, Fulton Low Pressure Regulators, Fulton House Service Regulators; Fulton Duplex Sensitive Gas Governors, Fulton Gas Fuel Boiler Governors, for steam boilers, using natural or artificial gas for fuel; Fulton Gas Relief Valves, for natural gas gasoline plants; Fulton Back, or Check Pressure Regulators, for natural or artificial gas; Fulton Water Regulators.

Vigilant Feed Water Regulator.

Object—Object is to automatically supply to steam boiler exact amount of water that is being converted into steam, thereby maintaining constant water level.

Scope—Adaptable to any size or style of boiler, independent or in batteries.

Advantages—(1) Insures dry steam for engine and better lubrication. (2) Safeguards against accident to boiler from low water. (3) Great economizer of coal, greatest efficiency of boiler when heating surface and steam space are maximum. Steady and constant feeding of boiler allows water to be heated to highest degree. Saving of fuel over hand fed boiler from 6% to 15%. (4) Prevents priming by keeping water level at middle gage. (5) Lessens repairs to boilers from leaky joints due to contraction and expansion of tubes caused by sudden changes of temperature by hand fed boilers. (6) Insures most uniform operation of feed pumps, heaters, etc.

Features—Simplicity in design and construction; all working parts in plain view. No complicated system of levers, floats or diaphragms. Positive in action. Impossible to clog with scale or mud (valves either shut or open). Uses small amount of steam for an instant only when stopping feed. Can be cut out without interrupting feeding of boiler. Regulates feed water within a ¼-in. rise and fall. One man can attend to 40 boilers equipped with regulators.

Style and Size—Two styles of Vigilant feed water regulators are manufactured: one with a small condenser supplying pure water for use through valves, the other without condenser.

Diameter of chamber, 9½ in. at flanges. Distance from top of chamber to bottom, 15½ in.; from side of flanges to end of weighted lever, 23 in.

Fulton Tank Governor.

Fulton tank governor, placed in steam line to pump, maintains a water level at any desired height with but little variation in tanks, standpipes, reservoirs, water towers, etc., or maintains a pressure in water mains at any desired head. May be used in same manner for pumping oil, acid, or any liquid it is desired to maintain at uniform head.

When forcing liquids through heaters, filters, clarifiers or other obstructions, connection to diaphragm must be made in line or tank in which uniform pressure is to be maintained.

Simple in construction; automatic in action. All valves have cast iron bodies and valves unless otherwise ordered. Valves under 3 in. have screwed end. In ordering, state fully purpose desired, whether used on steam, gas or water pipes, and whether on pumps or mains. Give pressure of said steam, gas or water, and pressure or head which it is desired to maintain.

Fulton Boiler Feed Pump Governor.

Automatic regulation of pump in accordance with changing boiler requirements is secured by Fulton governor. Fix excess pressure in feed line at 10 lbs., and at 10 lbs. the difference will remain, regardless of how boiler pressure fluctuates. Since boiler pressure is carried on one side of piston and pump pressure on the other, only small difference in pressure between them has to be balanced by governor weight and lever, a marked contrast to the immense springs, etc., often employed.

Fulton Steam Reducing Valve.

Valves, 3 in. and larger, have flanged ends with companion flanges bolted on; are also provided with a trap so that live steam does not come in contact with diaphragm.

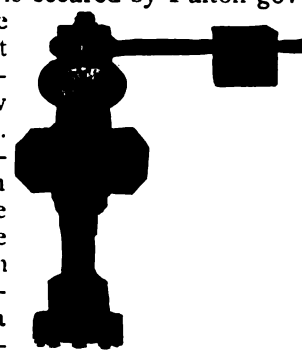
Lever is balanced on a knife edged fulcrum and supports valve stem by means of a toggle connection which reduces friction and insures quick response to slightest change of load.

Fulton Patent Ejector.

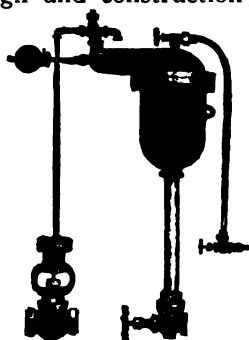
Two types. Triple acting jet pump requires one-half the steam other jet pumps require. Will lift 15 ft. and force 30 ft. without loss of efficiency. Working pressure, 80 lbs. Single acting jet pump will lift water 10 ft. and force it 75 ft. with working pressure of 80 lbs.



FULTON TANK GOVERNOR
Sizes, 3 in. and up



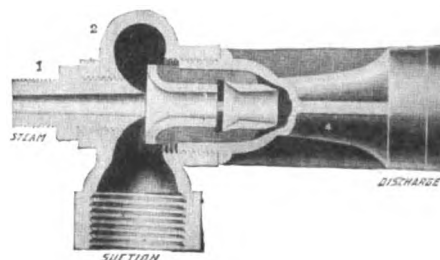
FULTON BOILER FEED PUMP GOVERNOR, PISTON TYPE
Also made with diaphragm



VIGILANT FEED WATER REGULATOR



FULTON STEAM REDUCING VALVE



FULTON PATENT TRIPLE ACTING EJECTOR
Also made in single acting type

G. M. DAVIS REGULATOR CO.

Manufacturers of Valve Specialties for the Automatic Regulation of Pressure

418 Milwaukee Avenue
CHICAGO, ILL.

BRANCHES

NEW YORK

BOSTON

PHILADELPHIA

PITTSBURGH

BALTIMORE

SAN FRANCISCO

Products.

DAVIS REDUCING VALVES; STOP and CHECK VALVES; CONDENSATION RECEIVER and PUMP GOVERNOR; BALANCED, FLOAT, BACK PRESSURE, WATER CONTROL and EXHAUST RELIEF VALVES; STEAM TRAP; COMBINATION BACK PRESSURE and RELIEF VALVE; SPECIAL VALVES.

Also Pump Governor; Vacuum Pump Governors; Valves: Victor Air, Altitude, Non-return Bleeder Line, Emergency Stop, Balanced Relief for steam, air and water; Regulators: Damper, Flow; Fluid Level Controller; Valve Floor Stands.

Stop and Check Valves.

Davis Class C valve has outside oil dashpot and counterweight lever. Will not stick on account of scale formation or expansion of parts. Has indicator, and may be tested by hand. Made in sizes from 2 to 12 ins., with extra heavy flanged ends, in globe and angle patterns.

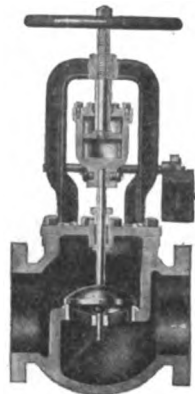


FIG. 233
STOP AND CHECK
VALVE

PRICE LIST AND DIMENSIONS

Size, ins.	2	2½	3	3½	4	4½	5	6	7	8	10	12
List price	\$45	48	50	55	60	65	70	90	120	140	190	250
Length, f to f, globe, ins.	9½	9½	14¾	14¾	14¾	14¾	14¾	15½	19½	19½	22½	23½
Length, c to f, angle, ins.	4¾	4¾	7¾	7¾	7¾	7¾	7¾	7¾	9¾	9¾	11¾	11¾
Height, center to top, ins.	14½	14½	22	22	22	28	28	28	30½	38½	38½	38½

Back Pressure Valve.

The original noiseless back pressure valve. Has piston type inner valve which is semibalanced. Operates without injury to seats. Only comparatively small counterweight required to maintain any reasonable back pressure. Valve may be used horizontally or vertically. Has full pipe area through seats, and may be held open permanently.

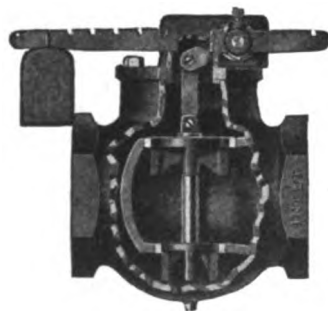


FIG. 217
BACK PRESSURE VALVE

PRICE LIST AND DIMENSIONS

Size, ins.	2	2½	3	3½	4	4½	5	6	7	8	9	10
List price	\$14	16	18	22	25	30	40	60	80	100	120	145
Length, f to f, scd., ins.	7½	7½	8½	9½	10½	11	12	13½	15	17	20	20
Length, f to f, figd., ins.	8½	8½	8½	9	10	11	11½	13	14½	16½	19	19

Size, ins.	12	14	15	16	18	20	22	24	26	28	30
List price	\$220	345	400	465	600	750	900	1050	1200	1400	1600
Length, f to f, scd., ins.	22½	24	24	27½	29½	30½	38	38	48	48	47
Length, f to f, figd., ins.	22	24	24	27½	29½	30½	38	38	48	48	47

Combination Back Pressure and Relief Valve.

For use with engine or turbine that is run both condensing and non-condensing. Will hold tight under high vacuum, and may be set to maintain a back pressure. May be used in either horizontal or vertical position, preferably in horizontal. Sizes from 6 to 36 ins.

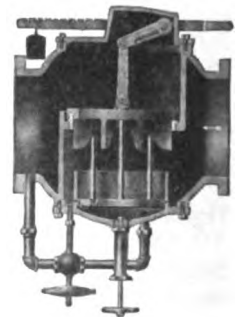


FIG. 227
COMBINATION BACK
PRESSURE AND
RELIEF VALVE

Balanced Valve.

Has balanced piston disc, and should be operated by some force applied to lever. Used largely as water inlet valve on feed water heaters. Will handle steam, air, gas, water and other fluids. Sizes up to 1½ ins. have swivel head so that lever may be shifted in any direction. Larger sizes may be so equipped when necessary.

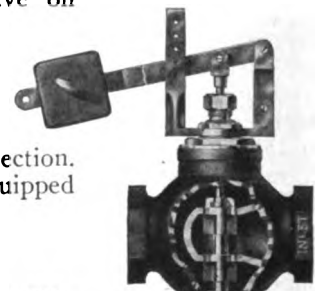


FIG. 212
BALANCED VALVE

Float Valve.

Automatically maintains constant water level in a tank. Has single seated inner valve, and is tight when closed. Disc and seat are renewable. Valve will not stick. No leather cup packing used. No leakage from top of valve to run down over body. Inner valve and cylinder of iron body valves are sherardized and will not rust.

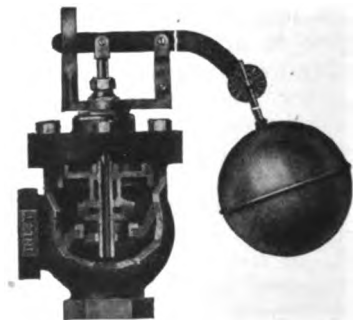


FIG. 214
FLOAT VALVE

Reducing Valves.

Made in two general types—piston and diaphragm. Both may be had in globe and expanded outlet patterns, having screwed ends from ½ to 6 ins., and flanged ends from 2 to 14 ins. Valves Nos. 1, 2 and 3, standard piston type, are constructed for reduction of any initial pressure up to 200 lbs. down to any delivery pressure between 40 lbs. and 1 lb. Valves for air or water and those for greater delivery pressure than 40 lbs. constructed especially for the service.

P & W diaphragm type designed for reduced pressures of 5 lbs. or less. Having rubber diaphragm of large area it is very sensitive, and is used largely on vacuum and low pressure heating systems.

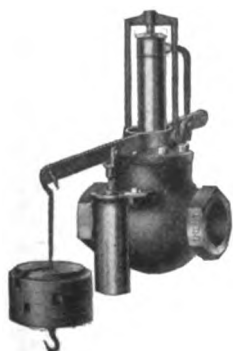


FIG. 203
NO. 2 REGULATOR



FIG. 211
P & W REGULATOR

Globe types

PRICE LIST AND DIMENSIONS

Size, ins.	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2
List price No. 1	\$20	20	22	24	25	30	35	40	50
List price No. 2	\$24	24	26	28	30	35	40	46	56
List price P. & W.	\$30	30	32	35	37	45	60	65	80
Length, f to f, scd., ins.	3 1/4	3 1/4	4	4 1/2	6 1/4	7 1/4	7 1/4	9 1/4	10 3/4
Length, f to f, std. flgd., ins.						7 1/4	7 1/4	9 1/4	10 3/4
Length, f to f, ex. hvy. flgd., ins.						8 3/8	8 3/8	10	11 1/2

Size, ins.	4	4 1/2	5	6	7	8	10	12	14
List price No. 1	\$60	70	75	100	135	175	275	400	500
List price No. 2	\$68	80	85	111	146	187	288	414	516
List price P. & W.	\$100	120	135	175	220	285	360	500	700
Length, f to f, scd., ins.	10 3/4	12	12	13					
Length, f to f, std. flgd., ins.	10 3/4	12	12	13	14	16 3/4	18 1/2	22	24 1/4
Length, f to f, ex. hvy. flgd., ins.	11 3/8	12 3/4	12 3/4	13 3/4	14 3/4	17 3/4	19 3/8	23 3/8	25 3/4

The No. 1 regulator is the same as the No. 2 except that it is not equipped with an oil dashpot.



FIG. 205
NO. 3 REGULATOR

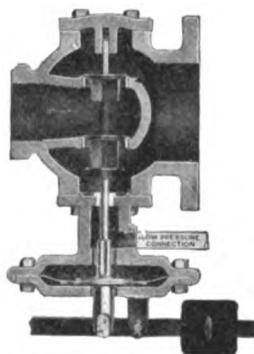


FIG. 210
P & W REGULATOR

Expanded outlet types

PRICE LIST AND DIMENSIONS

Size, ins.	1 1/2x3	2x3	2x4	2 1/2x5	3x5	3x6	3 1/2x7	4x6	4x7	4x8	5x8
List price No. 3	\$40	45	50	65	75	85	100	110	125	135	155
List price P. & W.	\$50	55	60	70	85	100	115	130	145	160	170
Length, f to f, ins.	7 1/4	8	8	9	9 1/4	10	10 1/4	10	12 1/2	12	

Size, ins.	5x9	5x10	6x8	6x10	6x12	8x10	8x14	8x16	10x16	10x20
List price No. 3	\$175	195	220	250	280	325	360	400	450	500
List price P. & W.	\$185	200	230	270	300	350	400	425	450	500
Length, f to f, ins.	15	15	13	17 1/2	17 1/2	16 3/4	20 1/2	20 1/2	18 1/2	18 1/2

Sizes 2x4 and less have screwed ends; 2 1/2x5 to 3x6 have inlet screwed and outlet flanged; 3 1/2x7 and larger have both ends flanged.

Condensation Receiver and Pump Governor.

Intended to receive the returns from a heating system and serve as automatic governor to a pump returning condensation to boiler. May also be used to maintain constant water level in a tank. Has open cast iron float, and is made in five sizes having capacities to handle from 5,000 to 40,000 sq. ft. of radiation.



FIG. 242
CONDENSATION RECEIVER AND PUMP GOVERNOR

Improved Water Control Valve.

Globe and angle patterns—screwed and flanged ends. For any working pressure up to 200 lbs. Constructed same as float valve, but equipped with straight lever and counterweight. Acts exactly the same as a balanced valve. Having single seat, it is tight when closed. Has renewable composition disc. Inner valve operated entirely by inlet pressure. Adapted for use as float operated water inlet valve on feed water heaters.



FIG. 216
WATER CONTROL VALVE

Steam Trap.

A general service trap. Has double cone shaped balanced valves, operated by high pressure seamless copper float. Will work on any pressure between 0 and 200 lbs. Valves and seats are renewable, and are made of Tobin bronze. Equipment includes self-contained by-pass valve and an air cock. It is tapped so that a gage glass may be attached if wanted.

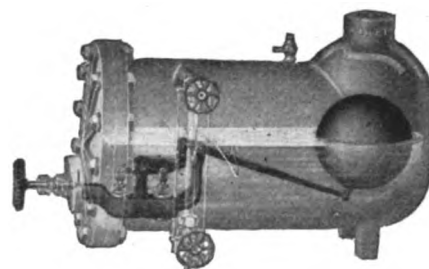


FIG. 240. STEAM TRAP

Exhaust Relief Valves.

For use on exhaust line of condensing engine. While vacuum is maintained they are closed and are airtight. If for any reason vacuum is lost, they open immediately and allow engine to exhaust into atmosphere. Made in horizontal, vertical and angle patterns, and in sizes from 6 to 48 ins., with standard flanged ends.

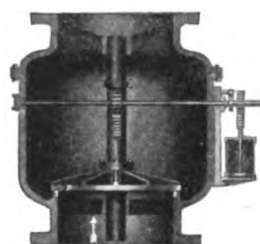


FIG. 224
VERTICAL EXHAUST RELIEF VALVE

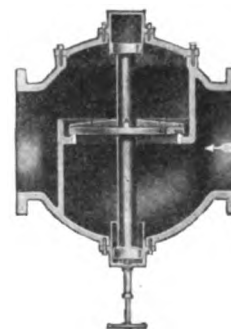


FIG. 223
HORIZONTAL EXHAUST RELIEF VALVE

PRICE LIST AND DIMENSIONS

Size, ins.	6	7	8	10	12	14	16	18
List price	\$100	150	170	270	335	415	500	584
Length, f to f, hor., ins.	16	16	20	24	29	32	36 3/4	39 3/4
Length, f to f, ver., ins.	14	14	16	16 1/2	21	24	26	27

Size, ins.	20	22	24	26	28	30	36
List price	\$670	917	1170	1420	1600	2000	3000
Length, f to f, hor., ins.	43 1/4	38	38	48	48	47	66
Length, f to f, ver., ins.	36	39	42	44 1/2	48	52	49

Special Valves.

This company has facilities for making special valves for any service and in all sizes, and invites inquiries. Complete line of standard specialties is shown in catalogue No. 9, which will be gladly sent on request.

JULIAN D'ESTE COMPANY

Manufacturer of Engineering Specialties

26 Canal Street
BOSTON (14), MASS.

NEW YORK, N. Y., 180 Washington Street

CHICAGO, ILL., 174 North Market Street

Products.

CURTIS ENGINEERING SPECIALTIES, which include:
REGULATORS: Damper, Temperature, Water, Air,
Steam, Pump and Steering Engine.

BALANCED STEAM TRAPS; EXPANSION TRAPS; BALL
COCKS.

Also manufacturers of Balanced Valves.

Curtis Improved Damper Regulator.

The regulator is actuated by steam pressure and consists of a gunmetal cylinder, within which is a piston fitted with water packing. The piston rod is connected by a chain to the lever of the damper, on which hangs a weight sufficient to overhaul the piston and open the damper, regardless of any ordinary friction.

When the rising pressure reaches the point of lifting the given load, it permits steam to enter the space over the piston, which slowly pushes it down and closes the damper. Falling pressure at length closes the valve, pressure then passing from top to bottom of the piston, which allows the weight to settle and open the damper.

This regulator is guaranteed to change the damper in either direction on a minimum variation of pressure. It is also a guaranteed fuel saver over the best hand regulation.



CURTIS IMPROVED DAMPER REGULATOR

Apparatus includes Regulator,
Pulleys, Chain, Weights, and
Screws.

No. 1 up to 40-in. diameter
damper.

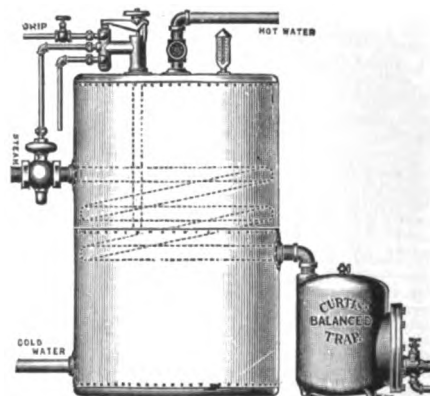
No. 2 up to 60-in. diameter
damper.

No. 3 up to 72-in. diameter
damper.

Curtis Temperature Regulator.

Will control any temperature from 0° to 300°. Easily adapted to steam or hot water boilers, or to tanks for heating water for hotels, baths, or restaurants. A minimum change of temperature produces sufficient movement to do the work. Power is unlimited.

Sizes from 1 to 8 in.



CURTIS TEMPERATURE REGULATOR

Curtis Water Pressure Regulator.

For pulp and paper mills, hotels, public buildings, and residences.

Warranted to maintain the pressure desired, with perfect uniformity, in spite of any and all fluctuations in the outside pressure.

This regulator obviates the wear and tear caused by water-hammer and high pressure on all plumbing fixtures and fittings.



WATER PRESSURE REGULATOR

DATA, CURTIS WATER PRESSURE REGULATOR

Size, in.	1/2	3/4	1	1 1/4	1 1/2	2
Height over all, in.	14 1/2	15	15	15 1/2	15 1/2	15 1/2
Diam. diaphragm, in.	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2
Face to face, in.	4 3/4	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2
Diam. flanges, in.	*	*	*	*	*	*
Net weight, lbs.	18	21 1/2	21 1/2	22 3/4	22 3/4	22 3/4

*Screwed.

Size, in.	2 1/2	3	4	5	6
Height over all, in.	17	17 1/2	24	27	29
Diam. diaphragm, in.	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2
Face to face, in.	7 1/2	10	11 3/4	13 1/2	15
Diam. flanges, in.	*	7 1/2	9	10	11
Net weight, lbs.	34 3/4	57	110	175	200

*Screwed.

Steering Engine Regulator for Marine Service.

This regulator prevents racing of the engine, and gives regularly and more quickly the desired speed of change in the rudder from amidships to either extreme port or starboard position. It is also a material aid to the pilot in controlling the ship.

All-bronze; screwed ends.

Sizes, 1/2, 3/4, 1, 1 1/4, 1 1/2 and 2 in.



STEERING ENGINE REGULATOR

Improved Steam Pressure Regulator.

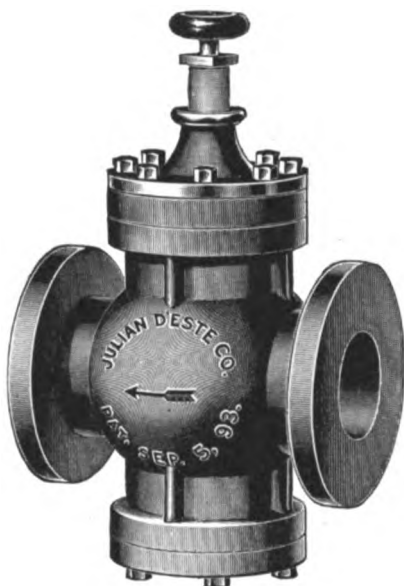
Made entirely of metal; a lock valve and very sensitive. It has no levers, weights, projections, glands or packing.

There is no drip or leak of steam or water, and all that passes into it passes through it.

Suitable for boiler pressures up to 200 lbs.

For hydraulic and air pressure an adaptation of the steam pressure regulator is used for the peculiar requirements of a pump pressure regulator.

This is accomplished by connecting the chamber under the diaphragm to the pipe or tank in which the water pressure is to be controlled, so that any change of pressure in the pipe or tank operates on the diaphragm and closes, or opens, the valve placed in the steam pipe of the pump.



IMPROVED STEAM PRESSURE REGULATOR

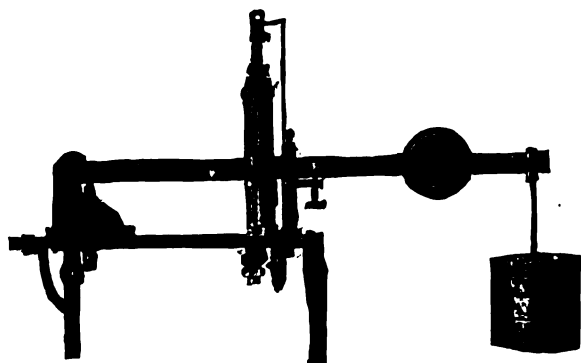
DATA, IMPROVED STEAM AND PUMP PRESSURE REGULATORS

Size, in.....	Bronze Body			Iron Body									
	1	1½	2	2½	3	4	5	6	7	8	10	12	13
Face to face, in..	4½	4¾	4¾	6¼	8¾	10¾	11¾	12¾	14¾	16¾	18¾	21	24
*Diam. flanges, in..	4	4	4	6	8	10	11	12	14	16	18	20	23
Diam. globe, in..	2¾	2¾	3	5¼	6¾	7¾	8¾	10¾	12¾	14¾	17¾	20	24
Diam. cover, in..	3½	3½	3½	4½	5	6	6¾	7¾	8¾	10¾	12¾	14	19
Center of pipe to bottom, in.....	2½	2½	2½	3¾	4¾	4¾	5¾	6¾	7¾	8¾	10	11¾	13
Center of pipe to top, in.....	7¼	7¼	7¼	10¼	11¾	12¾	13	13½	14¾	16	19½	21¾	25
Net weight, lbs..	10½	11	12	33	64	105	145	167	247	355	490	750	.....

*All flanges standard for extra heavy pressure. **Screwed.

d'Este Hydraulic Damper Regulator.

This regulator is a simple, compact and sensitive mechanism operated by water pressure and will control a damper on a slight variation of boiler pressure. It is designed especially for conditions that require heavy loads. Made in three sizes, 2-, 3-, and 4-in. motors.



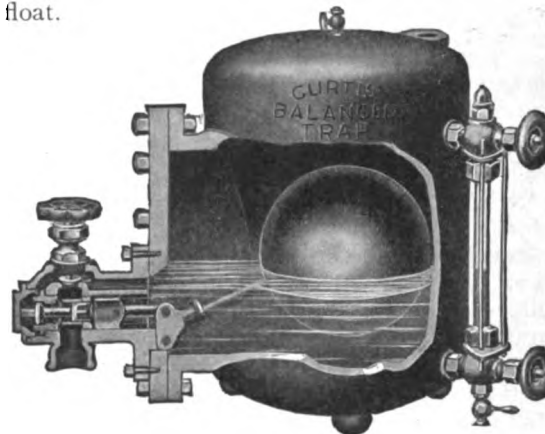
D'ESTE HYDRAULIC DAMPER REGULATOR

Curtis Balanced Steam Trap.

For all manufacturers having vacuum pans in use, for those having a large amount of steam and heavy

condensation to contend with, this trap is a valuable aid, working, as it does, without starts or stops which occasion jarring and straining. It is made of close grained cast iron, and is amply strong to withstand 200 lbs. pressure. It allows for the removal of both valve and float by taking off cover plate at the side.

The trap is fitted for a glass water gage that does away with guess work in maintaining a water seal for the float.



CURTIS BALANCED STEAM TRAP

Trap No.....	000	00	0	1	2	2½	3	4	5	6
Top to bottom, in..	11	12	13	14½	15½	17	18	20½	22	22
Front of valve to back of trap, in..	13½	16½	17¼	18½	19¼	20¼	22	23½	28	28½
Diam. trap, in.....	8	9½	10¼	11	12	12½	13½	14½	16½	16½
Diam. cover, in.....	8¼	9	9	12	12	12	13	13	13½	13½
Outlet and inlet, in.	½	½	½	¾	1	1¼	1¼	2	3	4
Outlet to bottom of trap, in.....	0	1¼	1¼	2	1¼	1½	2	1¼	3½	1
Float, in.....	5	6	6	8	8	8	8	8	8	8
Weight, lbs.....	50	75	82	112	145	168	189	230	385	410

Curtis Expansion Trap.

A practical adaptation of old principles, by means of which the slight difference of temperature between steam and water condensed from it completely controls the valve. When the expansion vessel is in contact with steam it instantly closes the valve, and when water covers it the valve immediately opens and the

water discharges, whether at a low or a high pressure of steam.

They are set to deliver at 212°, but can be adjusted to lower or higher temperatures.

U. S. Ball Cock.

Full sized area; valve is balanced; will not hammer even under pulsation of a pump; perfectly noiseless. Renewable seat of bronze metal. Good in any place for high or low pressure.



U. S. BALL COCK, 4-INCH
Sizes ½ to 4 in.

THE FISHER GOVERNOR CO.

Dependable Power Plant Specialties

5-11 Linn Street
MARSHALLTOWN, IOWA

Products.

PUMP GOVERNORS; AUTOMATIC CHECK and FLOAT VALVES; REDUCING VALVES; PRESSURE REGULATORS; SPRING CONTROLLED DIAPHRAGM REGULATORS; STEAM TRAPS; AUTOMATIC RELIEF, BALANCED LEVER and FLOAT VALVES.

Also manufacturers of Back Pressure and Atmospheric Relief Valves.

For Oil Field Specialties, see page 950.

Fisher Regular Pump Governors (Patented).

Type No. 1—For use on pumps for water works, hydraulic elevators, fire, boiler feed, railroads, mines, air compressors, etc.

They automatically start or stop a pump working under pressure and maintain a uniform pressure on discharge side at all times. Simply constructed, easy to operate, automatic and economical.

Seats and valves made from Fisher special hard phosphor bronze. Particular attention given to construction and testing before shipping.

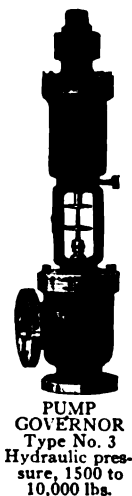
Type No. 2—Special extension cylinder handles pressures of 500 to 1500 lbs. without impairing sensitiveness to variation in discharge.

Type No. 3—Maintains guaranteed pressures from 1500 to 10,000 lbs., or capacity of pump.

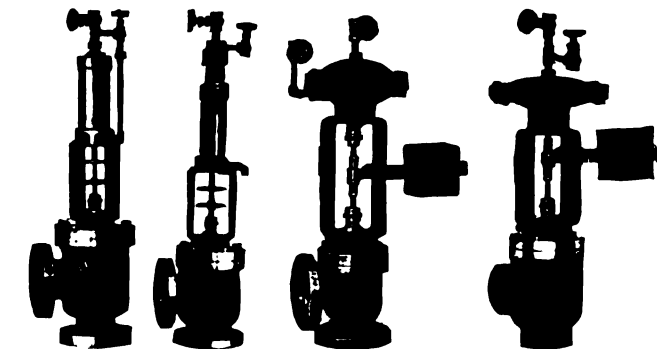
Type No. 4—Maintains constant over-pressure or excess pressure in feed line at all times, regardless of variation in boiler pressure. Durable, because not complex. For use where exacting duty and closest regulation are required.

Type No. 5—For use on fuel oil and other low pressure pumps pumping liquids, air or gas. It insures steady flow of oil at burners, controlling pump so as to permit only the slightest variation in pressure. Unequalled for sensitiveness on extremely low pressures. Not recommended for pressures in excess of 40 lbs.

State pump discharge pressure to be maintained and nature of service.



PUMP GOVERNOR
Type No. 3
Hydraulic pressure, 1500 to 10,000 lbs.



Type No. 1
Capacity
10 to 500 lbs.

Type No. 2
Capacity
500 to 1500 lbs.

Type No. 4
Maintains constant
excess pressure

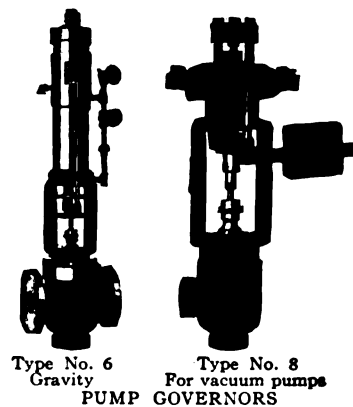
Type No. 5
For low pressure
pumps

PUMP GOVERNORS

Type No. 6—For controlling pumps discharging into open elevated tanks to maintain a certain water level. In addition to gravity or water level control, pump is controlled by discharge pressures, governor

being actuated from both sources. Use of float valve and other apparatus for tank control overcome.

Type No. 8—Used on all types of steam operated vacuum pumps used with vacuum heating systems, and where a certain number of inches of vacuum must be maintained. Diaphragm and lever mechanism can be swiveled and turned in any direction desired. Also made spring controlled for marine service.



Type No. 6
Gravity
PUMP GOVERNORS

Type No. 8
For vacuum pumps

Fisher Spring Controlled Diaphragm Regulator.

Type No. 55 is used for controlling steam driven pumps operating on closed systems, and is particularly adapted to low pressure pumps. For fuel oil pumps, when information is given, a specially constructed diaphragm is furnished.

Can be used as pressure reducing valve in any position. If used in vertical line, furnished with pilot guide.

Made globe and angle bodies.



TYPE NO. 55
DIAPHRAGM
REGULATOR

SIZES AND LIST PRICES OF PUMP GOVERNORS NOS. 1, 4, 5 AND 55

Size, in.	SCREWED		Size, in.	STANDARD FLANGED		EX. HEAVY FLANGED	
	Angle	Globe		Angle	Globe	Angle	Globe
3/8	\$25.00	\$25.00	1	\$35.00	\$37.50	\$36.00	\$38.50
1/2	25.00	25.00	1 1/4	40.00	42.50	41.00	43.50
3/4	27.50	27.50	1 1/2	45.00	47.50	46.00	48.50
1	30.00	30.00	2	50.00	52.50	52.00	54.50
1 1/4	35.00	35.00	2 1/2	60.00	63.00	62.50	65.00
1 1/2	42.50	42.50	3	75.00	78.50	78.00	81.50
2	50.00	50.00	3 1/2	87.50	90.00	92.00	94.50
2 1/2	58.00	58.00	4	100.00	105.00	105.00	110.00
3	70.00	70.00	4 1/2	112.50	117.50	120.00	125.00
3 1/2	82.50	82.50	5	125.00	130.00	135.00	140.00
...	...	...	6	150.00	160.00	165.00	175.00
...	...	...	*7	187.50	197.50	205.00	217.50
...	...	...	*8	225.00	235.00	245.00	260.00
...	...	...	*10	275.00	285.00	295.00	310.00
...	...	...	*12	450.00	460.00	470.00	485.00

*Governors Nos. 1, 5 and 55 only.

Fisher Float Valves.

Type No. 17 is designed to automatically control the flow of fluids into open tanks or reservoirs to maintain a predetermined level. Action of this valve controlled by seamless copper float, directly connected to lever by an adjustable stem.

Made in both angle and globe types. All valves tested. Standard valves suitable for cold water or air pressures ranging up to 200 lbs. If valves are to be used for hot water, steam, oil or other service, information to this effect should accompany order.



TYPE NO. 17
FLOAT VALVE

Fisher Steam Trap.

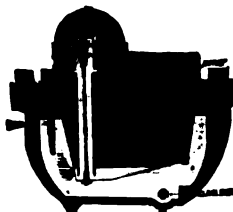
Steam trap, Type No. 33, is fitted with monel metal valve and non-rust bearings. Has a large capacity, for all services and for all pipe sizes.

Fully accessible in all parts. Intermittent discharge, eliminating wire-drawing of seats. Suitable for any pressure by changing valve and seats. Heavily built throughout. Every trap subjected to heavy and severe hydrostatic test.

Ribbed heavily, insuring strength. Readily covered with asbestos. Two wearing parts only; those easily renewed; economical maintenance.

Reliable design; uniform distribution of metal and strain; contraction and expansion in service will not affect joints.

Area of open hinge bucket is large, giving great pulling power. Possible to use a larger valve than with any other construction.



TYPE NO. 33
STEAM TRAP

DATA, NO. 33 STEAM TRAPS

Number	A	B	C	D	E	F	H
Size of pipe connection, in.	1½	¾	1	1½	1½	2	3
Capacity in lbs. of water per hr.	1000	1710	2140	4600	5700	7900	14000
Capacity in sq. ft. of radiation	3000	5130	6420	13800	17100	23700	52000
Capacity of lin. ft. of 1-in. pipe	9000	15390	19260	41400	51300	71100	156000
App. shipping wt., lbs.	54	70	95	118	178	284	426
List prices	\$25.00	30.00	40.00	55.00	70.00	100.00	175.00

Fisher Balanced Lever Valves.

Type No. 7 is under sole control of lever, outside force operating that lever. It remains unaffected by pressure. Can be used in connection with steam, air, gas, water or other fluids. Especially adapted for feed water heaters, tank feeding, quick opening throttling valves, condensation tanks or hot wells in any situation requiring a lever valve that closes tight when valve seats. Also used as a thermostatic or chronometer governor valve.



TYPE NO. 7
BALANCED LEVER
VALVE

Fisher Pressure Regulating and Reducing Valves.

Series No. 90, suitable for steam or air, reducing the initial pressure to the desired low pressure. Positive in operation even when the initial pressure fluctuates or service demand varies.

Bronze bodies up to 2 in. inclusive, larger sizes iron bodies bronze trimmed.

All valves thoroughly tested under actual operating conditions.



SERIES NO. 90
Pressure Regulating and
Reducing Valve

Fisher Reducing Valves.

Type No. 10—Responds quickly to sudden draw on service pressure. For use with steam, water, or oil. Takes initial pressure, and in one reduction attains the lower pressure desired. Never chatters, sticks, or allows the low pressure to build up. Diaphragm and lever actuated type. Made in vertical and inverted types.

Type No. 11-A—Suitable for all low pressure and vacuum systems of steam heating. An increased outlet allows for quick expansion of steam after its passage of valve from high pressure side. It is so nearly balanced that lower reducing range is atmospheric pressure or even below.

Made in vertical and inverted types. The large variety of outlet sizes stocked in this valve makes it convenient and economical to the contractor or engineer.

Type No. 12—Fisher piston type high pressure reducing valve. Cylinders are provided with a special packed piston, which places this valve in a class by itself for handling reduced pressures where low pressure is 50 lbs. or greater. Sensitive reduction is guaranteed. Valve can be varied 30 lbs. or more either way from set fixed point. Also stocked in vertical with angle or globe bodies, and with increased outlet bodies, either vertical or inverted.



TYPE NO. 11-A
INCREASED OUTLET
REDUCING VALVE

Fisher Automatic Relief Valves.

Type No. 14 is generally recommended for service in a main where it is necessary to relieve excess pressure into a branch line; on lines connecting high pressure boilers to low pressure boilers, or any service where a desired pressure is to be maintained and excess pressure above that point relieved.

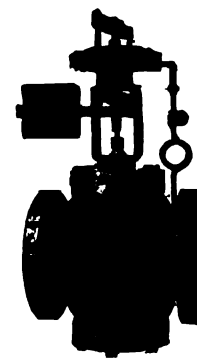
Absolutely automatic, opening precisely at the working pressure and closing promptly after relieving the excess pressure above the fixed working point.



TYPE NO. 10
REDUCING VALVE



TYPE NO. 12
PISTON TYPE HIGH
PRESSURE REDUC-
ING VALVE



TYPE NO. 14
AUTOMATIC RELIEF
VALVE

DATA, VALVES NOS. 10, 12 AND 14

SCREWED					STANDARD FLANGED					EX. HEAVY FLANGED			
Angle		Globe			Angle		Globe			Angle		Globe	
Size, in.	List price	App. wt., lbs.	List price	App. wt., lbs.	Size, in.	List price	App. wt., lbs.	List price	App. wt., lbs.	List price	App. wt., lbs.	List price	App. wt., lbs.
1/4	\$25.00	30	27.50	30	1	\$35.00	113	\$35.00	113	\$36.00	117	\$36.00	117
1/2	25.00	36	27.50	36	1 1/4	40.00	114	40.00	114	41.00	119	41.00	119
3/4	27.50	37	28.50	37	1 1/2	45.00	125	45.00	125	46.00	132	46.00	132
1	30.00	107	32.50	107	2	50.00	136	55.00	136	52.00	147	57.00	147
1 1/4	35.00	110	37.50	110	2 1/2	60.00	158	65.00	158	62.50	168	67.50	168
1 1/2	42.50	120	45.00	120	3	75.00	170	80.00	170	78.00	181	83.00	181
2	50.00	129	52.50	129	3 1/2	87.50	190	90.00	190	92.00	208	94.50	208
2 1/2	58.00	147	60.00	147	4	100.00	205	110.00	205	105.00	224	115.00	224
3	70.00	160	72.50	160	4 1/2	112.50	223	122.50	223	120.00	248	125.00	248
3 1/2	82.50	170	85.00	170	5	125.00	245	135.00	245	135.00	273	145.00	273
					6	150.00	266	150.00	266	165.00	304	165.00	304
					7	187.50	297	187.50	297	205.00	347	205.00	347
					8	225.00	377	225.00	377	245.00	437	245.00	437
					10	275.00	557	275.00	557	295.00	627	295.00	627
					12	450.00	691	450.00	691	470.00	766	475.00	766
					14	600.00	1007	600.00	1007	630.00	1128	630.00	1128
					16	800.00	1360	800.00	1360	850.00	1512	850.00	1512

* Valves Nos. 10 and 12 only.

KELLY CONTROLLER

DISTRIBUTED BY

THE FAIRBANKS COMPANY

Boiler Controller for Low Pressure Steam and Vacuum Systems

ADMINISTRATIVE OFFICES

NEW YORK, N. Y.

BRANCH HOUSES

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WASHINGTON

Products.

KELLY BOILER CONTROLLERS for low pressure and high pressure heating plants.

Also manufacturers of a wide range of high and low pressure Special Controlling Devices.

Kelly Low Pressure Controller — "The Boiler Master."

A rugged and simple device which compels proper operation of steam and vacuum heating systems, providing safety to life and property, reducing boiler depreciation and increasing operating efficiency.

The Kelly controller accomplishes this by overcoming three main causes of erroneous conditions which cause cracking of sections, explosions and the many minor troubles that dwarf boiler efficiency. These conditions are:

(1) Slight surging condition; due to presence of foreign substance in feed water such as grease. (2) Priming; due to too heavy firing. (3) Siphoning, or a velocity condition; due to a rupture in the steam line or the cutting in of an unused portion of the system.

The Kelly guards against these conditions by performing four separate automatic operations when the different conditions arise in service.

As a Steam Separator—At all times the controller acts as a steam separator, separating the water from the steam. When a slight surging occurs the water is returned to the boiler by a bleeder pipe.

As a Temperature Reducer—When an excess of water accumulates in the controller, due to priming, feed water is automatically discharged into the boiler, lowering the temperature of the overheated surging water.

As a Safety Device—If boiler becomes too unruly, due to improper firing, controller cuts off all communication with the system above eliminating all hazard.

As an Automatic Water Feed—This attachment to controller is optional. It automatically maintains a safe water level at all times even when the system is in charge of the most unskilled operator.

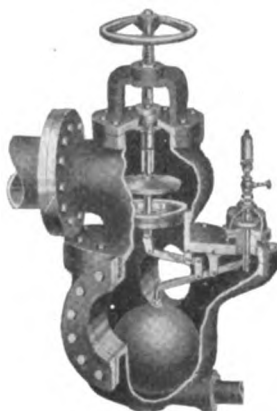
As a Steam Header—It lessens expense of several fittings ordinarily employed for this purpose.

To remove grease all that is necessary is to close the gate valve on bleeder pipe, turn on the water valve, and the grease will float into the controller chamber, where it is withdrawn by opening plug or drain cock in the bottom of chamber. This operation is quicker and shorter than former methods.

Horizontal controllers can be supplied where the vertical type is not practical due to headroom.

Catalogue—Kelly low pressure controllers are fully described and explained in a new catalogue.

SWEET'S CATALOGUE



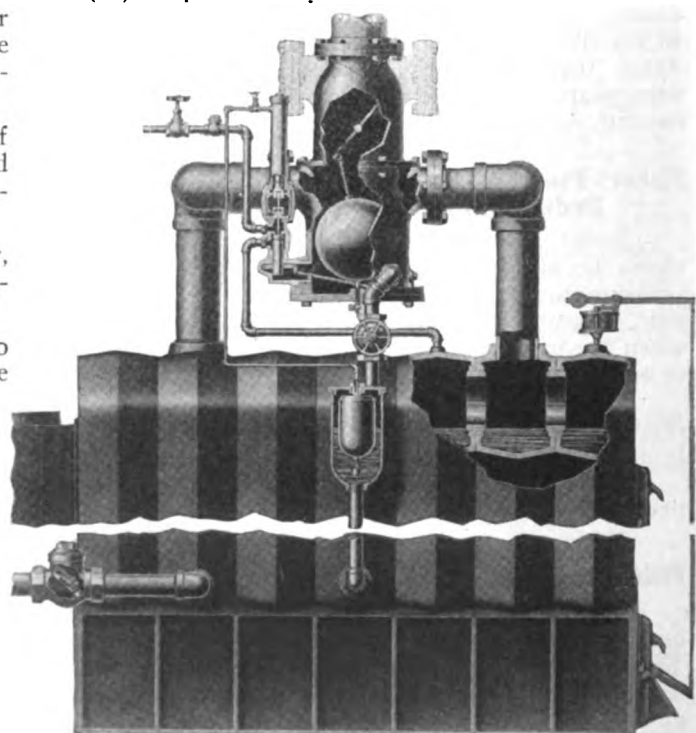
KELLY HIGH PRESSURE CONTROLLER

Kelly High Pressure Controller.

A universal safety device which closes automatically when boilers prime, siphon, and rupture; and, in addition, it serves as a positive stop valve, non-return valve, and steam separator. It sounds an alarm when boilers threaten to prime. Fully described in the new catalogue, "The Kelly High Pressure Controller."

To Summarize.

- (1) These controllers and none other operate when water begins leaving the boiler, or when boiler ruptures, automatically closing.
- (2) They equalize pressure on all boilers and prevent steam entering cold boiler.
- (3) They automatically prevent siphonage of other boilers, if rupture occurs in any boiler.
- (4) They prevent boilers from being primed by velocity or too rapid opening of steam line, or any other cause.
- (5) They automatically cut out damaged boiler without impairing the service of the others.
- (6) They automatically feed the boiler water only when water is needed and not spasmodically, as in other types of water feeds.
- (7) The fluctuating of the water line does not have any effect on the water valve.
- (8) They deliver 50 to 500 gals. of water at each operation, as desired.
- (9) They are foolproof; no springs or packing nuts to stick and prevent operation.
- (10) They furnish dry steam all the time.



SECTIONAL ILLUSTRATION SHOWING DETAILS OF APPLICATION OF THE KELLY LOW PRESSURE CONTROLLER

ESTABLISHED 1887

KITTS MANUFACTURING CO.

Steam Specialties

1921 West Seneca Street
OSWEGO, N. Y.

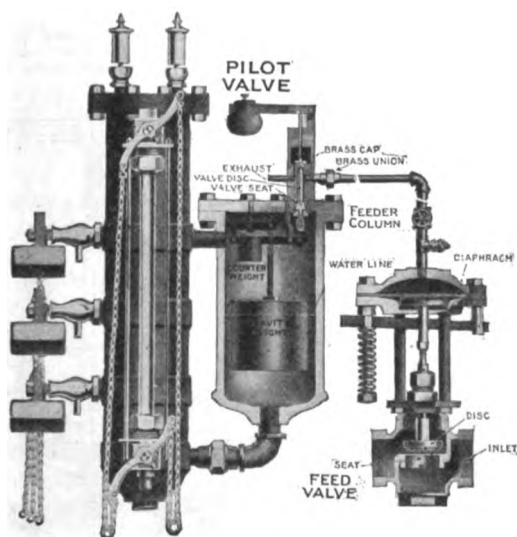
Products.

SAFETY FEED WATER REGULATORS; T. C. STEAM TRAPS; REDUCING VALVES; FAN ENGINE REGULATORS; EXCESS PUMP GOVERNORS; HYDRAULIC DAMPER REGULATORS; SINGLE BOILER FEEDER and WATER SUPPLY GOVERNORS.

Also manufacturers of Vacuum Pressure Reducing Valves, Vacuum Pump Governors, Vacuum Traps, Bucket Steam Traps, Safety Water Columns, Pump Pressure Regulators, Altitude Governors, Low Pressure Boiler Feeders, Air Regulators.

Kitts Safety Feed Water Regulator.

An economical safety device which maintains a constant water level in boilers and effects big savings in coal bills. Simple, durable and absolutely reliable. It insures the greatest possible efficiency, furnishes dry steam to engines and pumps and prevents strain on boilers due to unnatural expansion and contraction because it maintains a constant water level. Furnished with or without the high and low alarm water column.



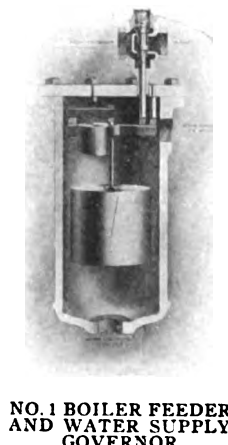
KITTS SAFETY FEED WATER REGULATOR

Single Boiler Feeder and Water Supply Governor.

No. 1—Used to perfectly control boiler feed pump and water line in a single boiler installation. Valve closes as water rises. The valve and all wearing parts are of bronze or brass, the casting and cover of cast iron.

No. 2—A yoke valve which opens as water rises. Used on tank and pump installations of return systems, such as schoolhouse or hospital work.

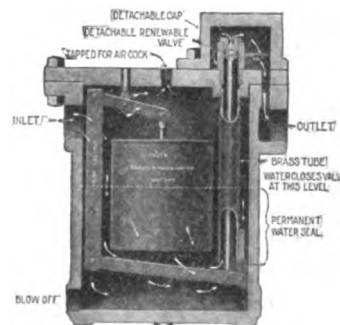
No. 3—A yoke valve which closes as water rises. Used on any



water supply system, especially where make-up water is required on a heating system.

Kitts Twentieth Century Steam Trap.

A powerful trap that operates without a float. It saves all the steam. Seats and disks easily renewable. The trap is water sealed at all times and can not blow steam.



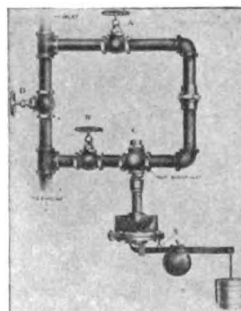
TWENTIETH CENTURY STEAM TRAP

Kitts Steam Pressure Regulating Valves.

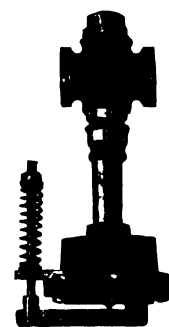
Adapted for every purpose. In extensive use in some of the largest steam heating plants in the United States.

Kitts Fan Engine Regulator.

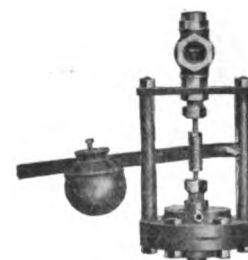
Automatically controls the engine used for forced or induced draft, also automatic stoker systems. Built on steel points and very sensitive in operation. For pressures above 125 lbs., a phosphor bronze reinforcement is furnished in addition to the rubber diaphragm.



FAN ENGINE REGULATOR



SPRING TYPE REDUCING VALVE



EXCESS PUMP GOVERNOR

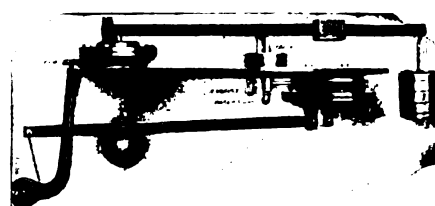
Kitts Excess Pump Governor.

It makes a feed pump deliver a steady, sure supply of feed water, under automatic control, regardless of the variation in steam pressure at the throttle. There is no other pump governor with such a perfect control.

Kitts Improved Hydraulic Damper Regulator.

Will control dampers on a variation of 1-lb. steam pressure. Built for hard service.

A powerful, durable machine.



HYDRAULIC DAMPER REGULATOR

LOCKE REGULATOR CO.

Manufacturers of Steam Appliances

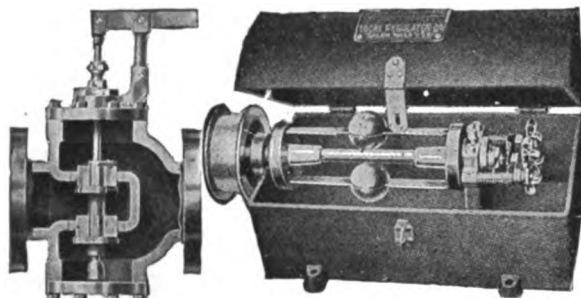
SALEM, MASS.

PITTSBURGH OFFICE, Jos. Cawley, Mgr., Ferguson Building
SAN FRANCISCO OFFICE, Wm. Ernst, Mgr., 154 First Street
NEW YORK OFFICE, 50 Church Street

Products.

REGULATORS; VALVES; AUTOMATIC ENGINE STOPS of various types; SPEED LIMITS; FIRE PUMP GOVERNORS.

Also manufacturers of "Locke" Steam Pressure and Boiler Feed Pump Regulators; "Beats All" Hydraulic Pump Governors; Valves: Auxiliary Electric, By-pass Water Relief, Vacuum Breaker, Differential, Exhaust Relief, Atmospheric Relief, Automatic Safety Shut-off, Renewable Disk Globe, Check, Closed Circuit, etc.; Steam Separators; Test and Charging Boards, etc.



"LOCKE" BALANCE VALVE

Sizes: 1, 1½, 1¾, 2, 2½, 3, 3½, 4, 5, 6, 7, 8, 10 and 12 in.
Prices range from \$9.00 to \$286.00

"LOCKE" SPEED LIMIT
Driven from main shaft; follows every revolution of engine; if speed be above normal it makes electric contact, shutting off steam from engine



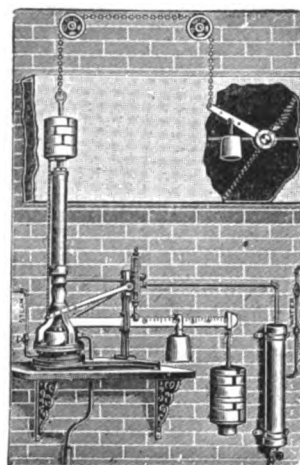
"LOCKE" DOUBLE LEVER REDUCING VALVE

Constructed to operate levers and weights for high reduced pressures, or with a single lever for light reduced pressures; inverted diaphragm eliminates stuffing box around valve rod.

State, in ordering, use of valve, initial and reduced pressures

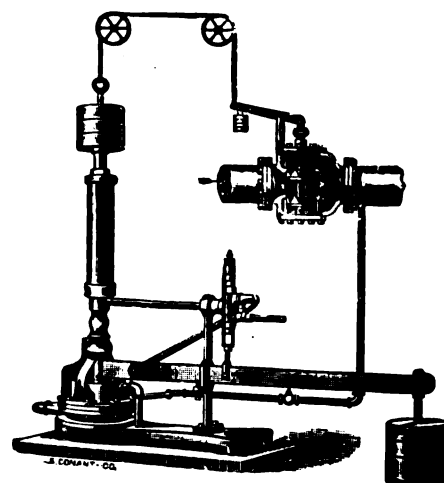


"LOCKE" "BEATS ALL" REDUCING VALVE



IMPROVED "LOCKE" HYDRAULIC DAMPER REGULATOR

Hydraulic regulator actuated by water pressure, admitted through valve to damper operating motor; valve is made to open and close by fluctuation of boiler pressure as it acts under diaphragm, moving weighted lever to which spindle to valve is attached. Cut-off attachment prevents full stroke of damper



"LOCKE" COMBINATION PRESSURE REGULATOR

Indispensable for controlling large valves at slightest variation of pressure.

Especially adapted for: regulating steam to digestors, controlling blower engines for forced draft, sugar refineries, etc.

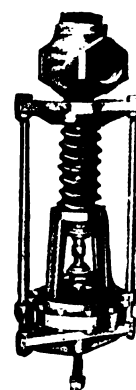
No amount of resistance caused by dirt or friction will interfere with its close regulation.

Guaranteed to operate within ¼ lb. variation

DIMENSIONS OF "LOCKE" GLOBE AND ANGLE VALVES IN INCHES

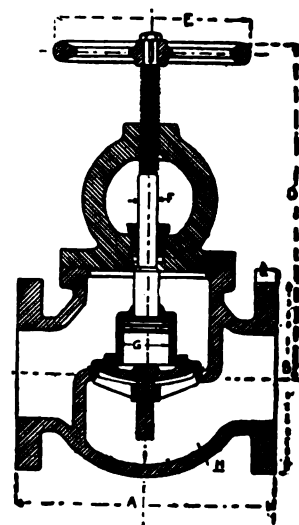
	4	4½	5	6
A	14	15	15½	17½
AA	7	7½	7½	8½
B	10	10½	11	12½
C	1½	1½	1½	1½
D	14	15	17	19
E	13	13	13	16
F	1½	1½	1½	1½
G	3½	3½	3½	3½
H	1	1	1	1

	7	8	9	10
A	19½	21	23	25
AA	9½	10½	11½	12½
B	14	15	16½	17½
C	1½	1½	1½	1½
D	21	23	24	26
E	16	16	20	20
F	1½	1½	1½	1½
G	3½	3½	4½	4½
H	1	1	1	1



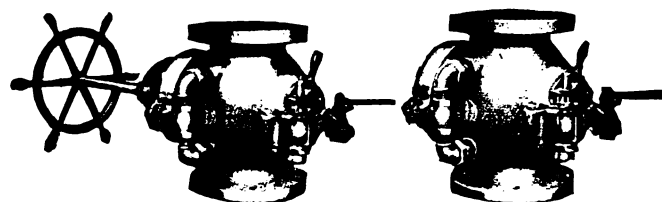
"BOARDMAN" FIRE PUMP GOVERNOR

Listed by Underwriters' Laboratories, Inc., among improved devices



"LOCKE" GLOBE STOP VALVE

Automatic; noiseless. Accomplished by holding valve ¼-in. from its base, at same time shutting off steam completely. Note valve seat below G



Large Combined Throttle Type
Opened or closed at will, shutting down engine when speed increases above normal

Independent Type
Installed in supply pipe between throttle valve and main steam header

"LOCKE" AUTOMATIC ENGINE STOP VALVES

SIZES AND PRICES "LOCKE" "BEATS ALL" REDUCING VALVE

Size, in.	1½	2	3	4	5	6	8	10	12
Length of valve, in.	3	3	3½	4½	5	5½	6½	7½	9
Price	\$15.00	\$18.00	\$22.00	\$28.00	\$35.00	\$44.00	\$57.00	\$72.00	\$90.00

ESTABLISHED 1874

WATTS REGULATOR COMPANY

Manufacturers of Steam Specialties

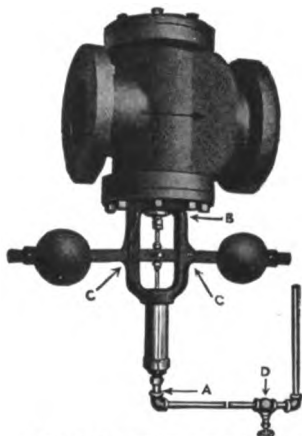
MAIN OFFICE AND FACTORY

250-252 Lowell Street
LAWRENCE, MASS**Products.**

REDUCING VALVES; PRESSURE REGULATORS for Steam, Water and Air; PUMP REGULATORS; VACUUM REGULATOR; WATER OR AIR REGULATORS; FAN ENGINE REGULATORS; FEED WATER REGULATORS; HYDRAULIC DAMPER REGULATORS.

Reducing Valves.

Reduce and maintain an even pressure of steam or air regardless of the initial pressure. Automatically reduce the pressure on all systems and on all situations where it is desirable to use a lower pressure than that on the boiler. All-bronze up to and including 2 in.; above 2 in., iron bodies with bronze trimmings.



PISTON TYPE REDUCING VALVE

Vacuum Regulator.

Designed especially for the requirements of vacuum heating systems. It will take the steam from the boiler and reduce and maintain the pressure on low pressure heating systems at atmospheric pressure or lower if necessary.



VACUUM REGULATOR

Water or Air Valve.

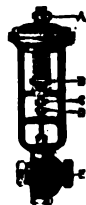
This regulator will maintain a uniform delivery pressure, between 1 and 150 lbs. against any variable initial pressure up to 300 lbs., on air, water or gas. Single seated.



WATER OR AIR VALVE

Fan Engine Regulator.

Automatically controls the speed of a fan engine used for forced or induced draft. When adjusted, keeps the engine moving slowly, and will not open to allow the engine to run beyond the speed limit.



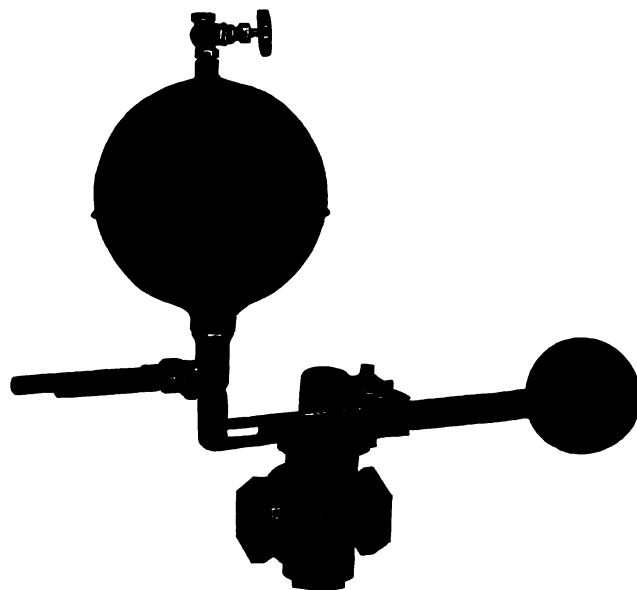
FAN ENGINE REGULATOR

Pump Regulators.

Designed for efficiency in pump regulation, exactly regulating the amount of steam to the pump, regardless of variations.

Feed Water Regulator.

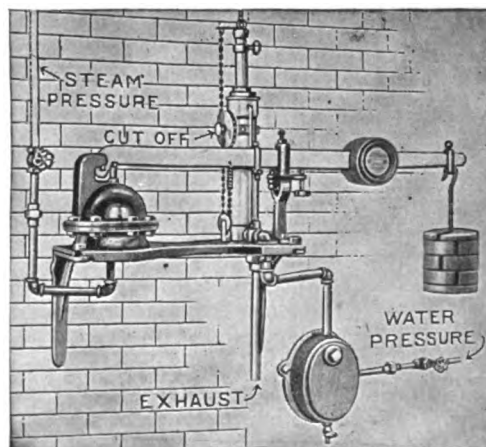
The last word in feed water regulation. It is absolutely frictionless, a protection against high and low water, a labor saver in use in plants all over the world. There are no needle valves, no diaphragms, no floats, no drips, no adjustments, no extra parts, no waste, absolutely automatic.



FEED WATER REGULATOR

Damper Regulator.

The Lawrence damper regulator has forty-seven years' experience behind it to distinguish it from all others. It is actuated by water pressure in both directions, has an automatic cut-off attachment that will open the damper at a partial stroke, which is essential for the complete combustion of the gases. It is sensitive to the least change of pressure, yet will change the damper slowly and to a minimum amount to secure the best results.



LAWRENCE DAMPER REGULATOR

MASON REGULATOR CO.

Pressure Regulating Appliances

BOSTON, MASS.

Products.

REDUCING VALVES and PRESSURE REGULATORS for Steam, Water and Air; STEAM PUMP PRESSURE REGULATORS and SPEED GOVERNORS; BALANCED and FLOAT VALVES; HORIZONTAL PRESSURE CONTROLLING DEVICES; HYDRAULIC DAMPER REGULATORS; STRAINERS.

Reducing Valves.

Reduce and maintain an even pressure of steam or air regardless of the variation of the initial pressure or of the volume of steam or air required. Automatically reduce boiler pressure for steam heating systems of all types (vacuum systems included), central heating plants, engines, paper machines, slashers, dye kettles and all situations where it is desirable to use a lower pressure than that on the boiler. Furnished in the auxiliary operated, lever and weight, and other types. All-bronze for initial pressures of 300 lbs., and iron body for pressures up to 180 lbs.

DATA, STANDARD REDUCING VALVES

Size, in.	Distance center to top, in.	Distance center to bottom, in.	Length over all, in.	Weight, lbs.	Price list
1/2	7 1/4	4 3/4	5 3/4	6	\$18
3/4	7 1/4	4 3/4	5 3/4	6	18
1	10	5	7	11	22
1 1/4	11	6	8	16	28
1 1/2	11 3/4	7 1/2	9	23	35
2	12	9 1/8	11 1/4	42	44

ALL-BRONZE, UNION ENDS TAPPED FOR STANDARD W. I. P.

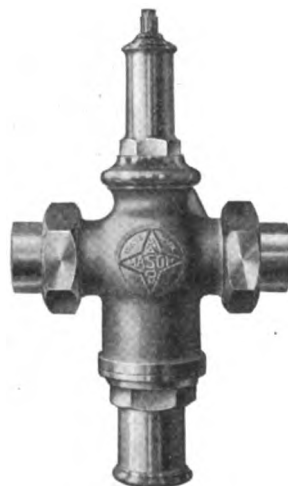
IRON BODY, FLANGED					
2 1/2	12	9 1/2	8 1/4	70	\$57
3	14	10 1/2	10 1/4	109	72
3 1/2	14	11 1/2	12	162	85
4	15	13 1/4	14	188	100
5	15 1/2	13 3/4	15 1/2	255	135
6	16 1/2	16	17 3/4	395	180
8	17 1/2	18 1/2	21	655	250
10	19 1/2	21 1/4	25 3/4	1400	350

DATA, LEVER STYLE REDUCING VALVES

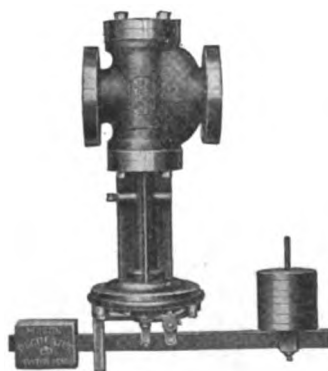
ALL-BRONZE BODY					
Size, in.	1/2	3/4	1	1 1/4	1 1/2
Weight, lbs.	43	44	45	50	52
Price list	\$25	25	28	33	35
IRON BODY					
Size, in.	2	2 1/2	3	3 1/2	4
Weight, lbs.	85	112	150	195	240
Price list	\$44	57	72	85	100

Steam Pump Pressure Regulators.

Designed for fire, boiler feed, air and water works pumps, or any class of pumping machinery where it is necessary to maintain constant pressure. They are placed in the steam supply pipe to the pump, and connected by a 1/4-in. pipe to the discharge system, thereby exactly regulating the amount of steam to the requirements of the pump, and automatically maintaining a uniform discharge pressure regardless of any variation of steam pressure or demand on the pump.



STANDARD REDUCING VALVE



REDUCING VALVE, LEVER STYLE

The key style regulator is provided with a dashpot, which positively prevents it from chattering or pounding when sudden changes occur in the discharge pressure. It is fitted with union connections threaded for standard wrought iron pipe. As regularly furnished, it is suitable for steam pressures up to 250 lbs. and discharge pressures between 20 and 140 lbs. No. 55 regulator has been designed for closed systems, such as are used in supplying domestic service or larger pressure systems for office and factory buildings up to 150 lbs.

DATA, STEAM PUMP PRESSURE REGULATORS

ALL-BRONZE BODY						
Size, in.	1/2	3/4	1	1 1/4	1 1/2	2
Weight, lbs.	9	9	15	19	29	48
Price list	\$20	20	25	30	42	55

IRON BODY				
Size, in.	2 1/2	3	3 1/2	4
Weight, lbs.	74	115	167	212
Price list	\$68	85	100	115

No. 55 BRONZE BODY				
Size, in.	1/2	3/4	1	1 1/4
Weight, lbs.	21	22	23	26
Price list	\$18	18	22	28

No. 55 IRON BODY				
Size, in.	2	2 1/2	3	3 1/2
Weight, lbs.	62	94	127	172
Price list	\$44	57	72	85

Steam Pump Speed Governor.

This governor is to the direct acting steam pump what the ordinary ball governor is to the steam engine. It derives its motion from some reciprocating part of the pump and controls a balanced valve placed in the steam pipe, thereby exactly regulating the amount of steam to the requirements of the pump, and automatically maintaining uniform speed, regardless of any variation of steam or load.

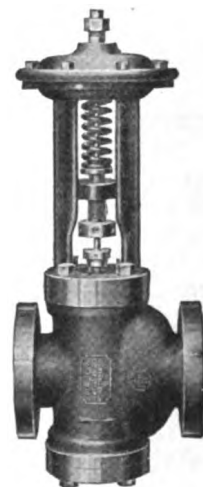
Suitable for controlling either duplex or single acting pumps, as well as flywheel pumps and other classes of pumping machinery.

DATA, PUMP GOVERNORS

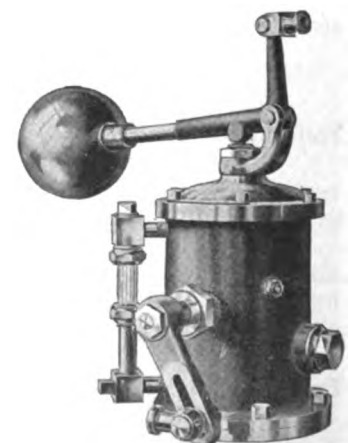
Size	Size balanced valves	List price
No. 1	1/2 in. to 2 in.	\$45
No. 2	2 1/2 in. to 4 in.	60
No. 3	4 1/2 in. and larger	80



KEY STYLE STEAM PUMP PRESSURE REGULATOR



NO. 55 STEAM PUMP PRESSURE REGULATOR

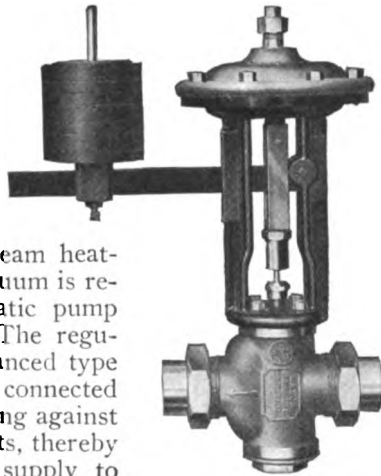


STEAM PUMP SPEED GOVERNOR

Steam Vacuum Pump Regulator.

Designed to control steam operated vacuum pumps so as to maintain a uniform vacuum on the system. They are particularly adapted to vacuum systems of steam heating where a steady vacuum is required and an automatic pump control is desirable. The regulator consists of a balanced type of double seated valve connected to a diaphragm operating against the action of the weights, thereby regulating the steam supply to the pumps.

Suitable for steam pressures up to 180 lbs. and adjustable for any desired vacuum.



STEAM VACUUM PUMP REGULATOR

DATA. STEAM VACUUM PUMP REGULATOR

BRONZE BODY, UNION ENDS						IRON BODY, FLANGED		
Size, in.	1½	¾	1	1¼	1½	2	2½	3
List price	\$25	25	28	33	35	44	57	72

Horizontal Pressure Controlling Device and Belt Shifter.

This device in its various modifications is used for controlling power and electrically driven pumps of all types and classes of service. It can be supplied for vacuums and pressures ranging from 0 to 3000 lbs. operating in connection with variable speed rheostats, clutches, throwing belts, etc.; cylinder can be either vertical or horizontal, and can be furnished in various diameters and lengths of stroke as may be required.



HORIZONTAL PRESSURE CONTROL

20 to 200 lbs. \$75 200 to 3000 lbs. \$100
For compensating device, add. 12
For varying device, add. 35
For slowing device, add. 20

Hydraulic Damper Regulator.

The design of the compensating device, which is positive in its action, insures the closest possible regulation. The operating cylinder as well as all parts coming in contact with the water are made from high pressure bronze and carefully machined to obtain the greatest durability and sensitive action of the apparatus. The knife edges and fulcrum points of the lever are also of special construction.

Suitable for controlling boiler pressures from 1 or 2 to 200 lbs. Piston is operated in both directions by water pressure, permitting use of rod connections to overhead shafting, which is desirable in the larger installations where a number of flue dampers are to be operated in unison.



HYDRAULIC DAMPER REGULATOR

DATA. HYDRAULIC DAMPER REGULATOR

No. 4, with operating cylinder 2¼-in. diameter by 10-in. stroke, complete with sediment chamber, bracket, 25 ft. of chain and weights.	\$60
No. 5, with operating cylinder 3-in. diameter by 10-in. stroke.	72
No. 6, with operating cylinder 4-in. diameter by 10-in. stroke.	88
No. 8, with operating cylinder 5-in. diameter by 10-in. stroke.	110

Balanced and Float Valves.

Used to control pumps, engines and the like, by means of tank floats or cords to distant points, and also in connection with various devices for the control of water to receivers, open heaters and other similar devices. They are made in both the double seated or disk and piston type, with weight and lever or float attachment.

Regularly furnished extra heavy, suitable for pressures up to 200 lbs.

DATA, BALANCED VALVES

Size, in.	Distance center to top, in.	Distance center to bottom, in.	Length over all, in.	Weight, lbs.	Price list
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ALL-BRONZE, WITH YOKE AND LEVER, UNION ENDS

½	6½	2½	5½	6	\$5.50
¾	6½	2½	6	7	6.50
1	6½	2½	6½	9	8.00
1¼	9½	2½	7½	14	9.00
1½	10½	3½	8½	17	10.50

IRON BODY, YOKE AND LEVER, FLANGED

2	12½	5½	8½	55	13.00
2½	14½	6½	11½	86	19.50
3	15½	7	12½	128	25.00
3½	17½	8	13½	176	31.00
4	20½	8½	15½	205	37.00
4½	21½	9½	17	265	55.00
5	23	9½	18½	315	75.00
6	26½	11½	20½	430	103.00
8	29½	14½	25½	830	160.00
10	34½	17½	30½	1275	200.00
12	38½	20	36	1950	286.00

ALL-BRONZE WITH VALVE STEM GUIDES

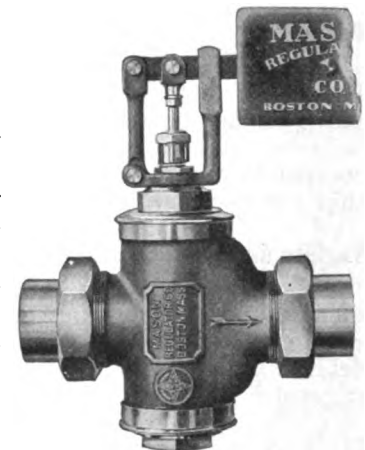
½	5½	2½	5½	5.50
¾	6½	2½	6	6.50
1	7½	2½	6½	8.00
1¼	9½	2½	7½	9.00
1½	9½	3½	8½	10.50

IRON BODY, VALVE STEM GUIDES, FLANGED

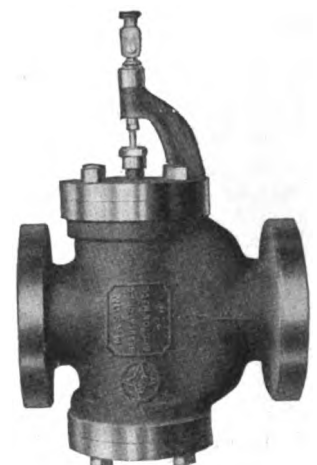
2	11½	5½	8½	45	13.00
2½	12½	6½	11½	76	19.50
3	14½	7	12½	110	25.00
3½	15½	8	13½	155	31.00
4	16½	8½	15½	200	37.00
4½	18½	9½	17	255	55.00
5	20½	9½	18½	285	75.00
6	22½	11½	20½	420	103.00
8	28	14½	25½	800	160.00
10	30½	17½	30½	1250	200.00
12	38½	20	36	1900	286.00

Strainers.

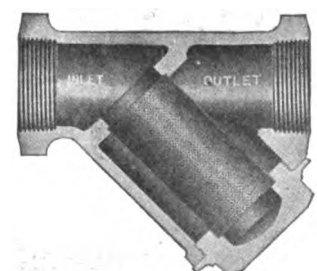
For use on steam or air lines to prevent sediment, scale, bits of packing or other foreign material passing into the reducing valve or other pressure regulator installed on the line, assuring the user of continuous service. Constructed not to reduce the volume of steam or air passing through them, yet are compact and self-cleaning without removing them from the line.



All-bronze, with Yoke and Lever



Iron Body, with Valve Stem Guide
BALANCED VALVES



STRAINER
Sizes, ½ in. to 6 in.

THE POWERS REGULATOR CO.

Manufacturers of Automatic Temperature Controlling Apparatus

GENERAL OFFICES AND FACTORY
2722 Greenview Avenue
CHICAGO, ILL.

GENERAL EASTERN OFFICES
931 Architects Building
NEW YORK, N. Y.

BRANCHES

BOSTON, MASS., 263 Summer Street
CINCINNATI, OHIO, Gerke Building
DETROIT, MICH., 919 Ellery Avenue
CLEVELAND, OHIO, 1660 East 75th Street
BUFFALO, N. Y., 852 Ellicott Square

SAN FRANCISCO, CAL., Hobart Building
SEATTLE, WASH., Alaska Building
KANSAS CITY, MO., 400 Chambers Building
SALT LAKE CITY, UTAH, Walker Bank Building
LOS ANGELES, CAL., 629 South Grand Avenue

BUTTE, MONT., 207 Daly Bank Building

THE CANADIAN POWERS REGULATOR CO., LTD., TORONTO, CAN., WITH BRANCHES AT MONTREAL, WINNIPEG, CALGARY, VANCOUVER

Products.

APPLIANCES for the AUTOMATIC REGULATION of HEATING and COOLING MEDIUMS and similar general purposes, all the result of years of research and experience in this one line of temperature control, and covered by the Powers guaranty of perfect workmanship and efficiency.

Variety and Adaptability.

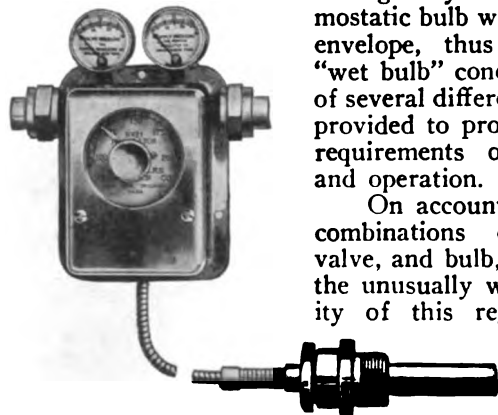
The specialties here shown are quite flexible in their adaptation to different temperature controlling requirements, and offer a variety designed to cover the field. New problems, however, are welcomed, and correspondence invited.

Liquid Air or Gas Temperature Control.

No. 21 Regulator—A compressed-air operated regulator with flexible extension bulb, for use with diaphragm valves and motors, in the automatic control of heating and cooling mediums, especially where the adjusting mechanism must be located at considerable distance from point where temperature is to be controlled. The instrument has an adjustment range of 100°, and can be furnished for processes involving temperatures anywhere between 0° and 1000° Fahr. Regulator and valve bear the same relation to each other and are connected as in the illustration of the No. 14B Regulator on the following page. Valves of the rubber diaphragm or all metal type may be used.

This regulator can be furnished either direct acting or reversed, and the valves with which it is used have a similar flexibility so that combinations giving absolute certainty in the control of either heating or cooling mediums may be readily secured. In many humidity controlling operations this regulator can be used to advantage by covering thermostatic bulb with a saturated envelope, thus producing a "wet bulb" condition. Bulbs of several different designs are provided to properly meet all requirements of installation and operation.

On account of the many combinations of regulator, valve, and bulb, which permit the unusually wide adaptability of this regulator, it is



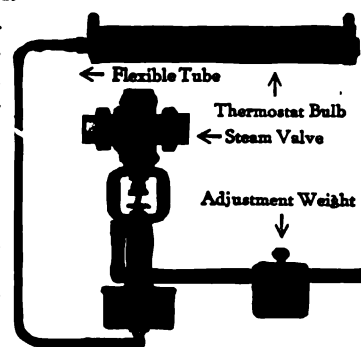
NO. 21 REGULATOR

impracticable to quote prices here. Ask for Bulletin 147 for complete detailed information, price lists, etc.

Air Temperature Control.

No. 15 Regulator—

For control of atmospheric temperatures where thermostatic bulb must be located some distance from steam valve. Particularly adapted to lumber kilns, smoke houses, textile and leather drying processes, grain and vegetable dryers, etc.



NO. 15 REGULATOR

Entirely self-contained, of rugged construction, built for hard wear and long life; no perishable rubber diaphragms; exceedingly sensitive; control within 1° or 2° may be expected.

Adjustment for different temperatures is accomplished by changing the position of the lever weight which can be locked when proper location is determined. Bulletin 138.

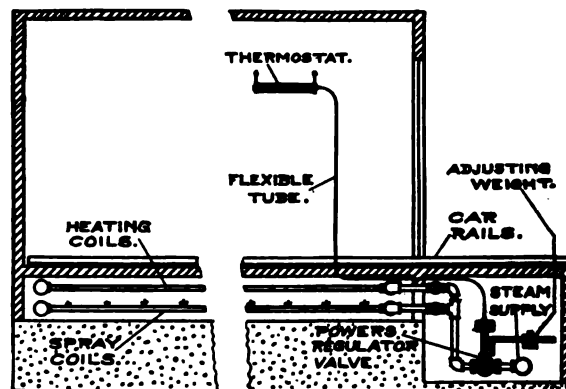
PRICE LIST AND SHIPPING WEIGHTS NO. 15 REGULATOR

Valve size, in.	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
Weight, lbs.	50	50	55	60	65	70	90	100	140
Price,	\$70.00	75.00	80.00	85.00	90.00	100.00	110.00	125.00	150.00

Always specify desired operating temperature, steam pipe size, steam pressure, and state fully the purpose for which regulator is to be used, with range of adjustment.

Valves to 1 1/2 in. inclusive have bronze bodies, with unions. The 2 to 3 in. inclusive have iron bodies screwed; larger than 3 in., iron bodies flanged, with standard drilling. Companion flanges and bolts furnished extra when desired.

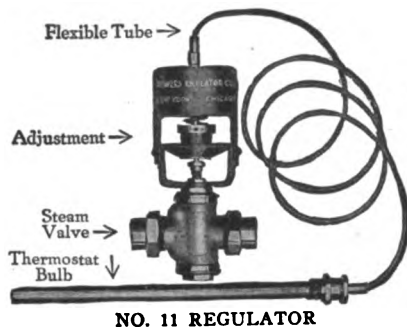
Standard flexible tube length, 8 ft.; additional length, \$1.00 per ft., net. Reversed valves for control of cooling mediums will be furnished at a slight extra charge.



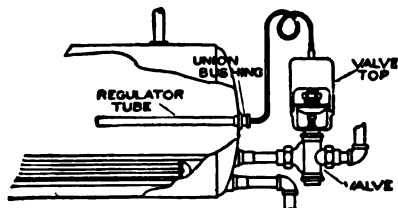
TYPICAL INSTALLATION NO. 15 REGULATOR IN A LUMBER KILN

Liquid Temperature Control.

No. 11 Regulator—Controls the temperature of liquids of all kinds under all conditions. Self-contained, requiring no water or other auxiliary operating power. All-metal. Of great durability, guaranteed accurate and positive in action. Very easily installed. Largely used on hot water tanks and heaters, glue heaters, paraffin and grease tanks, etc. Bulletins 129, 138 and 139.



NO. 11 REGULATOR



INSTALLATION NO. 11 REGULATOR IN HOT WATER HEATER

PRICE LIST NO. 11 REGULATOR COMPLETE WITH VALVE

Valve size, in.	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2
Price	\$60.00	65.00	70.00	75.00	80.00	90.00	95.00

Valve size, in.	3	3 1/2	4	5	6	8
Price	\$100.00	110.00	120.00	175.00	200.00	250.00

Screwed union valves up to 1 1/4 in. inclusive. 2 in., 2 1/2 in. and 3 in., screwed iron body; larger sizes iron body flanged. Standard flexible tube length, 8 ft.; additional length, \$1.00 per ft., net. Bulb lengths, 20 to 24 in., requiring 1-in. and 1 1/4-in. tapping.

Always specify desired operating temperature, steam pipe size, steam pressure, and state fully the purpose for which regulator is to be used, with range of adjustment required.

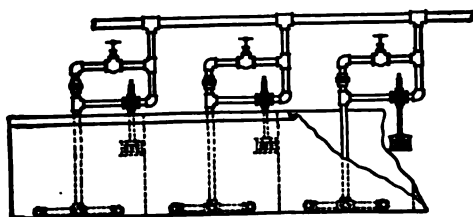
No. 16 Regulator—For the control of liquid temperatures in open vats, for various processes, where it accomplishes wonderful results. Self-contained, requires no air or water pressure for operation. The thermostatic element consists of a pile of thermo-sensitive disks arranged in an open cage, so that a great amount of sensitive surface is exposed to the liquid to be controlled. Standard length from center of valve to bottom of thermostat cage, 19 in., which may be varied on specification.

Bulletin 139 treats particularly of this regulator as applied to the meat packing industry. For other applications, see Bulletin 146.

PRICE LIST AND SHIPPING WEIGHTS NO. 16 REGULATOR

Valve size, in.	1/2	3/4	1	1 1/4	1 1/2	2
Price—Low pressure single seat valve	\$50.00	55.00	60.00	65.00	70.00	80.00
Price—High pressure double seat valve	65.00	70.00	75.00	80.00	90.00	100.00
Weight, lbs.	30	30	30	35	35	45

Add for lever weight adjustment, any size, \$3.00 net.
Small additional charge for "reverse operating" valves.



SHOWING USE OF NO. 16 REGULATOR IN HAM COOKING TANKS

SWEET'S CATALOGUE

No. 14B Regulator—Exceedingly accurate and reliable. Sensitive to a fraction of a degree. Uses compressed air as motive power.

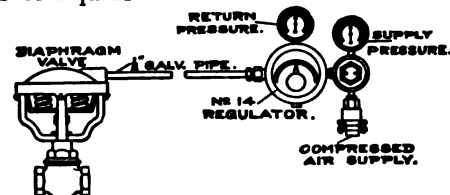
Used in air conditioning and for cold storage rooms, dry kilns, japanning ovens, varnish rooms, pasteurizers, leather dryers, steam cookers, etc.

All brass construction; polished nickel finish. Dials glass covered.

With this regulator may be used either rubber or all-metal diaphragm mounted valves of direct or reversed type and adapted to the control of steam, gas or liquids under any pressure; also diaphragm motors for the operation of dampers where heated air or gases are to be controlled. Bulletin 132.



NO. 14B REGULATOR



SHOWING METHOD OF INSTALLING NO. 14B REGULATOR

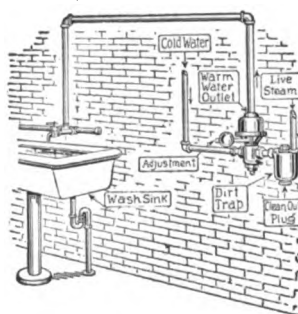
PRICE LIST NO. 14B REGULATOR WITH RUBBER DIAPHRAGM VALVE

Size, in.	1	1 1/4	2	2 1/2	3	4	5	6
Price	\$80.00	85.00	100.00	105.00	110.00	130.00	160.00	185.00

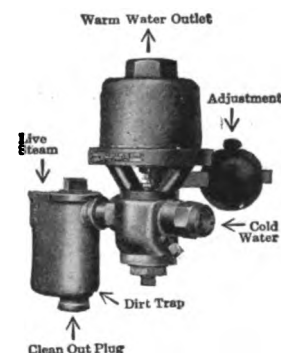
Reversed valves at slight extra charge. See Bulletin 132.

Instantaneous Steam Water Heater.

Thermostatically controlled. For wash sinks, shower baths, etc., in factories, mines, and industrial plants. Heats by mixing steam at 75 lbs. pressure with cold water. No waste. No noise. Bulletin 137.



INSTALLATION IN WASH SINK



INSTANTANEOUS STEAM WATER HEATER

PRICE LIST INSTANTANEOUS STEAM WATER HEATER

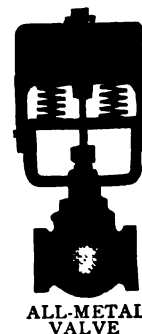
No.	Fittings			Capacity, gals. per min.	Shipping weight, lbs.	Price
	Steam inlet, in.	Water inlet, in.	Water outlet, in.			
1	1	1	1	25	60	\$100.00
2	1 1/4	1 1/4	1 1/4	40	75	150.00

All-metal Valves.

Made in all sizes, both single disk and balanced. Direct and reversed acting.

The absolute limit in durability. May be used with the No. 14-B Regulator in place of the rubber diaphragm valve and adds about 25% to the price.

Very desirable where the valve top is exposed to high temperatures. Bulletin 144.



ALL-METAL VALVE

THE WILLIAMS GAUGE COMPANY

Steam Specialties

PITTSBURGH, PA.

BOSTON, MASS

CHICAGO, ILL.

CINCINNATI, OHIO

ST. LOUIS, MO.

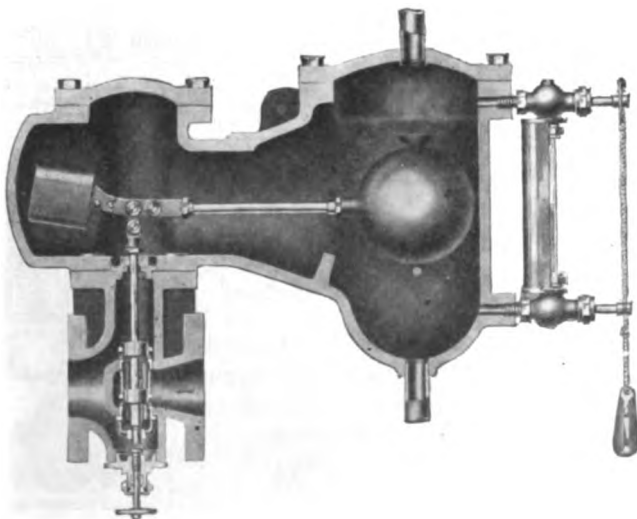
Products.

BOILER FEED CONTROLLERS; PUMP GOVERNORS and SAFETY COLUMNS.

Stets Boiler Feed Controller, Type B.

Description—A spherical displacement body, filled with water, and counterbalanced to ride one-half submerged; possesses all the power of a closed or buoyancy float of same size, and for the high pressures used in latest steam practice has no chance for failure. The Stets Type B controller design includes such a relation between weight of water filled float and weight of counterweight and lever arms as will cause float to ride at its middle line at all times. Float will not lose its water content by evaporation, because condensed steam which forms in upper steam connection to boiler drips into small pan attached to top.

Operation—Controller is connected to boiler at water level. Whenever water in boiler rises, the float must rise with it, otherwise it will gain buoyancy in proportion to rise in water level around it, and will no longer balance counterweight. Leverage and weight of counterweight then become effective to push valve stem downward. When water level in boiler falls the float loses buoyancy and gains weight proportional to the fall, and its impulsive power then becomes effective to pull valve stem upward. As leverage is very great and no stuffing box friction on valve stem to prevent gradual movement, a powerful, positive and fine control of valve movement is secured. The valve opening bears a fixed relation to water level. This is accomplished by no other regulator. Controller also eliminates usual water column.



TYPE B BOILER FEED CONTROLLER

V-Port Valve—Valve is of true balanced piston type. One sleeve serves both pistons and has 8 V-ports, 4 at upper and 4 near lower end. By removing jack wheel entire sleeve may be withdrawn without disturbing valve or breaking pipe connections. Valve stem is guided at its extreme ends. These metal guides are in water and consequently lubricated, hence but little friction. There is sufficient inertia in the mass of the float and counterweight to prevent any quick oscillations of water level from adversely affecting valve control.

The result of this design is a rate of feed proportional to boiler water level. This is accomplished with few parts and by powerful and certain means. As all parts are in pressure space the use of a stuffing box is avoided.

Finer control of flow may be obtained with V-port valve than with disc valve. The opening of disc develops a rectangle. As a V-notch weir will measure wide range of flows of water more accurately than a rectangular weir, so will V-port valve control flows far better than a disc valve.

Williams Steam Pump Governor.

This double disc type of governor is of heavy construction to meet the requirements of severe and constant service. The entire absence of weights, cups or pistons permits of very close adjustment, and gives exceptionally smooth operation. The governor is built in either angle or straightway styles of body, with flanged or screwed ends.

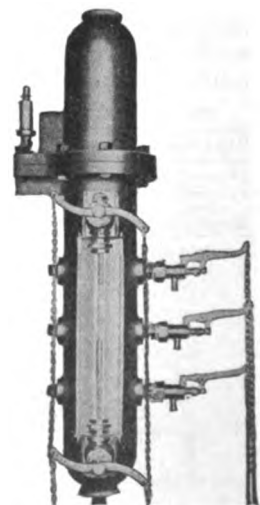


PUMP GOVERNOR

High and Low Safety Alarm Water Columns, Stets Type.

Especially designed for central station and other high pressure plants.

Has heavy pressure compensating float which prevents collapse under any operating steam pressure. Single float of large displacement, but one valve for both high and low alarms instead of two light weight floats with doubled likelihood of trouble.



SAFETY WATER COLUMN

AUTOMATIC FUEL SAVING CO.

Combustion Engineers and Contractors

Manufacturers of Gray System of Automatic Combustion Control

549 West Washington Street
CHICAGO, ILL.

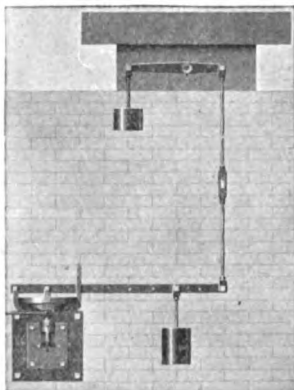
Bulletin Building
PHILADELPHIA, PA.

Products.

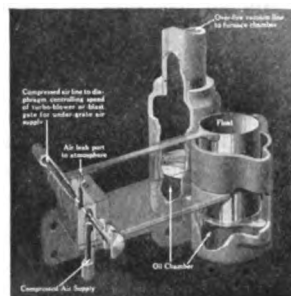
AUTOMATIC CONTROL APPARATUS for the COMPLETE REGULATION of COMBUSTION: Damper Settings, Stoker Speeds, Mechanical Draft, and Over-fire Draft.

How Fuel Waste Occurs.

The most common cause of fuel waste is incorrect air supply, either insufficient or excessive amounts of air resulting in very serious losses of good fuel. The best of hand control of stack draft



CONTROL OF DAMPER

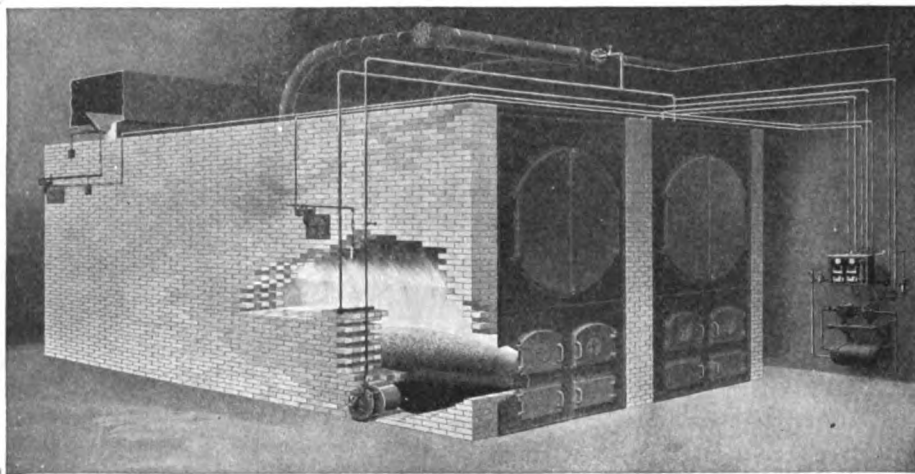


FURNACE AIR CONTROLLER

vidual furnace conditions immediately compensated. Any change in load is met by an accurate and corresponding change in the *rate* of combustion. Mechanical draft is automatically adjusted to the requirements of the individual fuel bed to maintain the *efficiency* of combustion at a constant high figure.

Gray System of Control.

Regulation of combustion by a simple co-ordinated control of the elements which determine efficiency is accomplished in the most logical way by this complete mechanism. For any given



TYPICAL INSTALLATION OF GRAY SYSTEM AUTOMATIC COMBUSTION CONTROL TO HAND FIRED BOILERS

and under-grate air supply is only an approximation of the proper adjustments, for conditions in the furnace are continually changing. The universal demand for higher operating efficiencies, which means regulation following closely upon individual furnace conditions, marks the passing of hand control.

Advantages of Automatic Control.

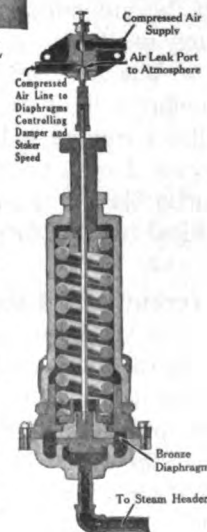
With automatic control, all factors are co-ordinated and the most minute change in the indi-

furnace installation, and particular fuel, the correct proportion of fuel and air for complete combustion and highest efficiency is easily determined. Once found, this ratio of fuel and air should be maintained constant for a constant high efficiency use of the fuel burned.

The Gray system of automatic combustion control maintains this proper ratio under all conditions of operation. Steam demand, as indicated by changes in pressure in the main steam header, is followed by adjustments of the *rate* of combus-



CONTROL OF TURBO BLOWER



STEAM PRESSURE CONTROLLER

tion to hold steam pressure within as close limits as may be required by individual plant conditions.

Under any variations of rate of combustion in order to meet the load, conditions in each furnace are held at the exact point determined as most efficient. As the dampers and stoker speeds are changed in response to a change in steam demand, there is naturally a resulting change in the over-fire draft. This change is met by an individual adjustment of under-grate blowers or wind box gates which brings the over-fire draft back to the predetermined correct amount.

Under-grate air supply is controlled for individual fires by a sensitive mechanism operated by the draft over the individual fires. It will be seen that any changes in fire bed resistance as well as changes in draft due to increases in rate of combustion, will be automatically compensated by an adjustment of the under-grate air supply.

Steam Pressure Controller.

The steam pressure controller of the Gray system responds directly to changes in steam pressure in the main header. A bronze diaphragm opposed by a spiral spring is used to reflect changes in steam pressure by opening or closing a small leak port at the top of the controller.

Compressed air, operating on a rubber diaphragm, is used to move the stack dampers in response to movements of the steam pressure controller.

Stoker controls are also operated from this steam pressure controller.

From the illustration it will be seen that this controller is extremely simple, and while it may be adjusted to operate within as close limits as are necessary, it does not require periodic adjustment or attention.

Furnace Air Controller.

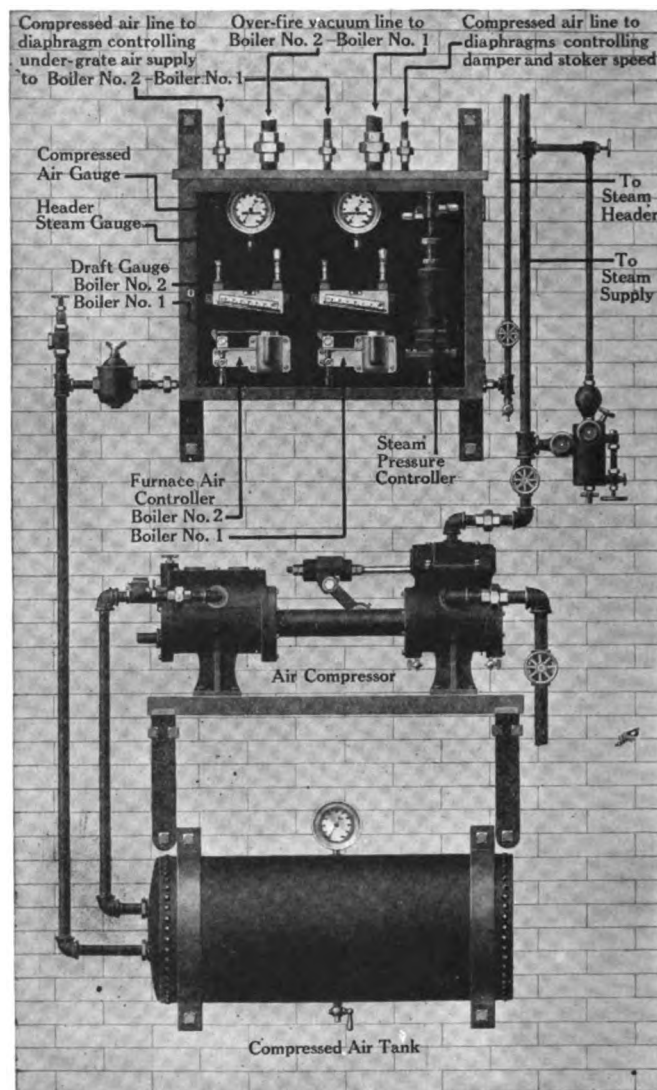
Through a float operated by oil in an enlarged U-tube, one side of which is connected to the furnace chamber over the fire, very sensitive regulation of the air supply is maintained. Any change in over-fire vacuum in the individual furnace, from any cause, is immediately met by an adjustment of the under-grate air supply.

The float of the controller operating a leak port similar to that of the steam pressure controller, either allows compressed air to escape to the atmosphere, or to build up a pressure on the diaphragm operating the turbo blower steam valve or the blast gate to the individual furnace air supply.

Prevention of Excess Air.

A common fault of operation is the presence of a high vacuum in the furnace, where stack draft is relied upon to draw air through the fuel bed as well as pull the products of combustion through the boiler passes and up the stack. The losses through infiltration of cold air are obvious. A similar fault in many plants is the presence of an actual pressure in the furnace, where mechanical draft is not properly regulated.

Excessive radiation, high temperatures in the furnace, general lack of control, result in direct fuel waste and high maintenance expenses. The Gray control holds the furnace draft at the correct amount, which is a happy medium between the extremes of high vacuum and pressure in the furnace. This amount of draft is adjusted for the requirements of each furnace, burning a particular grade of fuel.



TYPICAL GRAY SYSTEM CONTROL CABINET AND APPARATUS FOR TWO BOILERS

Advantages of the Gray System.

Heat Absorption—The moderate furnace vacuum maintained by the Gray system reduces the velocity of the gases, allowing more intimate contact with the entire heating surface of the boiler, and obtaining improved heat transfer.

Cheaper Fuels May be Used—Cheaper grades of coal generally run in smaller sizes and usually make a dense fuel bed. On account of the high air friction thus incurred, such fuel beds require strong suction, which can ordinarily only be obtained by extremely high stack or the use of mechanical draft under the grates. Presence of dirt and relatively lower B. t. u. content

make it necessary to burn this kind of fuel much more rapidly.

The Gray system makes it possible to get required ratings from the lower grades of coal, with corresponding reduction in fuel costs, by accurately controlling mechanical draft.

High Boiler Capacity—Most boilers are capable of operating from 140% to 175% of the builders' rating. The Gray system permits the burning of more coal per square foot of grate, and by passing the hot gases through the boiler at minimum velocity, easily secures these overloads when necessary. The economy thus offered by the Gray system in operating present installation at overload capacity as against installing new units, often pays for the investment in this system.

Saving of Coal Effected—It may be conservatively estimated that the average boiler room will secure a coal bill reduction of from 5% to 20% through the use of the Gray system. The average yearly saving represented may be easily determined for any particular installation, and is a very considerable amount in dollars and cents.

Fuel Feed Control—Typical Installations.

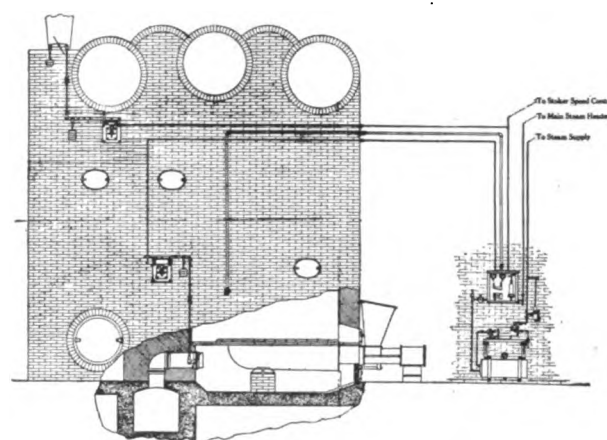
In the case of stoker fired furnaces of the chain grate type, the rate of grate travel is automatically controlled according to the rate of combustion required, the maximum speed being limited to a point where the fuel is burned to ash.

For this type of stoker, the space below the grate is zoned (in the Gray system) and the air pressure in each zone is regulated to the varying departments and stages of progressive combustion.

With the overfeed or underfeed types of stokers, the rate of fuel feed is automatically controlled to conform with the required rate of combustion. Typical installations of the Gray system for different types of stoker fed furnaces are illustrated on this page.

Application of the Gray System in Public Utility Practice.

In public service work it is customary to operate all boilers at a uniform rating. The Gray system automatically proportions wind box pressures to the resistance of the individual fuel beds. The maintenance of accurately adjusted conditions in each furnace in a battery of boilers, and the equal adjustment of load over



TYPICAL INSTALLATION OF GRAY SYSTEM TO BOILER WITH UNDERFEED STOKER

the entire battery results in distinct economies of operation and maintenance.

If it should be desired to operate any portion of the battery at a predetermined rating continuously, these units are set for that rating, and the wind box pressures will be automatically proportioned to the varying resistances of fuel beds. The rate of combustion remaining uniform, the remaining units will follow the steam load.

Actual Operating Data.

The Nelson Valve Co., Philadelphia, who have installed our system have this to say about it:

"We are saving 10% of our coal bill. Furthermore, we are able to maintain a uniform pressure chart throughout the entire working period."

W. R. Schnabel, Supt. Allentown Water Department advises as follows:

"The Gray System of Automatic Combustion Control installed by you in 1918 has been in continuous operation since, and with the help of this system we have been able to reduce the amount of coal used daily from 36,000 lbs. to 25,000 lbs."

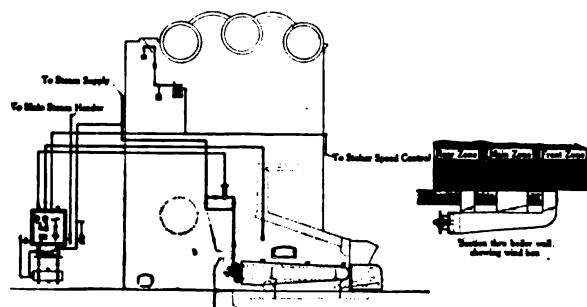
Three boilers do the work of four, The Florence Thread Company say:

"Before installing your equipment, our firemen were pushed hard to keep up steam for four boilers, but we are now doing more work with three boilers using your devices, than we formerly did with four, and this enables us to keep one boiler ready for emergency in good clean shape."

Services.

Our experienced staff of Combustion Engineers will be able to estimate in advance the performance of Gray system apparatus in individual plants. Installations can be made with all types of present boiler, stoker, or furnace equipment, and will be correctly applied to secure maximum performance under all the requirements of plant operation.

Installations are made under the direct supervision of an expert from our organization, and performance guarantees made in advance of the installation are met in every particular. The service department is at your command for help on any combustion problems.



TYPICAL INSTALLATION OF GRAY SYSTEM TO BOILER WITH CHAIN GRATE STOKER

McDONOUGH COAL SAVING CORPORATION

Manufacturers of Coal Saving Specialties

3952 Grand River Avenue
DETROIT, MICH.

Products.

McDONOUGH SYSTEM of CONTROLLING COAL, AIR and WATER, which includes Draft Regulators, Stoker Regulators, Steam Pressure Recording Gauges, Boiler Feed Regulators, Pump Governors and Strainers.

McDonough System.

The McDonough System is a complete, automatic system, for the control in a boiler plant of the three elements—coal, air and water—used in the generation of steam.

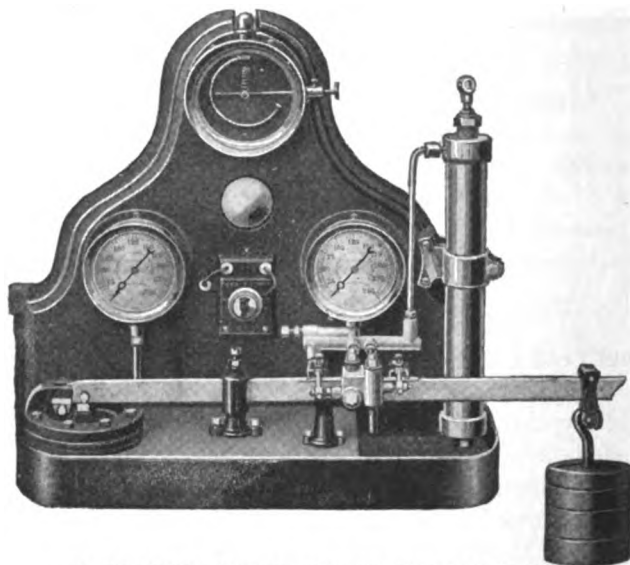
The system regulates the speed of the stokers, dampers, forced or induced draft engines and the speed of the boiler feed pumps.

The system includes a steam gauge showing the boiler pressure; a water gauge showing the operating water pressure; a recording gauge recording steam pressure; a colored signal lamp which shows the position of the dampers; an alarm bell which rings when the steam becomes low; also a boiler feed regulator and a pump governor.

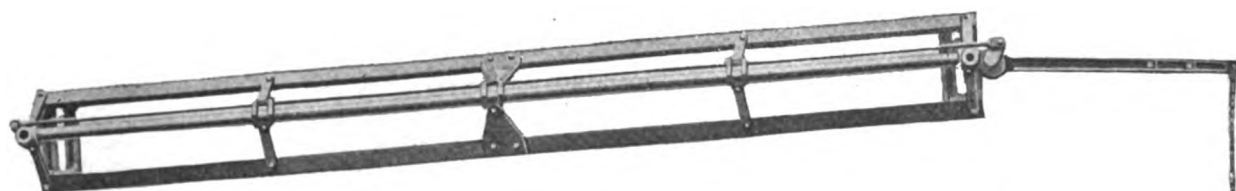
Advantages—The advantages gained through the use of the McDonough System are primarily a saving of coal, 10% as a minimum.

Boiler Feed Regulators.

This Regulator controls automatically the supply of water fed to the boilers. The expansion tube is placed



McDONOUGH DRAFT AND STOKER REGULATOR

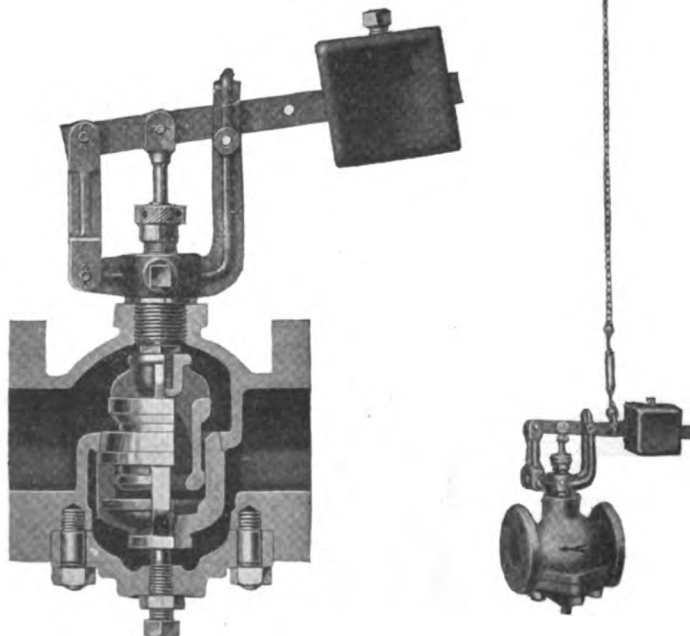


A secondary advantage is the more even maintenance of steam pressure: drier steam, less expansion and contraction of the boilers, furnaces, arches, linings, grates and tubes. There is an elimination of many boiler plant troubles and a minimum attention required on the part of the boiler room attendants.

Incredible amounts in reduced operating costs in coal saving through the McDonough System are being produced in hundreds of steam plants in every line of industry where steam is generated.

In one plant of a prominent steel firm a weekly saving of 10 carloads of coal is effected. In another plant 100 to 110 tons of coal daily; and proportionate amounts in smaller plants.

Operation—When the load on the boilers varies, the draft is increased or decreased, a greater or lesser quantity of coal and water is supplied to the furnaces and boilers, proportionate to the demand on the boilers for steam and all in proper relation to each other.



McDONOUGH BOILER FEED REGULATOR AND FEED VALVE

in an inclined position, the upper end of the expansion tube is filled with steam while the lower end is filled with water.

As the water rises or falls in the boiler, it correspondingly rises and falls in the regulator tube, causing it to contract or expand and this motion is directly transmitted to the valve, regulating the opening of the valve to admit the proper quantity of water to the boiler.

Points of Superiority—Valve and cage, easily accessible—easily removable through opening at bottom of valve.

Valve seats being beveled, prevent leakage—hold tight on banked fires—100% efficient in regulation.

Note liberal amount of metal for regrinding—the valve will give excellent service and outlast life of boiler; replace parts are unnecessary.

Expansion Tube Structure—Tube structure prevents vertical or sidewise buckling.

Lever operates valve from either steam or water end of tube.

Radial slots at either end of tube permit incline of regulator after installation.

Advantages—Through the operation of McDonough regulator, pressure variation at heavy loads is less, quality of steam is drier, degree of superheat more uniform and greatly increased economy and efficiency is obtained in a boiler plant.

Pump Governors.

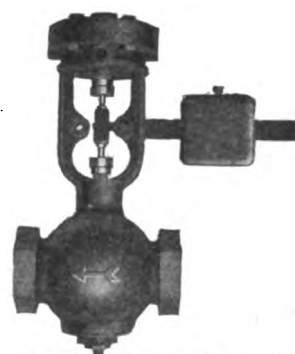
The McDonough governor (differential type) is particularly designed for automatic regulation of reciprocating or turbine driven feed water pumps. It maintains any differential pressure desired in the pump

discharge pipe over the boiler pressure.

Cap opening in the bottom of governor body for quick and easy removal of valve parts.

Valve and cage of same construction as shown in valve of McDonough boiler feed water regulator.

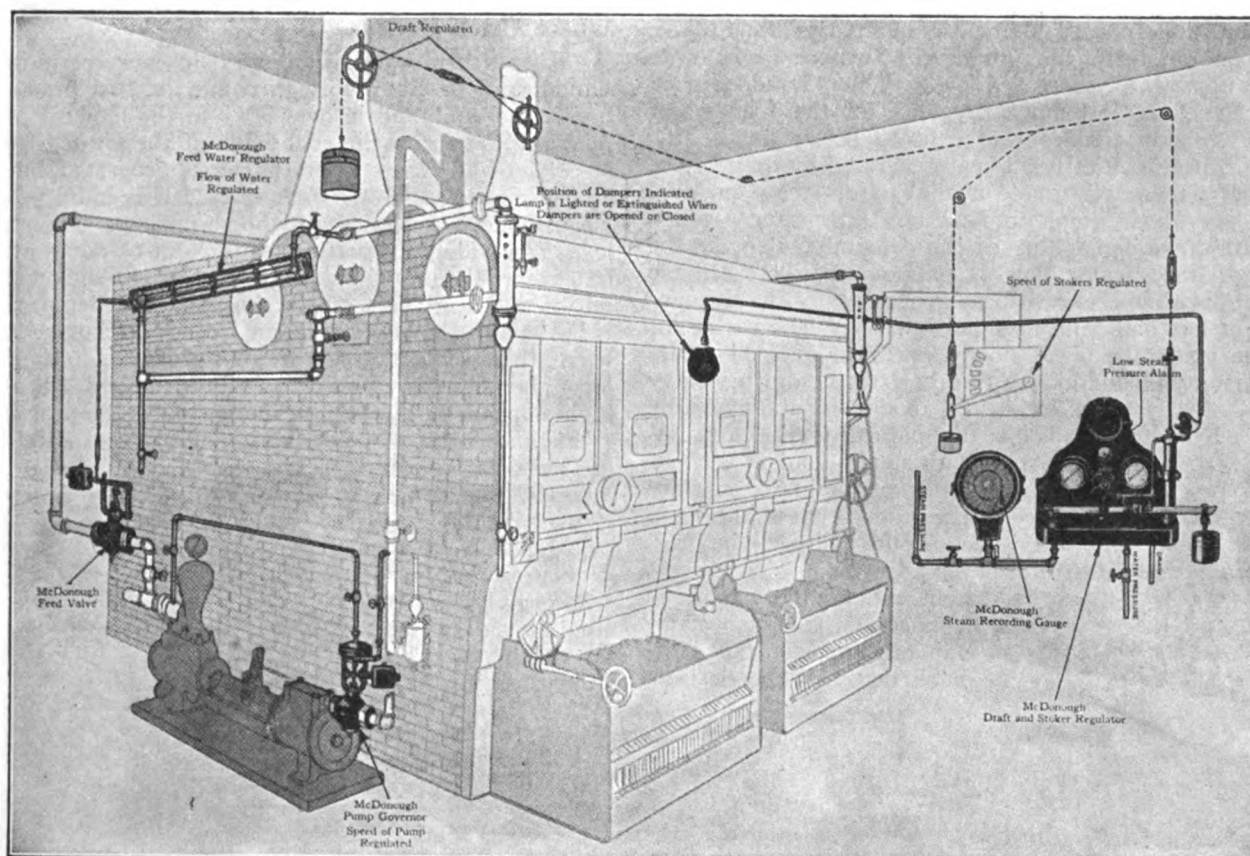
One adjustment only—by moving weight on lever arm. Built in every size required.



McDONOUGH PUMP GOVERNOR (DIFFERENTIAL TYPE)

A Few Companies Using the McDonough System.

Carnegie Steel Company, Pittsburgh, Pa. (32 Systems)
 Muncie Ice & Coal Company, Muncie, Ind.
 H. C. Frick Coke Company, Gates Station, Pa.
 Consolidated Coal Company, Jenner, Pa.
 Clearfield Bituminous Coal Corporation, Clearfield, Pa.
 Logan County Light, Heat & Power Co., Logan, W. Va.
 Willys-Overland Company, Toledo, Ohio
 American Sheet & Tin Plate Company, Pittsburgh, Pa. (22 Systems)
 Republic Iron & Steel Company, Youngstown, Ohio
 Edison Electric Company, Tiffin, Ohio
 University of Michigan, Ann Arbor, Mich.
 Middletown Gas & Electric Company, Middletown, Ohio
 American Rolling Mills, Middletown, Ohio (3 Systems)
 French Paper Company, Niles, Mich.
 Andrews Steel Company, Newport, Ky.
 Presto-Lite Company, Indianapolis, Ind.
 Denby Motor Truck Company, Detroit, Mich.
 Fisher Body Corporation, Detroit, Mich. (3 Systems)
 Liberty Steel Company, Warren, Ohio
 National Milling Company, Toledo, Ohio
 Wheat Paper Company, Elkhart, Ind.
 Pittsburgh Steel Company, Monessen, Pa. (5 Systems)



McDONOUGH SYSTEM FOR THE AUTOMATIC REGULATION OF COAL, AIR AND WATER

NORTHERN EQUIPMENT COMPANY

Automatic Boiler Feed Water Control Systems

MAIN OFFICE AND WORKS

115 West 11th Street
ERIE, PA.

BRANCH WORKS: MANCHESTER, ENGLAND; PARIS, FRANCE; HAMILTON, ONTARIO, CANADA
REPRESENTATIVES IN ALL PRINCIPAL CITIES THROUGHOUT THE WORLD

Products.

COPEs SYSTEMS OF FEED WATER CONTROL:
COPEs FEED WATER REGULATORS; COPEs STEAM
PUMP GOVERNORS.

Purpose of Copes System.

To provide in the most economical manner a continuous flow of water to boilers. To automatically increase the steaming capacity of boilers by lowering the water level whenever additional steam is required. To automatically raise the water level during periods of subnormal and no loads so as to save heat energy which would otherwise be wasted through the pop valve or up the stack. To improve the efficiency of labor through automatic, mechanical performance of a function otherwise requiring exacting continuous attention and manipulation. To promote safety by eliminating as far as possible dependence on the human element. To increase flexibility and responsiveness to fluctuation. To increase peak load carrying capacity of boiler plants. To reduce wear and tear on the equipment. To make possible the use of smaller capacity water pumps, feed lines and accessories.

Methods.

When the load suddenly increases, the Copes temporarily reduces the flow of feed water so as to use all immediately available heat generated in the furnace for making steam, thus giving the furnace a chance to catch up with the increased load. When a sudden peak load develops, it temporarily cuts off the feed water supply. This enables the plant to better handle the crisis, since practically all heat generated by the furnace is then temporarily made available for steam making, with very little going to heat up feed water. When there is a sudden falling of the demand for steam, the rate of feed water flow is temporarily increased, so as to absorb the excess heat generated by the furnace until it has had time to slow down. When variations in the load take place slowly, the rate of feed varies in unison with the load. In other words, during heavy loads, the water level in the boiler is automatically lowered; on light loads it is automatically raised, remaining constant with steady loads.

The governor maintains a constant difference in pressures between the regulator feed line and the boiler. The pressure difference is adjustable. The governor, with a slight change in connection, will also maintain any fixed constant pressure that may be desired.



COPEs STEAM
PUMP GOVERNOR



TRADE-MARK

Construction.

The illustrations show the simplicity of construction. The regulator consists of a straight tube, a lever, a heavy iron base, a rugged balanced valve that is practically frictionless. The governor—a cylinder and piston, frame and a balanced valve. No springs, floats, diaphragms, displacement bodies, needle or pilot valve, or other delicate mechanisms. No boiling liquids. Simple. Direct. Positive. Adjustments and repairs seldom required after cutting into service. Many have been in operation continuously for nearly 20 years.

Results.

Fuel saving 1½% to 4½% in almost every case, many running much higher.

Eliminates fuel losses and danger on account of a "man forgetting," or when new employees are "broken in."

Increases peak load carrying capacity.

Makes the plant more responsive to change in load without loss of efficiency.

Distributes the load evenly between boilers.

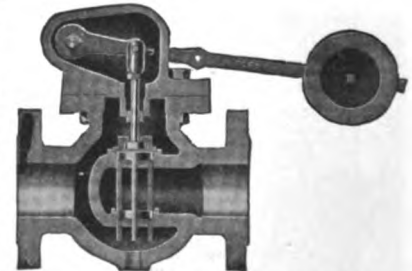
Makes steam and water charts more legible.

Makes use of smaller water pumps, lines and accessories possible; insures dry steam; not affected by variations in steam pressure, drafts, or climatic changes.

Where Used.

In practically every industry, in every state in the Union, and in many foreign countries. In practically every steel mill, and in over 90% of the modern power plants in the anthracite coal fields of the United States. In 90% of all plants where power is generated for sale at a profit in the United States, as well as in 98% of its large modern central steam power plants. On steady loads; on widely fluctuating loads. Out-of-doors at Duluth where the minimum temperature is 40° below zero; out-of-doors in India where the maximum temperature is 114° Fahr. In Mexico, Japan, China and South Africa, where the cheapest grades of labor are used; in the foremost plants of the United States and England, where the highest grades of labor are employed. On practically every known type of boiler from 40 h.p. to 2400 h.p., and aggregating over 9,000,000 h.p. (mostly over 200 h.p.).

In short, Copes regulators are used wherever boilers are used to generate steam for power and industrial purposes.



CROSS SECTION OF VALVE



COPEs FEED WATER REGULATOR

UNITED MACHINE & MANUFACTURING CO.

Manufacturers of Steam Separators
CANTON, OHIO

SALES AGENCIES

BUFFALO, LOUIS P. HOLLIDAY, JR., 411 Liberty Building
CHICAGO, TELKA SALES Co., 11 So. La Salle Street
CLEVELAND, L. G. FINLAY, 1836 Euclid Avenue
DETROIT, L. S. SHAW & Co., Book Building
GRAND RAPIDS, L. S. SHAW & Co.
INDIANAPOLIS, L. S. SHAW & Co.
LOS ANGELES, SUTOR & Co., Merchants National Bank Building

NEW YORK, ADVANCE ENGINEERING Co., 168 Washington Street
PHILADELPHIA, SHERMAN ENGINEERING Co., Stock Exchange Building
PITTSBURGH, POWER EQUIPMENT Co., Oliver Building
ST. LOUIS, E. M. & W. ENGINEERING Co., 202 Second Street
SAN FRANCISCO, G. A. FRENKEL & SON., 604 Mission Street
TOLEDO, L. S. SHAW & Co.
WOOSTER, OHIO, STEAM ECONOMIES Co.

Product.

MOSHER SEPARATOR, for separating water or oil from live steam, exhaust steam, compressed air, ammonia or other gases.

Why the Mosher Separator Is Bone Dry.

The steam, in passing through the separator, is caused to revolve many times around the spiral and any foreign matter heavier than the steam is thrown outward by centrifugal force. Acted on again and again, the denser portion is repeatedly shaved off by the overlapping edge of slotted openings through which water, oil or other matter separated is delivered to collecting chamber below. This matter is entirely isolated from currents of steam, air or gas and can not be again picked up and carried along, thus making the passage of steam through the separator free and unobstructed and causing no back pressure.

Specifications of the Mosher Separator.

Made in 3 types, the vertical, the angle and the horizontal types; for any desired working pressures per square inch in cast iron, cast steel or steel boiler plate construction, with either small or large collecting chambers.

Absolutely self-cleaning, as action of steam continually scrubs the surfaces. Material, workmanship and quick delivery are guaranteed.

Separators of 12-in. pipe size and over will be built up from steel plates for any required size or pressure.

Flanges, unless otherwise specified, will conform to A.S.M.E. extra heavy standard schedule for 1912. Companion flanges and gauge glasses will be furnished with each separator.

Special flanges and fittings will be furnished for ammonia separators at slight additional cost.

Prices on application.

Application of the Mosher Separator.

The Mosher separator may be used between boiler and engine, between engine and condenser, between high and low pressure cylinders, between reciprocating engines and low pressure turbines, etc.

When used on steam lines to dry houses, etc., it will remove moisture and steam and increase the efficiency. It will separate oil, grit and moisture from compressed air, tar from gas mains, etc.

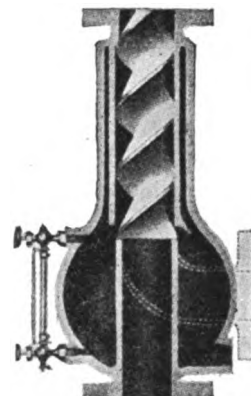
Other uses may be briefly listed as follows: on superheated lines for elimination of water slugs; on vacuum pans and other evaporating apparatus; on long lines of pipe, for ice and refrigerating plants, steam turbines, steam hammers; where steam is supplied from steam mains; as an oil or grease extractor; where quantity of liquid is usually small in proportion to amount of gas; where space is limited; or inside of boiler to overcome priming and for the separation of gasoline from volatile gases, etc.

Guarantee.

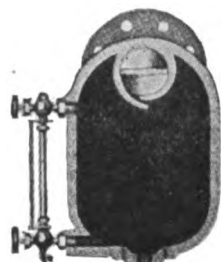
We will guarantee to place the Mosher separator behind any other separator on the market and take out whatever passes the competing machine, or we will place the Mosher separator first and leave nothing for the other machine to extract. We guarantee the Mosher separator to deliver steam, compressed air, etc., containing less than $\frac{1}{2}$ of 1% moisture.

Partial List of Installations.

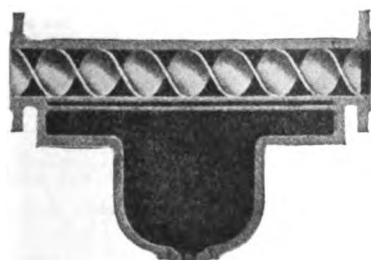
United States Steel Corp.
Republic Iron & Steel Co.
Carbon Steel Co.
Youngstown Sheet & Tube Co.
United Gas Improvement Co.
Central Union Gas Co. of New York
Danville Electric Light Co.
Newark Electric Light & Power Co.
Narragansett Electric Lighting Co.
Public Service Corporation of New Jersey
B. F. Goodrich Co.
Goodyear Tire & Rubber Co.
Firestone Tire & Rubber Co.
Miller Tire & Rubber Co.
United States Rubber Co.
United States Navy
American Sugar Refining Co.
National Sugar Refining Co.
Spreckels Sugar Refining Co.
Pacific Mills
Canadian Pacific Railroad
Pennsylvania Railroad
Ford Motor Co.
General Motors Corp.
General Electric Co.



MOSHER VERTICAL AND ANGLE SEPARATOR
Built per 200 lbs. working pressure unless higher pressures are required.



CROSS SECTION OF MOSHER SEPARATOR
Showing spiral and slotted opening with edge



MOSHER HORIZONTAL SEPARATOR
With large collecting chamber for steam or oil separation

THE OHIO BODY AND BLOWER COMPANY

Steam and Oil Separators, Steam Traps, Cast Iron Exhaust Heads, Feed Water Heaters

CLEVELAND, OHIO

BRANCH OFFICES

NEW YORK, N. Y., 103 Park Avenue
BOSTON, MASS., 136 Federal Street
DETROIT, MICH., Penobscot Building
ATLANTA, GA., Candler Building

BUFFALO, N. Y., Mutual Life Building
PITTSBURGH, PA., Jones Law Building
CHICAGO, ILL., 318 West Washington Street
INDIANAPOLIS, IND., Board of Trade Building

AGENTS IN ALL PRINCIPAL CITIES

Products.

STEAM, OIL, and AIR SEPARATORS; HYDROMATIC STEAM TRAP; AIR TRAP; HYDROMATIC WATER LEVEL CONTROL VALVE; CAST IRON EXHAUST HEADS; ALL SERVICE FEED WATER HEATER.

Also manufacturers of Swartwout Metal Low Temperature Ovens; Swartwout Gas-oil Burners; Swartwout Ship Cows.

For Ventilators, see page 360.

Swartwout Steam Separators.

Centrifugal force is a certain and powerful separator, and, as applied in Swartwout separators, does not interfere with the pressure or straight through flow of the steam. The steam is given a whirling motion by the helix, and centrifugal force throws the heavy particles of water and oil to the walls of the separator, whence they flow into the large chamber below.

Built in any size for any pressures, Swartwout steam separators give 99% effective separation, and produce commercially dry steam without causing appreciable back pressure.

The illustrations show the types most frequently required.

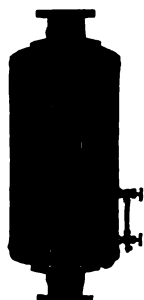
PRICES, STEAM SEPARATORS

Size pipe, in.	Vertical type	Horizontal type	Size pipe, in.	Vertical type	Horizontal type
1½	\$25.00	\$25.00	5	\$95.00	\$95.00
2	35.00	35.00	6	120.00	120.00
2½	45.00	45.00	7	140.00	140.00
3	50.00	50.00	8	175.00	175.00
3½	60.00	60.00	10	250.00	250.00
4	70.00	70.00	12	300.00	300.00
4½	80.00	80.00			

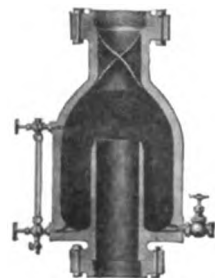
Discounts on application. Prices do not include companion flanges, etc.
For further information see Catalogue No. 117.



SWARTWOUT VERTICAL ANGLE STEAM SEPARATOR
(Patented)



SWARTWOUT RECEIVER TYPE STEAM SEPARATORS
(Patented)



SWARTWOUT VERTICAL STEAM SEPARATOR
(Patented)



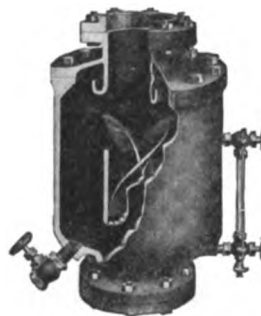
SWARTWOUT HORIZONTAL STEAM SEPARATOR
(Patented)



SWARTWOUT HORIZONTAL OIL SEPARATOR
(Patented)



SWARTWOUT VERTICAL DOWN-CURRENT OIL SEPARATOR
(Patented)



12-in. and Smaller
SWARTWOUT VERTICAL UP-CURRENT OIL SEPARATORS
(Patented)



PRICES, OIL SEPARATORS

Size pipe, in.	Vertical up-current and down-current	Standard horizontal	Size pipe, in.	Vertical up-current and down-current	Standard horizontal
1½	\$42.00	\$35.00	7	\$162.00	\$135.00
2	54.00	45.00	8	198.00	165.00
2½	60.00	50.00	10	288.00	240.00
3	72.00	60.00	12	336.00	280.00
3½	78.00	65.00	14	420.00	350.00
4	90.00	75.00	16	510.00	425.00
4½	96.00	80.00	18	600.00	500.00
5	108.00	90.00	20	720.00	600.00
6	138.00	115.00			

Discounts on application. Catalogues on request.
Prices do not include water gauge, drip valve, nipple and companion flanges and bolts. These can be furnished at additional cost when requested.
Unless ordered otherwise bolt holes of flanges will straddle vertical center line.

Swartwout Air Separators.

Air tools, such as hammers, chippers, drills and hoists, must be supplied with air that is as nearly dry as

possible. Water in the air lines will cause trouble by knocking, etc.; while in cold weather the lines may be damaged by water freezing.

The Swartwout helico-centrifugal horizontal air separators will remove all condensation from the air. The air has a straight, unobstructed passage through the separator. There are no baffle plates or angles to reduce the pressure.

The "corkscrew" helix imparts a whirling motion to the air, and the centrifugal force thus set up throws all particles of water to the outside walls of the chamber, where they run down and are collected and drawn off by a Swartwout hydromatic trap. Nothing but dry air leaves the chamber. This application of the centrifugal principle, a natural law, is patented and found only in Swartwout separators.

Swartwout Hydromatic Trap.

The illustration shows the trap just before discharge.

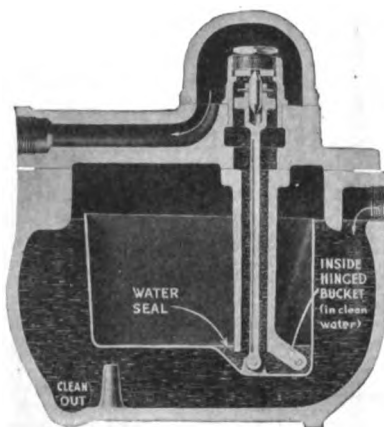
The rising water fills the bucket, causing left side of bucket to drop to post below. The lever action of the hinged bucket on the pull rod opens the discharge valve wide. Steam pressure empties the bucket and buoyancy then lifts the bucket, closing the valve.

The perfect water seal within the bucket prevents steam from passing over, a patented feature exclusive with this trap. The bucket is hinged on the inside. Scale or sediment in the trap body can not clog the hinge, as the swirl of water thoroughly cleans it at each discharge. The presence of only two moving parts reduces wear to a minimum. Valve and seat (reversible) are of monel metal. In the higher pressures the valve is double ended. The action of the valve, being intermittent, removes all chance of wire-drawing.

The design, construction and materials are such that the Hydromatic can be used at all pressures up to 250 lbs., merely by substituting interchangeable valves and seats.

The Hydromatic is guaranteed to perform up to rated capacity and against defective material or workmanship.

For complete information to be filed, write for Trap Bulletin No. 207 and Steam Specialty Catalogue No. 117 containing full specifications, drawings, installation diagrams of separators, exhaust heads, etc.



SWARTWOUT HYDRAMATIC TRAP
(Patented)

CAPACITIES, WEIGHTS AND PRICES, HYDRAMATIC TRAPS

Size, in.	Lin. ft. of 1-in. pipe	Sq. ft. of radiation	Lbs. of water per hour	Weight, lbs.	Price
1/2	9000	3000	1000	35	\$18.00
3/4	15300	5100	1700	60	22.00
1	18000	6000	2000	90	28.00
1 1/4	40500	13500	4500	120	35.00
1 1/2	50400	16800	5600	170	50.00
2	70650	23550	7850	250	70.00
3	124200	41400	13800	435	150.00

All sizes can be fitted with valves and seats suitable for pressures from 0 to 250 lbs. When ordering state the highest operating pressure. If no pressure is specified, traps will be fitted with 150-lb. valves.

SWEET'S CATALOGUE

Swartwout Air Traps.

Swartwout air traps (patented) are indispensable on air lines supplying pneumatic hoists.

A Swartwout air trap placed at the lowest part of the air line and primed with water will positively collect all condensate and discharge it without loss of pressure. There can be no loss of air, as the bucket float is always buoyant, and after each discharge automatically closes the valve and water seals it.

No sediment can hinder the action of the hinge, as it is washed clean of all sediment by the swirl of the water at each discharge. The valve and seat are of monel metal and will wear indefinitely. By a simple change of these the trap will work under any pressure up to 250 lbs. Each trap is fully guaranteed as to material, workmanship and operation.

See steam traps for specifications and prices.

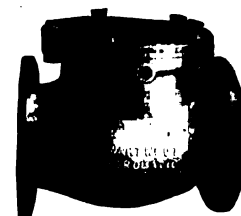
Swartwout Hydromatic Water Level Control Valve.

Maintains a constant water level in open heaters, tanks, vats, reservoirs, etc.

The controlling valve is opened or closed by its pilot valve controlled by its float. There is no mechanical connection between the pilot valve and the main inlet. This allows the pilot valve to be placed in any convenient position. The float, rising or falling with the water, opens or shuts the pilot valve, which in turn causes the water to flow through or back up in the auxiliary pipe running from the main valve to the pilot valve. This opens or shuts the hydromatic valve that controls the main inlet.

The water level can not vary more than 1 1/2 in., as that is the full movement of the float between the wide open and closed positions. In actual practice it is usually less than 1 in.

The pilot valve is of extra heavy, solid brass construction, guaranteed against defects in material or workmanship. There are no leather washers or packed joints. The seat is ground in and may be easily reseated when worn. The float is of the indestructible seamless copper type, making a strictly high grade proposition throughout.

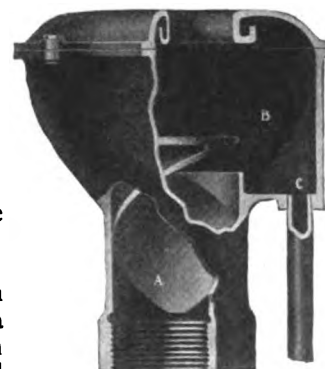


SWARTWOUT
HYDRAMATIC
WATER LEVEL
CONTROL VALVE
(Patented)

Swartwout Cast Iron Exhaust Heads.

The helico-centrifugal principle is also employed in the Swartwout cast iron exhaust head. The whirling motion given the steam throws the heavy water particles to the walls of chamber "B," where they flow out through drip pipe "C." The result is positive separation without back pressure.

Swartwout cast iron exhaust heads will last a lifetime, and are light in weight and ornamental from the architectural view point.



SWARTWOUT CAST IRON
EXHAUST HEAD
(Patented)

Continued on next page

PRICES, CAST IRON EXHAUST HEADS

Size exhaust pipe, in.	List price	Size exhaust pipe, in.	List price	Size exhaust pipe, in.	List price
1	\$20.00	5	\$50.00	20	\$360.00
1½	20.00	6	60.00	22	450.00
1¾	20.00	7	75.00	24	600.00
2	25.00	8	90.00	26	700.00
2½	25.00	10	125.00	28	800.00
3	30.00	12	150.00	30	900.00
3½	30.00	14	200.00	32	1000.00
4	40.00	16	250.00	34	1100.00
4½	40.00	18	300.00	36	1200.00

Discounts on application. Catalogue on request.

Note: Sizes 5 in. and smaller are tapped; larger sizes are flanged. Bolt holes of flanges are drilled to straddle center line of drip outlet on sizes 6 in. and larger. Companion flanges and bolts furnished at extra cost when requested.

Drip pipe should be carried full size to catchbasin or sewer.

service at any time for cleaning or inspection without stopping the engine or in any way interfering with the plant.

The fresh water is controlled by a balanced valve, actuated by means of a self-draining float, which keeps the water at the proper level at all times.

Any excess of water entering the heater, from drips, condensate or leaky valves, will cause the water level to rise to the overflow box, overflow to the trap and thence to the waste pipe.

The Swartwout feed water heater is peculiarly adapted to the present conditions of continuous plant expansion. It is built like a sectional bookcase and sections can be added from time to time as the power plant grows. It is not necessary to buy a heater that is too big now, to take care of any possible growth. Neither is it necessary to scrap the heater every time a new boiler is bought.

Write today for a detailed description of the heater which "grows with your plant." It is mighty interesting reading.

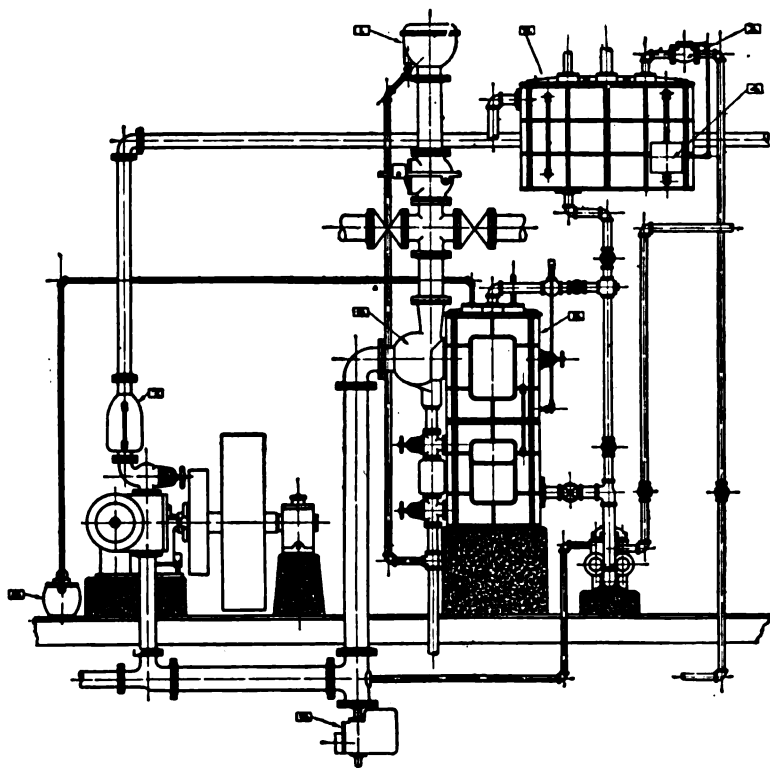


DIAGRAM SHOWING INSTALLATION OF SWARTWOUT APPLIANCES

(1) Cast iron exhaust head. (2) Receiving tank. (3) Water level control valve. (4) Water regulator. (5) Feed water heater. (6) Oil separator. (7) Steam separator. (8) High pressure trap. (9) Oil trap

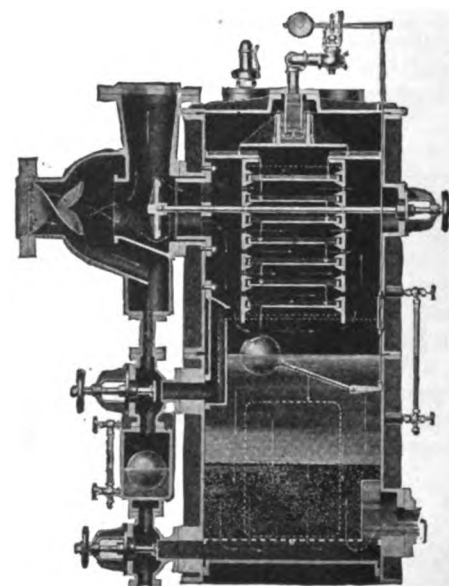
Swartwout All Service Feed Water Heaters.

Designed by a man who has devoted his life to the study and designing of open feed water heaters, the Swartwout feed water heater is the result of a lifetime of specialized endeavor.

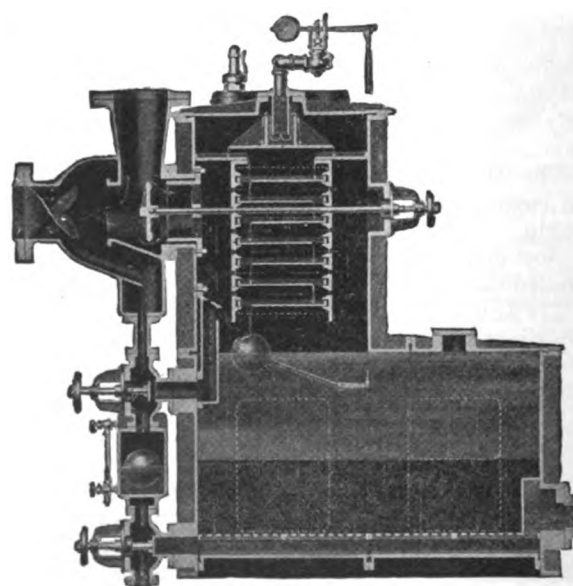
It has a higher standard of efficiency and economy than ever before attained in a feed water heater. It has many features never before thought possible.

The steam enters the heater through a Swartwout helix oil separator (patented) which imparts a whirling motion to the steam, throwing all oil and condensate against the walls of the separator, where they collect and run down to the trap and thence to the waste pipe. After purification of the steam it enters the body of the heater, where it is deflected downward, passing through and under the trays, completely filling the chamber.

The steam opening into the heating chamber is provided with a cut-out valve of the floating ball type. This valve is opened and closed from the opposite side of the heater. The overflow is also provided with a cut-out valve which, together with the main steam cut-out valve, enables the operator to cut the heater out of



Style A, Two Units



Style A, Three Units

SWARTWOUT ALL SERVICE FEED WATER HEATER
Built like a sectional bookcase, it grows with the plant

THE V. D. ANDERSON CO.

Manufacturers of Steam and Air Traps

CABLE ADDRESS:
"ANDERSON CLEVELAND"

CLEVELAND, OHIO

CODES USED:
ABC 5th and 6th Editions
Bentley's
Western Union Universal and
5-Letter Editions

Products.

STEAM TRAPS.

AIR TRAPS.

Also, Steam and Oil Separators; Oil Filters; Oil and Moisture Expellers; Fertilizer Dryers.

Model "D" Steam Trap.

This trap delivers live, hot, dry steam to steam-using apparatus, and keeps it dry by removing the condensation as fast as it accumulates.

The Anderson Model "D" works continuously and automatically.

The valve and seat are sealed with at least 3 in. of water at all times, which prevents live steam escaping with the condensation.

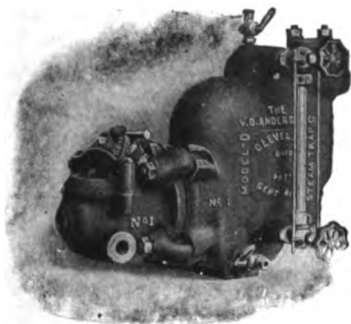
A removable perforated strainer protects the valve and seat against scale, packing and other sediment.

A glance at the gauge glass determines whether the trap is holding back the live steam and discharging the condensation, or allowing the live steam to blow through.

All parts are interchangeable and easily accessible.

The spun Lake Superior copper float is non-collapsible and will not leak.

Each trap is tested under hydrostatic as well as steam boiler pressure before leaving our factory.



ANDERSON MODEL "D" STEAM TRAP

Code word for telegram...	Hat	Hen	How	Hide	Harp	Hint	Ham
Size number of trap.....	1	2	3	4	5	6	7
Size of pipe connection, in..	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2
Maximum discharge of condensation per hour, lbs....	1500	2400	4000	5600	8000	12000	24000
Greatest number of sq. ft. of surface that should be applied.....	4500	7200	12000	16800	24000	36000	72000
Greatest number of lin. ft. of 1-in. pipe surface that should be applied.....	13500	21000	36000	50400	72000	108000	216000
Net weight of complete trap, lbs.....	81	92	150	166	268	321	525
Shipping weight (boxed), lbs.....	110	114	195	211	335	394	640

Model "D" trap is suitable for any pressure from 225 lbs. down. Our standard valve opening is adapted for pressures from 150 lbs. down to 30 lbs. Our low pressure valve opening is adapted for pressures from 30 lbs. down. For pressures below 10 lbs. or above 150 lbs., we are prepared to furnish special valve openings.

Note: When ordering, be sure to state maximum steam pressure at the trap.

Junior Steam Trap.

The Anderson Junior Steam Trap, shown below, meets the demand for a practical trap with a limited capacity at a low price.

This trap has no by-pass or gauge glass, but is made especially for use on sterilizers, paper dryers, radiators or any other place where a reliable steam trap of small capacity is required.

This trap is arranged to be used on ordinary steam lines. It is constructed to work at all pressures from 150 lbs. down, and is tested at working pressure before being boxed for shipment.



ANDERSON JUNIOR STEAM TRAP

Code word.....	"Junior"
Size of pipe connections, in.....	1/2
Maximum discharge of condensation per hour, lbs.....	350
Greatest number of sq. ft. of surface that should be applied.....	1050
Greatest number of lin. ft. of 1-in. pipe surface that should be applied.....	3150
Net weight of complete trap, lbs.....	14
Gross weight of trap (boxed), lbs.....	18

Air Trap.

The Anderson Air Trap, shown below, removes accumulated air from water under pressure. It is especially adapted for air pockets at high points in street mains; water mains and pipes in large buildings; hot water heating systems; and closed-water receivers.

This trap can be placed above or below the ground. It works automatically and requires no attention. It is simple in construction, substantially made, fitted with our seamless copper float, and can be fitted with a valve to work at any required pressure from 0 to 150 lbs.

This air trap is designed for use where large capacity is required.

Alarm whistles can be furnished at an additional charge.



ANDERSON AIR TRAP

Code word.....	"Air"
Size inlet, in.....	2 1/2
Outlet connection, in.....	1 1/4
Net weight, lbs.....	13
Gross weight (boxed), lbs.....	17
Will swing in circle, diameter, in.....	7

JOHN W. BARTON CO.

Manufacturer of Automatic Steam Traps

Vestry Avenue
CLEVELAND, OHIO

Products.

BARTON EXPANSION AUTOMATIC STEAM TRAPS.

Construction and Operation.

Trap operation is effected by the differences in expansion or contraction between an inner (bronze expansion) sleeve and an outer (steel) casing, due to differences of temperature. The inlet end of the inner sleeve and the corresponding end of the outer casing are rigidly attached to a common fitting, which in turn is connected to the discharge from the system (see illustration). The discharge valve seat forms the free end of the inner sleeve; the floating valve disc and its casing are attached to the free end of the outer casing. As the casing and sleeve are firmly united at one end of the apparatus and are free at the other, movements caused by changes of temperature are entirely independent, one of the other, and will vary with the differences of expansion between them; therefore the seat and valve will approach or recede according to the relative changes in the lengths. Steam entering the inner sleeve causes it to expand and seat against the valve disc sealing the trap. When the steam condenses, the inner sleeve contracts, opens the valve and discharges the condensate. The action of the trap is absolutely positive and automatic. The trap is always water sealed when steam is on the system, and always open when not in use, preventing any accumulation of water. A universal trap for high or low pressure steam, vacuum or gravity systems.

Uses.

Especially adapted for agitators, cookers, dry kilns, dryers, greenhouses, heating systems, kitchen steam tables, laundry machinery, low pressure steam mains, steam hammers, sterilizers, submerged coils, underground tanks, vats, and wherever condensation has to be taken care of.

Advantages of the Barton Trap.

Its simplicity and metal construction throughout. The straight flow and right angle flush valve seat. No intermediate members of expansion such as carbons or liquids or mechanism such as diaphragm, bellow, float, lever, hinge, spring, etc.

Can not blow steam, become airbound, clog up or freeze. Gives continuous discharge of condensate.

Automatic—When used on a vacuum heating system a vacuum is in between the inner and outer tubes and subjects the outer tube to the temperature of the vacuum. For instance if a vacuum of 15 in. were maintained on the system, the temperature would be 176° Fahr. Should the vacuum become lost for any reason, the vapor discharge of the trap will enter between the two tubes and raise the temperature of the outer tube to 212°—a change of 34°—which causes the outer tube to expand and draw the disc off the

seat, thereby increasing the opening to allow for the loss of the vacuum.

Method of Installing.

Trap is placed in a horizontal position at the lower end of the coil so that the water will flow through the trap. Connect the end of the coil to the opening in the trap marked "inlet." The outlet, (the large opening) may be piped to feed tank, waste outlet, or to a vacuum pump.

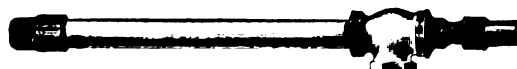
Leave valve open and allow steam to blow through the coil pipe until thoroughly cleaned and the trap heated, then close the trap valve until there is no escape of steam. The trap is then set for operation and will require no further attention.

Guarantee.

Guaranteed against defects in workmanship and material during the life of the trap. All worn or defective parts will be replaced free of cost, within two years, upon their presentation.

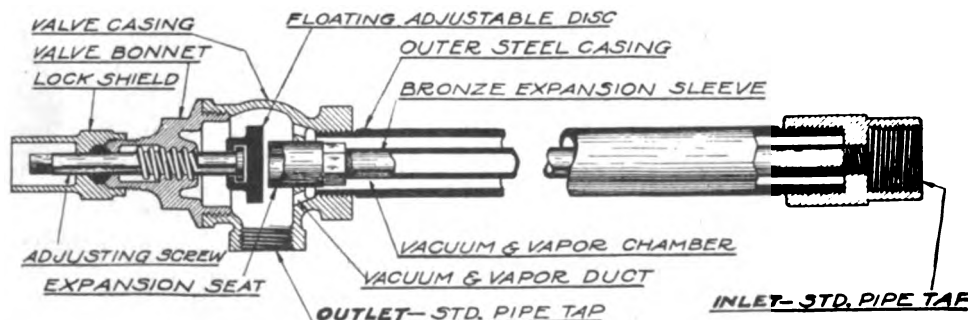
References and Installations.

Youngstown Sheet & Tube Co., Youngstown, Ohio
Brier Hill Steel Co., Youngstown, Ohio
Carnegie Steel Co. (Ohio Works), Youngstown, Ohio
M. A. Hanna & Co., Cleveland, Ohio
American Sterilizing Co., Erie, Pa.
Ohio Brass Mfg. Co., Mansfield, Ohio
Cleveland Light & Power Co., Cleveland, Ohio
Great Western Oil Co., Cleveland, Ohio
Great Lakes Dredge & Dock Co., Detroit, Mich.
Dangler Stove Co., Cleveland, Ohio
National Stove Co., Lorain, Ohio
Born Steel Range Co., Cleveland, Ohio
Paige Motor Car Co., Detroit, Mich.
American Car and Foundry Co., Chicago, Ill.
Chisholm-Moore Mfg. Co., Cleveland, Ohio
White Co., Cleveland, Ohio
Baker-R & L Co., Cleveland, Ohio
Ducktown Sulphur, Copper & Iron Co., Isabella, Tenn.
Bruce-Macbeth Engine Co., Cleveland, Ohio
Illinois Glass Co., Alton, Ill.



BARTON AUTOMATIC STEAM TRAP

Trap number.....	0	1	2	3	4	5
Inlet, in.....	$\frac{1}{2}$	$\frac{3}{4}$	1	1 $\frac{1}{4}$	1 $\frac{1}{2}$	2
Outlet, in.....	$\frac{1}{2}$	$\frac{3}{4}$	1	1 $\frac{1}{4}$	1 $\frac{1}{2}$	2 $\frac{1}{2}$
Length from end to center of valve, in.....	20	26	38	50 $\frac{1}{2}$	63	76
Minimum sq. ft. radiation.....	400	800	1400	2000	4000	8000
Maximum sq. ft. radiation.....	1600	3200	5600	8000	16000	32000
Minimum lin. ft. radiation.....	1200	2400	4200	6000	12000	24000
Maximum lin. ft. radiation.....	4800	9600	16800	24000	48000	96000
Price.....	\$20.00	24.00	32.00	45.00	65.00	80.00



SECTIONAL VIEW OF BARTON AUTOMATIC STEAM TRAP

TEMPLETON MANUFACTURING CO.

Manufacturers of Return, Vacuum and Separating Traps

117 Business Street
HYDE PARK, MASS.

Products.

RETURN STEAM TRAPS; VACUUM TRAPS; SEPARATING TRAPS.

Sterling Return Steam Trap.

More efficiently removes condensation from steam systems than any other trap and automatically returns it to the boilers.

Pumps water at a temperature exceeding 212° Fahr. (a steam pump will not), thus preserves all of the heat above 212°, returning a cubic foot of water for every cubic foot of steam. It operates on 90% less power than a steam pump.

Distinctive Features—Valves and air vent are opened and closed by a rolling weight which travels from one end to the other of a rocker arm. This eliminates all trunnions and hence trunnion troubles, pounding, sticking and leaking.

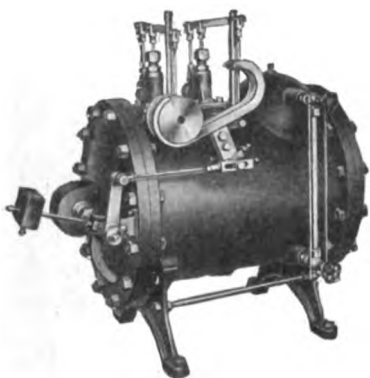
The steam valve can be adjusted to open only when the receiving chamber of the trap is full of water. This gives maximum discharge capacity with minimum space, or it can be adjusted to discharge at any height of water.

While the rising and falling of the rocker arm is actuated by a float, this float is counterbalanced by a weight. This enables the use of a patented, very heavy, strong, indestructible, leakproof, seamless Sterling float, as from this counterbalance the full lifting power of the float is obtained regardless of its weight.

A gauge glass discloses constantly the work going on and gives immediate notice when return system is not functioning properly.

The traps are automatic in action and require little attention. There is no friction. They are noiseless, require no cylinder lubrication, will not race or run away, never become steam bound and air binding is an impossibility. All valves are on top of trap, easily accessible for regulation. No packing except in the valve stem, which is easily accessible for re-packing.

The Sterling vacuum trap automatically sprays cold water throughout the casing of the trap when it is full of steam, condensing the steam and cre-



STERLING RETURN STEAM TRAP

*CAPACITIES OF STERLING RETURN TRAPS

Trap No.	Size water inlet and discharge, in.	Lin. ft. of 1-in. pipe trap will drain	Lbs. water trap will discharge	Gals. water trap will discharge	Sq. ft. radiation trap will drain
51	1	16000	3300	400	5330
52	1¼	26000	5300	650	8633
53	1½	34000	7000	850	11300
54	2	42000	8200	1020	14000

*Maximum capacities per hour based on ordinary condensing conditions.

ating a vacuum which pulls condensation from all over the system.

Automatic Operation as Boiler Return—The trap should be placed 4 ft. above the boiler; when it is empty, the vent is open. Either by gravity, or the pressure in the system, or the pressure from another trap acting as a pump, condensation flows into the trap through inlet check valve at bottom of trap. As the trap fills, a large copper float in the trap casing rises. At an adjustable water level, a roller weight on tilting track and connected with the float is carried to the other end of the track, closing the vent and opening steam inlet connecting with boiler pressure.

The trap will then return the water directly into the boiler, as the pressure in the trap is equalized with that in the boiler and the water will flow down through outlet check valve into the boiler by gravity. Trap casing is emptied and the float following the water, lowers itself, causing weight to return to other end of track, closing steam inlet and opening vent for another filling and another discharge. Gauge glass shows that receptacle is emptied on each discharge. Trap can then be used as a pump-to-pump condensation from one part of the plant to another and it will operate at about one-tenth the cost of a steam pump.

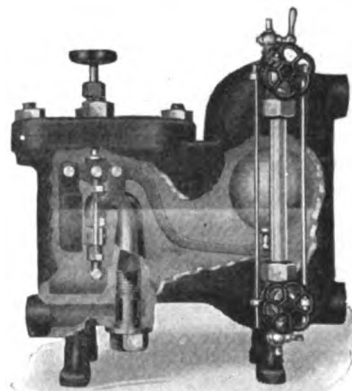
This company maintains a no-charge service department. Write concerning condensation problems.

Sterling Separating Traps.

The only steam trap wherein it is not necessary to break any pipe connection to get *all* parts out of the casing. One operation removes all parts at once.

The Sterling trap operates at any pressure and is equipped with the Sterling indestructible copper float. All parts are interchangeable.

Ingenious combination of counterbalanced float and vertical valve dropping from its seat overcomes the friction found in all other float traps and the obvious result is greater capacity, with elimination of wire drawing in valve, which with seat is of government metal and always under water seal.



STERLING SEPARATING TRAP

CAPACITIES OF STERLING SEPARATING TRAPS

Size No.			Conden- sation, lbs. per hour	Lin. ft. 1-in. pipe	Weight, lbs.	Dimensions, in.
Series 1 0 to 30 lbs. pressure	Series 2 0 to 150 lbs. pressure	Series 3 0 to 225 lbs. pressure				
0	20	31	1200	2400	65	11½ x 12 x 7½
1	21	31	2100	4000	75	13 x 14 x 8½
2	22	32	3500	7000	95	14 x 14½ x 9
3	23	33	5400	12000	110	15 x 17 x 9½
4	24	34	7500	16000	130	16 x 18 x 10
5	25	35	11000	25000	150	18 x 19 x 10½
6	26	36	18000	40000	180	18 x 20 x 12

MOREHEAD MANUFACTURING COMPANY

Steam Drainage and Boiler Feeding Apparatus

DETROIT, MICH.

CANADIAN REPRESENTATIVES: CANADIAN MOREHEAD MFG. Co., Ltd., WOODSTOCK, ONT.

Products.

BOILER FEEDING APPARATUS and STEAM TRAPS for all Steam Drainage Service.

Foreword.

Builders of Morehead tilting steam traps, originators and designers of the Morehead back-to-boiler system. Internationally known and sold the world over.

Wide Adaptability of Use.

Designed to efficiently drain all kinds of steam heated apparatus, whether working under high pressure, low pressure, exhaust steam or vacuum conditions. They make any required disposition of the condensation—spilling it to the sewer, to the hot well, the heater, or directly to the boilers.

Description of the Morehead System.

The degree of drainage obtained in any steam heated apparatus determines its efficiency and output. The first office of a Morehead system is to effect a condition of 100% efficiency drainage; keeping the radiating surfaces perfectly dry so that every square foot of radiation is available to perform its work to maximum capacity. This means maximum results from the steam supplied. Circulation is positively assured.

The second important function of the system is the disposition of resulting water of condensation. In any plant, there is only one point of disposal where condensation can be *used without loss*, and that *one place is the boiler*. The Morehead system operates on a closed cycle principle, does not vent the condensation to atmosphere, thus retaining practically all the heat units originally present in the condensate. When not vented to atmosphere, condensation has the same temperature as the steam from which it is formed. It is, therefore, apparent that an increase in the efficiency of boiler evaporation will result when feeding pure high temperature condensation directly to the boiler through the Morehead method. In this way an equivalent boiler evaporation can be obtained on a smaller fuel consumption.

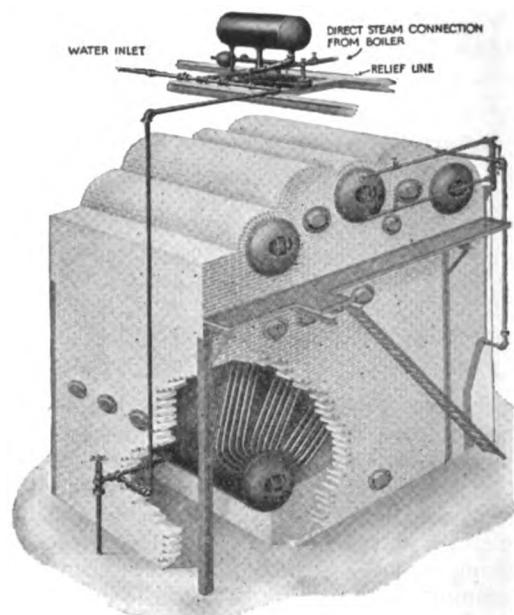
The system is entirely automatic in action and dependable in service. The machines can not become air or steam bound; can not race or pound and are not subject to derangements.

Morehead Traps—Built to meet all conditions of service, requiring the handling of condensation from any source. Operate automatically and dependably at all temperatures and pressures. So designed and installed that a perfect water seal is permanently maintained, thus preventing all waste.

All machines constructed of material having an ample factor of safety for this class of work. Working parts on the outside, easily accessible. Bearings of solid brass throughout. Valves of the sliding stem globe type fitted with removable disks. Packing boxes of the stud gland type, deep, readily adjustable and very efficient.

Morehead Return Trap.

Designed to drain all types of steam heated apparatus operating on a lower steam pressure than that



TYPICAL METHOD OF FEEDING BOILERS

represented by the static head against which the trap must evacuate. Adaptable to all conditions of service in the place of a pump and especially suitable for *boiler feeding*. Used in conjunction with both open or closed type feed water heaters.

This type of machine will handle water of *any temperature* however hot. Vaporization due to *excessive temperature* has no effect on its operation.

Morehead Non-return Trap.

Used under conditions of service where steam pressure on apparatus drained is greater than pressure represented by discharge head against which trap must deliver its water—hence it is generally referred to as a cut-off-trap.



SECTIONAL VIEW MOREHEAD NON-RETURN TRAP

Morehead Condenser Trap.

Combines the features of a direct return trap and those of the spray or jet condenser. Especially adapted

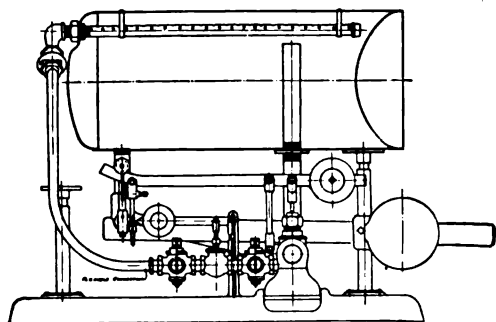


DIAGRAM MOREHEAD CONDENSER TRAP

for service on exhaust steam and low pressure heating systems, cooking and drying apparatus. The *positive vacuum* formed in the tank of the machine acts directly on the surfaces drained, increasing circulation and decreasing back pressure carried on the engine. This machine performs much the same service as a vacuum pump, except that vacuum valves or thermostatic traps are not necessary on the drip system, and the vacuum formed by the trap being intermittent, makes this type of trap particularly applicable for drainage of single pipe systems.

Operating Temperatures.

It is unnecessary to allow water of condensation to cool to 212° to enable a steam pump to handle it. The Morehead back-to-boiler system returns the boiling-hot water direct to boilers at steam line temperatures.

There is only a few degrees difference in temperature between the steam going into system and the water of condensation coming out. And when delivered direct to the boilers by the Morehead system, fuel costs are lowered 20% to 50%. The Morehead system requires for its operation 90% less steam than is consumed by a pump in returning the same quantity of condensation.

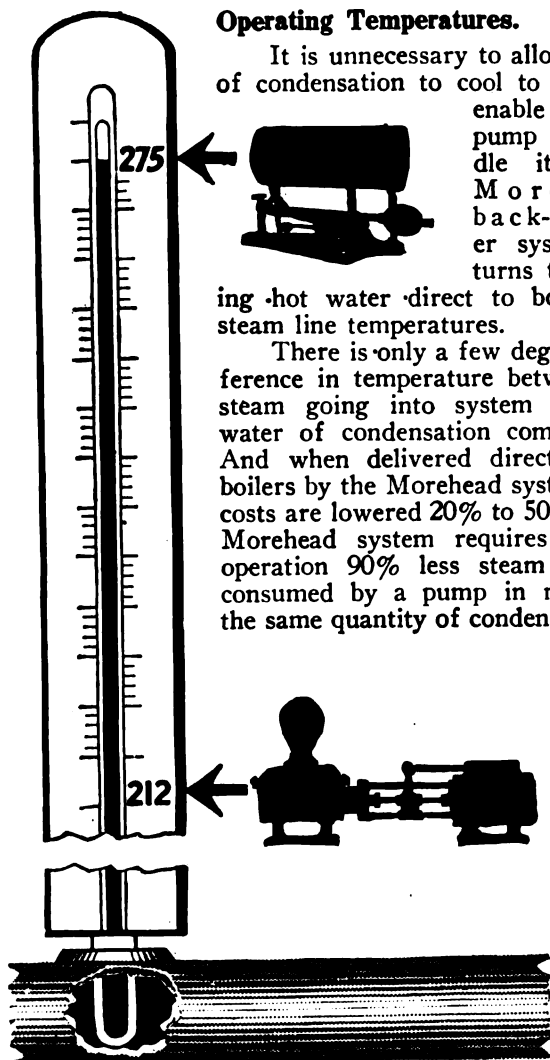


DIAGRAM CONTRASTING THE OPERATING TEMPERATURE OF THE MOREHEAD SYSTEM WITH THAT OF A PUMP

Morehead Vacuum Trap.

Automatically removes all water of condensation from exhaust lines, oil separators, and all vessels oper-

ating under a vacuum. Delivers the condensation to any desired point above or below the level of the trap without interfering with the vacuum in the apparatus drained.

SIZES, CAPACITIES AND WEIGHTS OF MOREHEAD TILTING VARIABLE PRESSURE AND NON-RETURN STEAM TRAPS

Number		Inlet, in.	Outlet, in.	Cap. in water discharged per hour	Drainage cap. in 1-in. pipe lineal	Cap. sq. ft. direct radiation	Cap. lin. ft. hot blast heater
Variable pressure trap	Non-return trap						
31	21	1	1	200 gal.	12000 ft.	3000	1300
32	22	1½	1½	400 gal.	25000 ft.	5200	2400
33	23	1½	1½	600 gal.	40000 ft.	12000	5200
34	24	2	2	720 gal.	60000 ft.	21000	9000
35	25	2½	2½	900 gal.	90000 ft.	33000	16000
36	26	3	3	1300 gal.	140000 ft.	50000	50000

MOREHEAD TILTING RETURN, VACUUM AND CONDENSER STEAM TRAPS

Number			Size of drum, in.	Size inlet and outlet connections, in.	Size steam pipe connections, in.	Cap. of water in lbs. per hour	Drainage cap. in ft. of 1-in. pipe lineal	Cap. sq. ft. direct radiation	Cap. lin. ft. hot blast heater
Vacuum trap	Condenser trap	Return trap							
41	51	1	10x24	1	1	1050	5000	2300	1000
42	52	2	12x30	1½	1	1850	9000	4000	1800
43	53	3	14x36	1½	1½	4000	20000	9000	4000
44	54	4	16x40	2	1½	6000	35000	16000	7000
45	55	5	18x42	2½	2	11000	50000	25000	12000
46	56	6	18x42	3	2	15000	75000	40000	18000

The above capacities are figured on a basis of 50 lbs. pressure to the sq. in. The above drainage capacity in 1-in. pipe is based on ordinary radiating conditions. For lumber kilns, greenhouses and moist goods, divide by two. For laundries, brick dryers and wet goods, divide by three. For fan stacks and blowers, divide by five.

Capacities of steam traps vary greatly, according to conditions under which they are operated.

Note: 3 ft. of 1-in. pipe equals 1 sq. ft. of surface; 2.3 ft. of 1½-in. pipe equals 1 sq. ft. of surface; 1.61 ft. of 2-in. pipe equals 1 sq. ft. of surface.

MOREHEAD RECEIVERS

No.	Length, in.	Height, in.	Diameter, in.
1	30	16	10
2	40	20	12

No. 1 receiver has capacity for traps Nos. 1 and 2. No. 2 receiver has capacity for traps Nos. 3, 4, 5 and 6.

To compute the equivalent in 1-in. pipe of any quantity of pipe of larger diameter, use the following table of equations:

Size of pipe, in. . .	1¼	1½	2	2½	3	3½	4	4½	5	6	7	8
Equivalent of 1 lin. ft. in 1 in.	1.26	1.44	1.81	2.19	2.66	3.04	3.42	3.80	4.23	5.03	5.80	6.55

Special Note: Quotations on copper or brass tanks with bronze, brass, nickel, steel or cast iron fittings will be made on request

Morehead Tilting Return Steam Trap and Boiler Feed.

Has bolted gland boxes on the trunnions. No stuffing nuts to tighten up and stick the trap or to loosen up and cause packing to leak. Renewable disk in valve. Large bonnets on valve easily removed with any ordinary wrench. Heavy valve stems with gland packing box.



SHOWING THE STEAM INLET PORT, THE AUTOMATICALLY OPERATED STEAM VALVE AND THE AUTOMATIC RELIEF VALVE

WRIGHT-AUSTIN COMPANY

Manufacturers of Steam Equipment

DETROIT, MICH.

NEW YORK, N. Y.

BRANCH OFFICES
CHICAGO, ILL.
REPRESENTATIVES EVERYWHERE

BOSTON, MASS.

Products.

WRIGHT "EMERGENCY" HIGH PRESSURE STEAM TRAPS.

WRIGHT "VICTOR" LOW PRESSURE STEAM TRAPS.

WRIGHT SAFETY ALARM WATER COLUMNS.

WRIGHT STRAINERS.

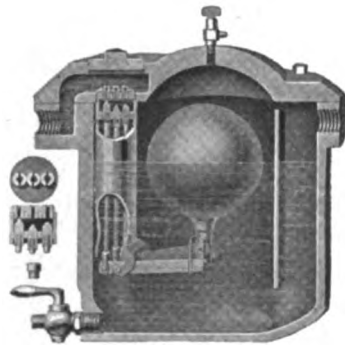
AUSTIN STEAM and OIL SEPARATORS; AIR and GAS SEPARATORS.

Also manufacturers of Wright Air Traps; Wright "Cyclone" Exhaust Heads; W-A Cast Iron Exhaust Heads; Murray Boiler Feed Regulators; Murray Pump Governors.

Wright "Emergency" High Pressure 3-Valve Steam Trap.

Is practically three traps in one.

By opening wide each valve in turn, as needed, four great advantages are attained in one simple, compact trap. (1) An enormous discharge capacity is provided by three valves—equal to the discharge capacity of three ordinary traps. (2) The trap is automatically regulated to any service, whether heavy or light. (3) The throttling effect and the wear on valves and seats is eliminated almost entirely. (4) The trap is perfectly adapted to any working pressure up to 200 lbs. without adjustment or change of any parts.



"EMERGENCY" 3-VALVE STEAM TRAP, SECTIONAL VIEW

The trap operates on the principle of three separate units, putting into service each unit or valve in succession as the amount of condensation requires. Or, all three valves will instantly open wide for "Emergency" slugs or floods of condensation. When rate of condensation decreases and water level in the trap recedes, the valves are closed steamtight, one at a time.

The three valves and valve seats are genuine monel metal, well known to most engineers as the toughest metal yet discovered to withstand high velocities, temperature and erosion.

The trap is regulated automatically to any degree of load, and, as the amount of water every steam trap must handle necessarily varies greatly from one extreme to the other, it will be seen how naturally the three valves of the Wright "Emergency" trap are adapted to all conditions of service.

When each valve operates, or leaves its seat, it opens practically wide without wire drawing or throttling effect, almost entirely eliminating wear on the valves and seats.



SHOWING CONTROL OF VALVES BY 3-STEP STIRRUP

DATA, WRIGHT "EMERGENCY" STEAM TRAP
SIZES, DIMENSIONS AND WEIGHTS

No. of trap.....	1	2	3	4	5	6	7	8
Size inlet and outlet, in.....	½	¾	1	1¼	1½	2	2½	3
Distance through inlet and outlet, in.....	11¼	12	12¾	13¾	15¼	16½	18	19½
Height, in.....	10¾	12	13¾	13¾	15	16¾	17½	18½
Shipping weight, lbs.....	70	100	120	140	160	220	260	320
List price.....	\$28.00	32.00	38.00	45.00	63.00	86.00	132.00	150.00

CAPACITY AT VARIOUS PRESSURES

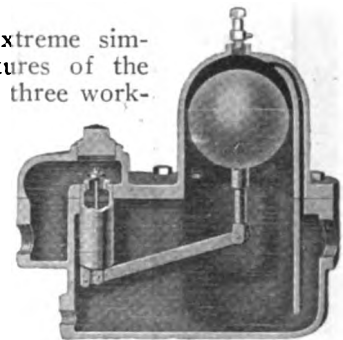
Maximum discharge in lbs. of water per hour at pressures of.....	10 lbs.	2000	2400	3100	4000	5500	7000	11500	16100
20 lbs.	2500	3200	4050	5960	7800	10300	16500	22800	
30 lbs.	2900	3700	4800	7000	9300	12400	20200	28000	
40 lbs.	3200	4200	5300	7800	10500	13800	22600	31500	
50 lbs.	3500	4500	5700	8400	11300	15000	24900	34800	
75 lbs.	4000	5100	6400	9500	13100	17400	29200	41000	
100 lbs.	4400	5600	7100	10400	14400	19200	32500	45900	
125 lbs.	4700	6000	7600	11200	15600	20800	35300	49800	
150 lbs.	4900	6300	8100	12000	16700	22400	38000	53700	
175 lbs.	5100	6700	8600	12800	17800	23900	40700	57600	
200 lbs.	5300	7000	9000	13700	19000	25500	43500	61500	

Wright "Victor" Low Pressure Steam Trap, 0 to 20 lbs.

Great capacity and extreme simplicity are dominant features of the "Victor" trap. It has but three working parts: a round, seamless, strong copper float; one lever; and one large valve.

It is so designed that the valve opens above the seat. As the incoming condensation fills the trap, the valve is raised above the seat, and it simply overflows, freely and unobstructedly. Straightway pipe connections to body at both inlet and outlet make the "Victor" very simple and inexpensive to install.

Especially adapted for continuously draining large volumes of condensation from low pressure apparatus, such as heating coils, evaporators, etc. Or, as an oil and grease trap for draining oil separators, because the one large valve is practically the same area as the pipe connection, and will never become choked up.



"VICTOR" STEAM TRAP, SECTIONAL VIEW

DATA, WRIGHT "VICTOR" STEAM TRAP
SIZES, DIMENSIONS AND WEIGHTS

No. of trap.....	0	1	2	3	4	5	6	7	8
Size inlet and outlet, in.....	½	¾	1	1¼	1½	2	2½	3	
Distance inlet to outlet, in.....	9¼	12¾	14	15¼	18	19¼	22	23	24
Height of trap over all, in.....	9¼	11¼	12½	14½	15¼	17¼	20	21	22
Shipping weight, lbs.....	45	70	80	100	120	160	200	255	260
List price.....	\$22.00	28.00	32.00	38.00	45.00	63.00	86.00	132.00	150.00

Every trap factory tested before shipment, and fully guaranteed.

CAPACITIES AT VARIOUS PRESSURES

Maximum discharge in lbs. of water at pressures of.....	1 lb.	1125	2020	3040	3700	6880	9550	11400	14580	19920
3 lb.	1945	3495	5250	6400	11900	16520	19720	25220	34460	
5 lb.	2500	4500	6770	8250	15340	21290	25420	32510	44420	
10 lb.	3540	6360	9575	11650	21670	30080	35910	45920	62745	
15 lb.	4340	7795	11735	14280	26555	36860	44000	56275	76890	
20 lb.	5015	9000	13555	16500	30685	42590	50845	65025	88840	

Wright Safety Alarm Water Columns.

The combined high and low alarm column has *one* round, seamless, high pressure float; one simple set of inside parts—operating *both* alarms; positively moving all parts at every alarm, either high or low, and every time the column is blown down by the operator; eliminating entirely the possibility of the alarm becoming corroded and sticking.

The float is free, without any rods or attachments. As the water lowers, bringing it in contact with the low water alarm basket, its weight operates the low water alarm. Should the boiler become too full of water, the float rises against the upper basket, and its buoyancy operates the high water alarm.

The low water alarm column is constructed on the same principle, except that the float is attached to rod which operates the alarm for low water only.

Gage cock openings are provided on both sides of all columns, making them either right- or left-hand.

Wright columns are designed with a large factor of safety, for service under any conditions, with either high or low pressure. They comply with all insurance regulations and with the rules of every city or state in the United States and Canada.

W-A Strainers.

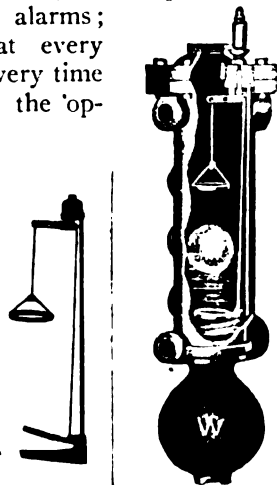
Stop all foreign matter, scale, packing etc. in pipe lines, from passing into receptacles of all kinds—steam turbines, steam traps, pressure reducing valves, oil burners, and many other devices.

The screen or strainer tube is tapered, which makes the strainer self-cleaning when blown off at bottom under pressure, since it thoroughly flushes the inside of the screen of all debris.

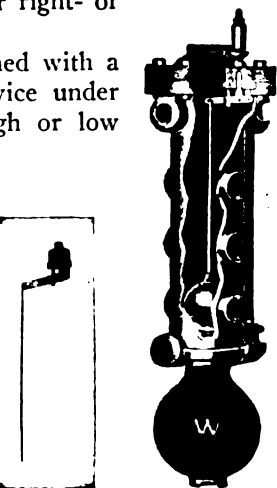
There is no friction loss as the holes through the screen are several times the area of the pipe.

DATA, W-A STRAINERS

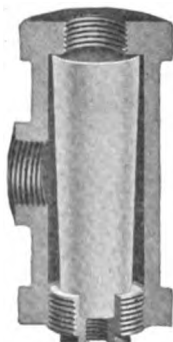
Size No.	Pipe size, inlet and outlet, in.	Length over all, in.	Top to side inlet, in.	Wt., lbs.	List price
1	1/2	6 3/4	3	7	\$3.00
2	3/4	6 3/4	3	7	3.00
3	1	6 3/4	3	7	3.00
4	1 1/4	6 3/4	3	7	4.00
5	1 1/2	7 3/4	3 1/2	12	6.00
6	2	9 3/8	4 3/8	20	8.00
7	2 1/2	11 1/4	5	28	11.00
8	3	13 1/2	6	50	14.00



COMPLETE INTERIOR ASSEMBLY, COMBINED HIGH AND LOW ALARM



COMPLETE INTERIOR ASSEMBLY, LOW WATER ALARM



STRAINER

DIMENSIONS AND PRICES OF WRIGHT COLUMNS

Size of column, in.	Kind and size of boiler	Variation between alarms	Price list		
			Without water gage and gage cocks	Water gage and gage cocks	
COMBINED HIGH AND LOW WATER ALARMS					
1	Others determined by natural variation of water in boiler	36" to 54"	6"	\$28.00	On application
5		56" to 72"	8"	30.00	
7		Water tube	12"	35.00	
9			18"	40.00	
11			24"	42.50	
13			30"	45.00	
15		36"	50.00		

LOW WATER ALARMS				
2	36" to 54"	.....	\$25.00	On application
6	56" to 72"	.....	28.00	
8	Water tube	.....	35.00	

Subject to discount.

GENERAL DIMENSIONS ALARM WATER COLUMNS

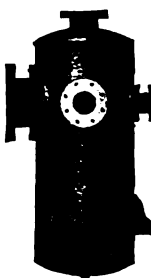
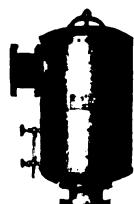
Size of column, in.	Steam and water connections, in.	Blow-off, in.	Water gage, in.	Gage glass, in.	Gage cocks		Center of water connection to top of column, in.	Diam. of column, in.	L'gth over all, in.
					Center, in.	Size, in.			
1	1	3/4	1/2 x 14	5/8 x 12	3	1/2	18 1/2	4 1/2	26
5	1 1/4	3/4	1/2 x 18	5/8 x 16	4	3/4	21 1/2	5	30 3/4
7	1 1/2	3/4	1/2 x 21	5/8 x 19	6	3/4	26	5	34 1/4
9	1 3/4	3/4	1/2 x 24	5/8 x 22	9	3/4	30	5	39
11	1 3/4	3/4	1/2 x 30	5/8 x 28	12	3/4	36	5	45
13	1 3/4	3/4	1/2 x 36	5/8 x 34	10	3/4	42	5	51
15	1 3/4	3/4	1/2 x 42	5/8 x 40	12	3/4	49	5	57
2	1	3/4	1/2 x 14	5/8 x 12	3	1/2	18 1/2	4 1/2	26
6	1 1/4	3/4	1/2 x 16	5/8 x 14	4	3/4	20	5	29
8	1 1/2	3/4	1/2 x 21	5/8 x 19	6	3/4	26	5	34 1/4

*Two glasses joined at center with stuffing box. Four gage cocks.

Austin Special Separators.

Where steam conditions and piping arrangements are such that a regular pattern Austin steam or oil separator does not meet the special requirements our Service Engineering Department will be glad to cooperate with you.

We have the facilities for designing and constructing separators for high pressure, superheat, low pressure, and vacuum service, to meet any conditions. The special separators in illustration are just a few of the many that have been constructed to solve special separating problems.



SPECIAL SEPARATORS

Austin Live Steam Separators.

The fundamental of all separation is gravity.

The principle of all successful separation of moisture from steam is the sudden change of direction within the separator. The introduction of an obstacle or baffle directly in the path of the steam causes the heavier particles of moisture, by their own weight, to be thrown out or separated from the lighter steam. This baffle must be of sufficient size and area to collect and carry away the moisture. To provide for this large baffle and for the sudden change of direction without friction loss or back pressure requires a separator of large internal areas or cross section.

Figures "A" and "B" Separators—The Figure "A" separator is designed for installation in vertical steam lines just above the throttle of the engine, and is of the baffle type, having very large internal areas.

The Figure "B" is for installation in horizontal steam lines as near as possible to the engine. It is an ideal separator for limited headroom, since it does not project above the pipe line.

The baffle plate in Figures "A" and "B" is not set at right angles to the entering steam current but is so set that when the incoming steam is impinged against it and rebounds to the opposite wall of the separator, the particles of moisture are deflected down the deep, slanting corrugations on the walls and baffle, entirely out of the course of the steam, and into the well below, where they are drained off.

Passing around the lower edge of the baffle, the flow of the steam is completely reversed by a quick sharp turn upward, which whips out the final trace of moisture.

Figures "M" and "E" Separators—These have considerable receiver capacity, and in this respect are the next step larger than Figures "A" and "B," yet they are built in the same range of pipe sizes. The Figure "E" in addition to live steam service, is used successfully on compressed air lines and will eliminate water from gas to perfection.

A great many additional Austin types are built in vertical, horizontal and angle patterns. Write for booklet No. 1220.

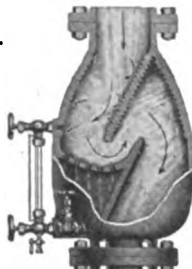


FIG. A. LIVE STEAM VERTICAL IRON SEPARATOR



FIG. B. LIVE STEAM HORIZONTAL IRON SEPARATOR



FIG. M. LIVE STEAM VERTICAL IRON SEPARATOR



FIG. E. LIVE STEAM HORIZONTAL IRON RECEIVER SEPARATOR

DATA, AUSTIN LIVE STEAM SEPARATORS

Size, in.	1½	2	2½	3	3½	4	4½	5	6	7	8	10	12	14
FIGURE "A" VERTICAL														
Flange diam., std., in.	SE	SE	7	7½	8½	9	9½	10	11	12½	13½	16	19	...
Flange diam., ex. hy., in.	SE	SE	7½	8½	9	10	10½	11	12½	14	15	17½	20½	...
Face to face, in.	11	11	13	13½	16½	18	20	22½	25½	27½	31½	37	40½	...
Weight, lbs.	50	50	95	125	135	160	215	245	315	440	575	910	1000	...
Drains, in.	½	½	¾	¾	¾	¾	¾	1	1	1½	1½	1½	1½	2
FIGURE "B" HORIZONTAL														
Flange diam., std., in.	SE	SE	7	7½	8½	9	9½	10	11	12½	13½	16	19	21
Flange diam., ex. hy., in.	SE	SE	7½	8½	9	10	10½	11	12½	14	15	17½	20½	23
Face to face, in.	9	9	13½	15½	16	18½	19½	20½	24½	27½	30½	31	36	39
Weight, lbs.	45	45	115	125	165	215	265	285	435	600	835	1135	1455	1625
Drains, in.	½	½	¾	¾	¾	¾	¾	1	1	1½	1½	1½	1½	2
FIGURE "M" VERTICAL														
Flange diam., ex. hy., in.	SE	SE	7½	8½	9	10	10½	11	12½	14	15	17½	20½	23
Face to face, in.	16	16	18	19½	22½	26½	30½	34	37½	42½	48½	58	64	70
Weight, lbs.	35	35	115	145	175	240	315	375	515	665	930	1165	1455	1625
Drains, in.	½	½	¾	¾	¾	¾	¾	1	1	1½	1½	1½	1½	2
FIGURE "E" HORIZONTAL														
Flange diam., ex. hy., in.	SE	SE	7½	8½	9	10	10½	11	12½	14	15	17½	20½	23
Face to face, in.	9	11	12½	14½	16½	19	21	22½	24½	27½	30½	34	39½	43
Weight, lbs.	35	55	115	170	230	310	470	565	715	880	1170	1455	1625	1855
Drains, in.	½	¾	¾	¾	¾	¾	1	1	1½	1½	1½	1½	1½	2

Austin Figure "S" Horizontal Oil Separator.

For use on exhaust steam lines from engines, pumps, compressors, etc. to remove oil and purify the exhaust steam so that the condensation may be used as distilled water for boiler feed, ice making, textile and chemical processes, etc.

The Figure "S" horizontal self-cleaning oil separator and its baffles are made in one solid casting without any joints or gaskets, the baffle being attached to the body of the separator by several lugs. The baffle is flushed clean continuously, making it absolutely unnecessary to shut down the plant to clean it.



FIG. S AUSTIN HORIZONTAL SPECIAL OIL SEPARATOR

Size pipe, in.	Diam. of flanges, in.	Bolt circle, in.	Bolt number and size, in.	Face to face of flanges, in.	Wide, in.	High, in.	Center of pipe to top, in.	Size drip, in.	Weight, lbs.
1½	Serd.			9½	12	15½	6½	¾	60
2	Serd.			10	12½	15½	6½	¾	60
2½	7	5½	4-¾	10½	14½	17½	7½	1	160
3	7½	6	4-¾	11	15	18	7½	1	165
3½	8½	7	4-¾	11½	17	20	8½	1	190
4	9	7½	8-¾	12	19	23	9½	1	235
4½	9½	7½	8-¾	13	21	25	10½	1½	290
5	10	8½	8-¾	15	23	27	11½	1½	370
6	11	9½	8-¾	17	25	30	13½	1½	475
7	12½	10½	8-¾	17½	27	33	14½	1½	545
8	13½	11½	8-¾	18	29	36	16½	1½	650
10	16	14½	12-¾	19	32	40	18½	1½	855
12	19	17	12-¾	20	34	42	20½	1½	905
14	21	18½	12-¾	20	36	43	21½	1½	1060
16	23½	21½	16-1	22	40	44	22½	1½	1150
18	25	22½	16-1½	24	42	46	23½	1½	1375
20	27½	25	20-1½	26	44	49	25½	1½	1475

Built in regular patterns up to 48 in.
 Sizes 2½ in. to 10 in. inclusive, built with nozzle flange connections, larger sizes with close flanges and furnished with stud bolts. Eye bolts placed on all sizes above 12 in. inclusive.
 Water gages furnished on all sizes except 1½ in. and 2 in.

THE RELIANCE GAUGE COLUMN CO.

Manufacturers of Steam Specialties

5914 Carnegie Avenue
CLEVELAND, OHIO

Products.

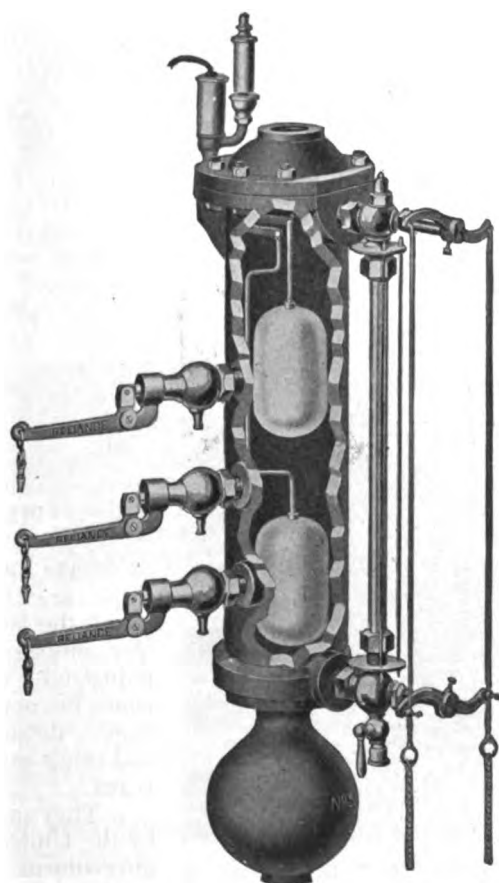
SAFETY WATER COLUMNS.
MONEL DISK LEVER GAUGE COCKS.
STEAM TRAPS.
SEAMLESS COPPER FLOATS.
Also Quick Closing Water Gauges.

Reliance Safety Water Columns.

The Reliance is the original safety alarm water column. It has been the standard for over 30 years and meets all codes and laws.

The whistle gives a warning when the water level falls to the lower gauge cock or rises to the upper gauge cock. Reliance columns are made in two styles, the low alarm only and the combined high and low alarm. A Reliance seamless copper float operates each valve. The valves and levers are located above the water line away from sediment and scale which falls to the sediment chamber at the bottom where it can be blown out.

Reliance Electric Alarm—Can be used in place of or in addition to the whistle. It can be connected to ring a bell, light a lamp, or record on a chart when the water level is too high or too low. It gives a silent alarm for hospitals, hotels or schools.



SECTIONAL VIEW OF RELIANCE COMBINED HIGH AND LOW ALARM

Reliance Monel Disk Gauge Cock.

A monel metal pointed valve disk seats on a narrow seat of high grade steam bronze, and is held against the pressure by a copper coated spring. The pointed disk and seat are blown clean every time the cock is operated. The valve stem is always in alignment and always takes the same seat.

It has a good factor of safety for working pressures up to 350 lbs. per sq. in.

Entire gauge cock, including lever, finished in polished brass.

Furnished in 1/2- and 3/4-in. sizes.



SECTIONAL VIEW OF RELIANCE MONEL DISK GAUGE COCK

Reliance Steam Traps.

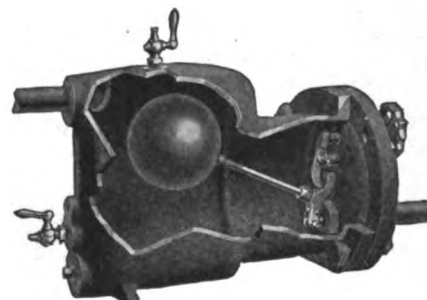
Water entering at the inlet fills the trap until the buoyancy of the float opens the valve and allows the water to escape through the outlet. The valve opens slightly if there is a small inflow of water, but widely if a large quantity is entering the trap.

Water is discharged in proportion to the inflow and thus gives greater capacity for the same discharge port than if the action were intermittent.

By turning the hand wheel above the outlet, the valve is raised from the seat and the trap is drained and blown free from sediment and the valve cleaned.

The entire internal mechanism can be readily taken out by removing the cap from the end of the trap.

The trap is provided with pet cocks which may be used to determine whether the trap is operating satisfactorily. They indicate by blowing either steam, air or water.



SECTIONAL VIEW OF RELIANCE STEAM TRAP

DATA, RELIANCE STEAM TRAPS

Size.....	1	2	3	4	5	6
Size connection, in.....	1/4	3/8	1	1 1/4	1 1/2	2
Discharge per min., lbs.....	4	7	10	25	40	60
Ft. 1-in. pipe trap will drain.....	1000	3000	4500	7500	11,000	16,000

Reliance Seamless Copper Floats.

Used in all Reliance specialties. They are furnished in various sizes up to 12 in. in diameter, and for pressures up to 350 lbs. per sq. in.

JENKINS MACHINE COMPANY

Manufacturers of Engine Stops

SHEBOYGAN, WIS.

Product.

FRICTIONLESS AUTOMATIC ENGINE STOPS.

Purpose of the Falls Automatic Engine Stop.

Falls engine stops provide a reliable protection for engine room equipment against engine runaways, flywheel explosions, main belt or rope drive failure, cylinder head blowouts. Not only will the Falls engine stop automatically shut off the steam should the flywheel overspeed, but furthermore, by means of stop stations located in the engine room or at various points in the plant, the engine can be instantly shut down from any electrical stop station by simply breaking a glass panel or by a sharp pull from any of the mechanical stop stations.

Salient Features of Falls Engine Stops.

The Falls automatic engine stop will positively shut off the steam at the first indication of dangerous speed, and as it is *frictionless and packless*, it is absolutely reliable.

It is operated by gravity, actuated directly and instantaneously, and is 20% greater in area than the steam line for which it is designed. Direct tripping device on engine shaft provides the simplest and surer method of indicating overspeed.

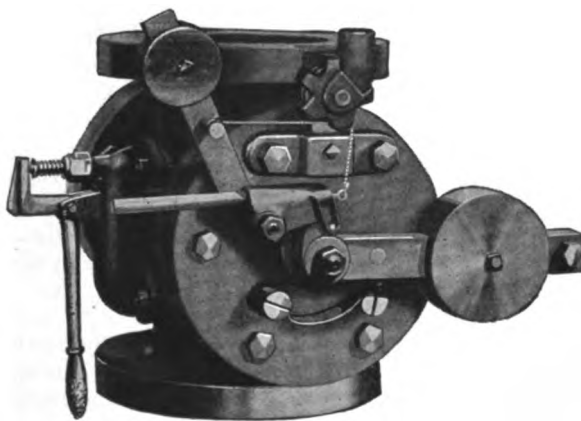
The Falls engine stop is to the engine what the safety valve is to the boiler. Casualty company statistics show that there are approximately 33% more flywheel explosions than boiler explosions and that the former are 50% more costly. There are many instances on record where loss of life, property, profits, and business caused by flywheel explosions could have been prevented by the installation of Falls engine stops. The cost of this device is infinitesimal as compared to the property it protects.

The Falls engine stop protects property by enabling any one to instantly shut down the engine from any part of the plant. It saves money by preventing losses such as fires, burned belts, broken machinery, maimed employees, racing engines and *flywheel explosions*. Its effectiveness in these respects has been repeatedly proved in service for a number of years.

The maintenance factor is eliminated almost entirely for there is nothing that can gum, stick or jam during long periods of idleness. It is a complete and independent unit in itself and in no way relies (for its operation) upon any function of the machinery that it protects.

Easily and quickly installed, thus no interruption to plant operation.

All equipment guaranteed against defective material and workmanship for a period of one year.



FALLS MECHANICAL ENGINE STOP

Field of Application and Types of Control.

Falls automatic engine stops can be fitted to any type and size of steam engine and in either vertical or horizontal steam lines.

Three distinct types of engine stop control are offered: *Mechanical* by means of braided wire cable; *electrical closed circuit*; or *electrical open circuit*, (on high voltage, A.C. or D. C., or battery sets)—in accordance with local conditions.

Any number of stopping stations may be installed, located as desired throughout the plant.

Indorsement and Use.

Falls engine stops are indorsed by all the large casualty companies, state industrial commissions, factory inspection departments, and other safety bureaus.

They are used by the United States government and the world's largest industrial plants.



FLYWHEEL EXPLOSIONS LIKE THIS ARE IMPOSSIBLE IF PLANT IS EQUIPPED WITH FALLS AUTOMATIC ENGINE STOPS

Illustration shows wreckage caused by the bursting of two 20-ft. flywheels, killing the engineer and injuring five others. The loss was estimated at \$160,000.00

SARCO COMPANY, INC.

Manufacturers of Steam Specialties

18 Park Place
NEW YORK, N. Y.

BUFFALO, N. Y., 325 Ellicott Square PHILADELPHIA, PA., Drexel Building CLEVELAND, OHIO, 6523 Euclid Avenue
DETROIT, MICH., Majestic Building CHICAGO, ILL., Monadnock Block

Products.

STEAM TRAP SARCO; RADIATOR TRAP SARCO; TEMPERATURE REGULATORS for liquids and atmosphere, for drying ovens and manufacturing processes.

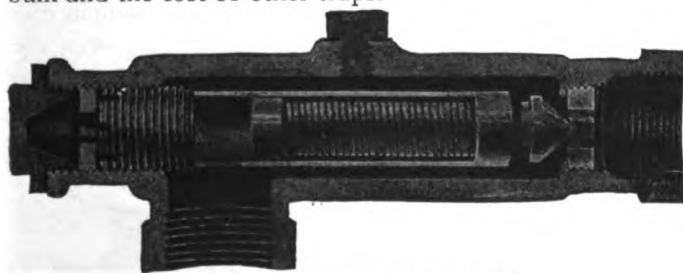
Advantages of Steam Traps and Radiator Traps Sarco.

There is no simpler form of trap manufactured. There is practically nothing to get out of order; no levers, gages, packing, stuffing boxes or trouble causers. The traps can be adjusted instantly, and this company guarantees that, when adjusted, no live steam will be emitted.

Steam Trap Sarco.

Consists of a steam pipe body which can be screwed on anywhere in a steam main or pipe, occupying very little space and taking the place of an elbow or bend. In this body, a Sarco cartridge is inserted, containing an easily expandable fluid operating a spirally corrugated, hermetically sealed tube, to the lower end of which is attached a piston, which carries the valve head.

The trap requires simply to be put into position and the cartridge unscrewed a few turns. When the steam has heated the cartridge, expanding the fluid and forcing out the piston, the cartridge is gently screwed forward, until the valve head meets the seat, closing off the steam. The adjustment can then be locked and the trap works automatically. As soon as water collects, the liquid contracts and the valve opens; the condensation is then ejected by the pressure behind it, and immediately the steam comes into contact with the cartridge there is an expansion, and the trap closes. The Sarco trap works continuously, thus it requires no large storage capacity such as increases the bulk and the cost of other traps.



DETAIL OF STEAM TRAP SARCO
LOW PRESSURE—0 TO 50 LBS.

Size, in. .	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3
List prices	\$6.00	6.00	9.45	11.25	24.15	30.00	38.70	51.75	60.00

HIGH PRESSURE—50 TO 200 LBS.

Size, in. .	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3
List prices	\$7.75	7.75	10.35	12.00	28.50	34.50	48.30	60.00	75.00

Radiator Trap Sarco.

A development of the steam trap Sarco. It uses a spirally corrugated tube of large diameter, which forms the expansion chamber, containing a volatile liquid. The diaphragm is directly exposed to steam or vapor, insur-



ing quick action. Slight change of temperature within the trap, due to condensation collecting in same, gives a wide open movement of the valve.

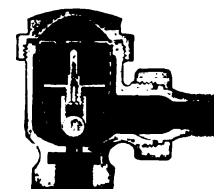
The Sarco is provided with a new valve head, which is a bronze metal ball, freely turning in a socket, insuring a perfect seat and offering a wearing surface many times greater than that of any other type of valve on the market.

The new Sarco radiator trap construction also permits the provision of a strainer of ample surface, ten times the area of the discharge opening of the trap itself. This obviates entirely trouble from clogged or leaking valves.

The trap is a factory adjusted trap and requires merely to be connected to the radiator and to a return exhaust line. It will work perfectly on any degree of vacuum and on any steam pressure up to 20 lbs. per sq. in., without strain and without adjustment.

DATA, TYPE "E" RADIATOR TRAP SARCO

Size, in.	1/2	3/4
Over all length, in. . .	3 3/4	3 3/4
Center inlet to face outlet, in.	1 1/2	1 1/2
Center valve to face inlet, in.	2 3/4	2 3/4
List prices.	\$6.00	8.00



DETAIL OF RADIATOR TRAP SARCO

Sarco Temperature Regulator.

The Sarco temperature regulators are for controlling the temperature of atmosphere and liquids. They use the same thermostatic principle as the well-known steam trap Sarco, that of expansion and contraction of a sensitive liquid hermetically sealed within the elements. They possess many advantages over thermo regulators at present on the market, in as far as they are compact, simple and wholly self-contained, requiring no exterior operating means, such as compressed air, water or electricity.

This form of construction accounts for the success of the Sarco, as it permits a more accurate and constant regulation, reduces installation expense to the lowest possible point, and eliminates maintenance expense, there being no parts to get out of order.

Sarco regulators are made in two standard types: KR 14 for room temperature control, and dry kiln work and TR 21 for tank control, operating on any given temperature between 32° and 300° Fahr. All types can be adjusted by user for any temperature 10° Fahr. above or 10° Fahr. below that for which regulator is calibrated.

Prices on application. Sizes of valves, 1/2 in. to 6 in.



SARCO TEMPERATURE REGULATOR

MONASH - YOUNKER CO.

Manufacturers of High Grade Return Line Traps, Air Relief Valves
and Steam Specialties

CHICAGO, ILL.

NEW YORK, N. Y.

Products.

Manufacturers of HIGH GRADE RETURN LINE TRAPS, AIR RELIEF VALVES and STEAM SPECIALTIES.



Trade-mark.

Stands for 30 years of quality and service. It guarantees engineer or architect a reliable article for his client.

Circulars and Testimonials.

Circulars and printed matter and testimonials from users of thousands of these valves in the last twelve years may be had upon request.

The Double Engineering Charge.

To specifying engineers and architects—vacuum and vapor equipment less the double engineering charge. We do not make plans and specifications for separate installations because we have found that present day engineers and architects are capable of doing so.

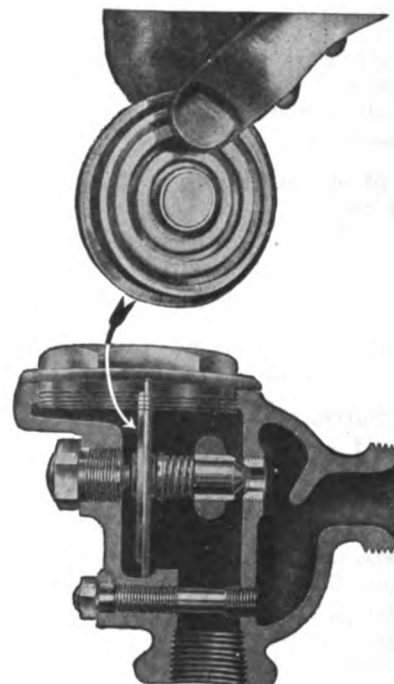
Monash Thermostatic Return Line Trap or Valve.

This trap or valve has features not contained in the make-up of any other trap. The special feature is the *by-pass* and *clean-out*. It is adapted for heating systems of factories, railroad shops, roundhouses, packing, slaughtering, and other industrial plants, and for use in connection with mechanical apparatus such as cookers, vulcanizers, etc.

Dirt Can Not Wreck a Monash Vacuum Valve—

Dirt wrecks more vacuum valves than any other thing in connection with a vacuum system. In the Monash thermostatic return line trap all the steam, air, water or other substances which may pass through the radiator must first enter the dirt pocket of the valve. This dirt pocket is constructed in the form of an inverted weir, producing a complete water seal and preventing the passage of steam to the diaphragm of the valve. The weir also acts as a deflector, causing everything such as dirt, foundry mould, scale or core sand from the interior of the radiator, which may be carried along with the water of condensation, to fall to the bottom of the dirt pocket, trapping the dirt and preventing it from entering into the working parts of the trap, or, as in many cases, even passing through the suction strainer into the vacuum pump where it causes undue wear, and loss of efficiency, besides being forced through the system again.

These same fine particles of dirt and grit, when trapped in the dirt pocket of a Monash return line trap, assume much larger proportions; they are readily caught



MONASH NO. 40 THERMOSTATIC RETURN LINE VALVE WITH BY-PASS AND CLEAN-OUT FEATURE

This thermostatic diaphragm dropped into the Monash thermostatic valve does the work

and held in a properly designed suction strainer at the pump if discharged once or twice a year by opening the by-pass and permitting free passage of steam.

The thermostatic diaphragm, as illustrated, is not attached to the cover or body, and is always out of the steam chamber, which means longer life and efficiency. It is not complicated, not a bellows, but a simple diaphragm disk so sensitive that it will relieve even the slightest amount of condensation or air and so constructed that it will close tightly against steam at any pressure up to 25 lbs., and is guaranteed in writing in the hands of the owner for *ten years*.



No. 40

No. 42

No. 44

THERMOSTATIC RETURN LINE VALVES

No.	Size, in.	Capacity of direct radiation, sq. ft.	Lbs. water per hour
No. 40.....	1½	350	108
No. 42.....	3⁄4	1500	475
No. 44.....	1	5000	1560

Valve No. 50, ½-in. connection, same capacity as No. 40, but without by-pass and clean-out feature, can be furnished.

Monash No. 35 Thermostatic Return Line Trap.

For vapor or vacuum heating in homes, apartments, hotels, banks, churches, schools, office and public buildings. It is guaranteed for ten years.

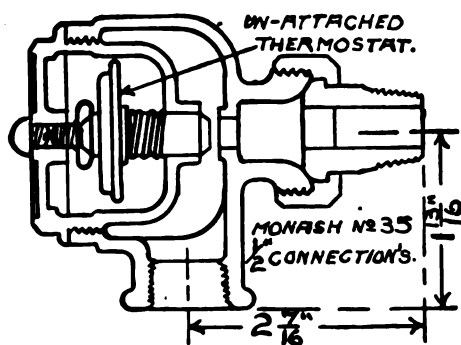
This trap is made of a fine grade, high tensile, non-porous, steam metal, nickelplated. It is compact and efficient, built under careful supervision, and rigidly inspected and tested before leaving the factory.

The heart of this trap, the thermostat which controls the action of the trap, is always out of the steam chamber, which means long life and greater efficiency.

This Thermostatic Diaphragm is not connected to the cover or body of the trap, thus giving the Thermostat a chance to work independently, which means more efficiently.

This diaphragm is not a bellows but a simple disk so sensitive that it will relieve even the slightest amount of condensation or air and so constructed that it will close tightly against steam pressure carried in the ordinary vapor or vacuum heating system.

Since the fall of 1914, 3300 of these valves have been installed in the Continental & Commercial National Bank Building, Chicago. The manager and chief engineer of this building will tell you that during these many years they have not been called upon to renew a single part or piece, and that our valve stands for economy plus



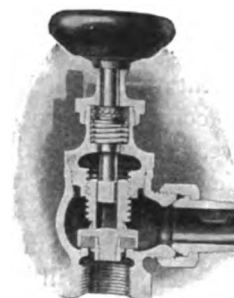
THE MONASH NO. 35 THERMOSTATIC RETURN LINE TRAP
Guaranteed for ten years

efficiency; also that they consider it 100% efficient. A photograph of this testimonial will be furnished if desired; likewise, references showing thousands and thousands of these valves in use in all classes of buildings, each giving 100% efficiency, can also be furnished.

How to Specify—To all heating units, attach a Monash No. 35, "Ten Year Guaranteed" return line trap and a Monash graduated No. 131 packless radiator supply valve. Attach to the boiler a Monash syphon vapor regulator, and on the return line attach a Monash thermostatic air expellor, in accordance with directions furnished by the manufacturer.

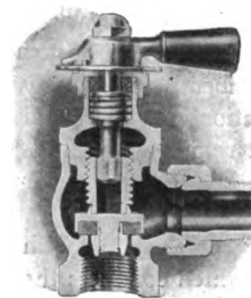
Monash Packless Radiator Valves.

Monash packless radiator valves are equipped with Jenkins Bros. genuine Diamond Brand disks, and made



MONASH NO. 119 PACKLESS RADIATOR SUPPLY VALVE

of the finest non-porous steam metal. They will stand strenuous service for many years. Valve No. 119 is

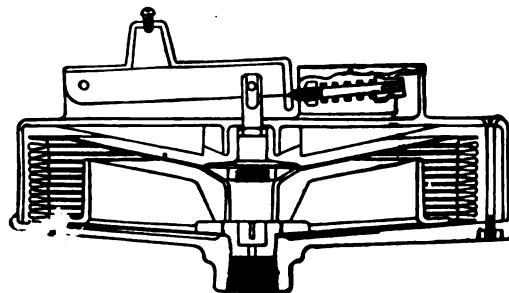


MONASH NO. 131 PACKLESS GRADUATED RADIATOR SUPPLY VALVE

used on one-pipe gravity heating. Valve No. 131 is used for graduated and vapor heating systems.

Monash Syphon Vapor Regulator for Boilers.

Monash syphon vapor regulators will control boiler pressures as low as 4 ozs. in dampers on the average boiler. The syphon diaphragm is fitted with a device which assures perfect action as well as gradual movement of the dampers, preventing rattling and slamming of dampers so often experienced.



MONASH SYLPHON VAPOR REGULATOR FOR BOILERS

Variation in the water line does not affect the regulations as it operates entirely on variations. Made entirely of metal and constructed to overcome leaky joints.

Monash Air Valves for Gravity or One-pipe Heating Systems.

The MONASH-YUNKER Co.'s thirty years' experience as valve makers is embodied in the valves shown below. Each one is constructed under careful supervision, rigidly inspected, and is guaranteed for *ten years*.

Any one of twenty makes of boilers may be used, and a good steam contractor may install the system, but if inferior valves are attached there will be heating troubles within a few months; the radiator will become air bound, preventing steam from circulating through its loops. To remedy this condition it will be necessary to take off the valve. Trouble will arise from the valves leaking water and hissing steam, thus spoiling the ceiling and ruining the walls.

Monash No. 6 Four-way Drain Automatic Air Valve.

This valve has an adjustable feature that can only be regulated by the proper party—so constructed that the cold air from the radiator will be expelled and the water of condensation will be returned to the radiator. Its expansive member will instantly respond to the action of steam and cold air, and will retain its expanding and contracting qualities for years.

It is the only valve made with a special air tube which conducts the air from the radiator to the top of the valve, permitting its escape through the outlet, and which also equalizes the air pressure in the valve—an all-important feature in a perfect working automatic air valve.

It is the only valve that has a four-way drain extending from the body of the valve into the radiator, draining off the water of condensation, preventing flooding of floors and damage to ceilings below.

Made with a hexagon shaped base so that it may be distinguished from all other valves.

How to Specify—To each radiator or coil, attach a Monash No. 6 four-way drain guaranteed automatic air valve and a Monash No. 119 leakless, packless radiator supply valve.

For Mains, Risers, and Large Coils—Same valve is furnished with $\frac{1}{4}$ -in. bottom outlet, and has a greater capacity for the venting of air. Specifications should state:

For venting main in basement and risers (or coils) use a Monash No. 6 bottom outlet guaranteed automatic air valve.

Monash No. 1 Non-adjustable Automatic Air Valve, With Removable Syphon Drain.

The Monash No. 1 non-adjustable automatic air valve with removable syphon drain can not be tampered

with by any one. It is adjusted and set at the factory under the same careful supervision and inspection as the No. 6 four-way drain automatic air valve.

The thermostat, or expansive member, is controlled by a volatile liquid which is very sensitive and quick in action. It stops both steam and water from escaping, but permits free passage of cold air. Made throughout of heavy metal, with base and nipple cast in one piece. It is noiseless in operation and overcomes annoyance from hissing and escaping steam, or whistling of escaping air.

The syphon drain, which returns the water of condensation to the radiator, can be easily removed from the valve, permitting the valve to be cleared with gasoline of the dirt and core sand—more or less of which is contained in every heating system. This is an important feature in the perfect working of a non-adjustable air valve, and is not included in any other valve of this kind on the market.

How to Specify—To each radiator and coil, attach a Monash No. 1 non-adjustable guaranteed automatic syphon air valve and a Monash No. 119 leakless, packless radiator supply valve.

For Mains, Risers, and Large Coils—Specifications should state:

For venting main in basement and risers (or coils) use a Monash No. 3 bottom outlet non-adjustable guaranteed automatic syphon air valve.

Monash No. 7 Vacuum Four-way Drain Automatic Air Valve for Gravity or One-pipe Heating Systems.

Used in connection with leakless, packless radiator supply valves, it has a special heat resisting composition disk which seats itself over the air outlet end of the valve, closing against ingress of air, thus creating a perfect vacuum in the radiator. A radiator thus equipped will retain the heat for hours after the fire has been banked. This means reduction in fuel bills.

The interior construction of this valve is the same as the No. 6 shown on this page.

How to Specify—To each radiator or coil, attach a Monash No. 7 vacuum four-way drain automatic air valve and a Monash No. 119 leakless, packless radiator supply valve.



MONASH NO. 1 NON-ADJUSTABLE SYPHON THERMOSTATIC AUTOMATIC AIR VALVE



MONASH NO. 6 FOUR-WAY DRAIN AUTOMATIC AIR VALVE

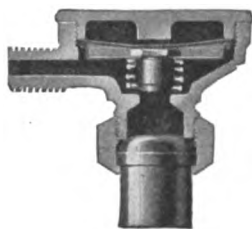


MONASH NO. 7 VACUUM FOUR-WAY DRAIN AUTOMATIC AIR VALVE

Monash No. 2 Liquid Thermostatic Diaphragm Automatic Air Valve for Drip and Air Line Systems.

Can be used with or without pump. Non-adjustable. No air bound radiators, no steam passing into air lines. Rapid and positive in action. Nipple connection to radiator, $\frac{1}{8}$ in. Air line connection, $\frac{1}{4}$ in.

How to Specify—Each radiator or coil to have a Monash No. 2 liquid thermostatic air valve and a Monash No. 119 leakless, packless radiator supply valve attached.



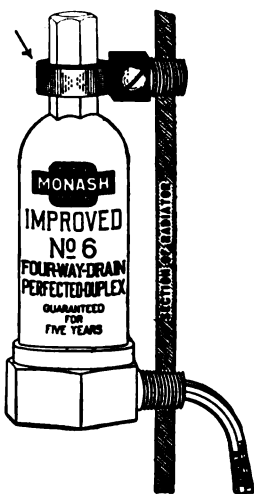
MONASH NO. 2 LIQUID THERMOSTATIC DIAPHRAGM AUTOMATIC AIR VALVE

Monash Valve Holder.

This valve holder prevents valve from being turned or removed from radiator and is especially adapted for use in schools and all classes of public buildings. Illustration shows manner of fastening valve to radiator with Monash valve holder, used only with locked shield valves.



MONASH VALVE HOLDER



MONASH VALVE HOLDER INSTALLED

How to Specify—Each radiator to be equipped with a Monash No. 6 four-way drain air valve and a Monash valve holder to prevent removal of valve from radiator.

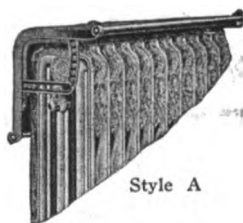
Monash Adjustable Radiator Covers.

The only practical adjustable radiator cover on the market. Easily attached and easily removed when not in use. These covers prevent the dust stain appearing on the walls above the radiator. No portion of the radiator surface is enclosed; thus the maximum emission and widest distribution of heat is always obtained.

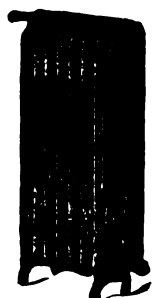
When ordering, state the name and make of radiator, also the number of loops in each. If impossible to do this, send us a sketch and state whether the supply pipe is attached near the top or bottom of the radiator, and also give the location of the air valve.

After you have given the full length of the radiator, the manufacturer adds from 1 in. to $2\frac{1}{2}$ in. to the length of the shield for the adjusting bolts.

When ordering Style B, give the height of the radiator, and state how near to the floor the bottom of the shield is to come.



Style A



Style B
MONASH ADJUSTABLE
RADIATOR
COVERS

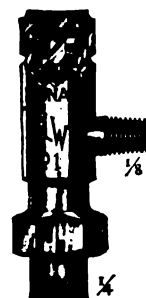
Monash Telwen No. 1 Drip Line Automatic Air Valve.

Used in connection with Monash steam exhauster, Paul or other air line systems of vacuum heating.

The Telwen feature "tells when" valve is properly adjusted, saving time and work due to careless adjustment. Compensating spring seat prevents buckling or bending of expansion member by undue pressure.

The Monash Telwen No. 3 is made identically the same with connections to the radiator $\frac{1}{4}$ in., and $\frac{3}{8}$ in. to air line.

How to Specify—Each radiator or coil to have a Monash Telwen No. 1, $\frac{1}{8}$ by $\frac{1}{4}$ in. (or Telwen No. 3) automatic steam air valve attached.



MONASH TELWEN NO. 1
DRIP LINE
AUTOMATIC
AIR VALVE

Monash No. 13 Trap.

A small and simple steam trap especially made for use on steam heating coils, heaters, steam jackets or other places where a small amount of condensation is to be removed without waste of steam.

It is perfectly automatic and, when properly adjusted, remains open as long as water escapes, closing when steam strikes expansion post.

Made with $\frac{3}{8}$ -in. connections and not recommended for use on pressure over 80 lbs.

How to Specify—Each steam main to be equipped at proper point with a Monash No. 13 trap, $\frac{3}{8}$ -in. connection.

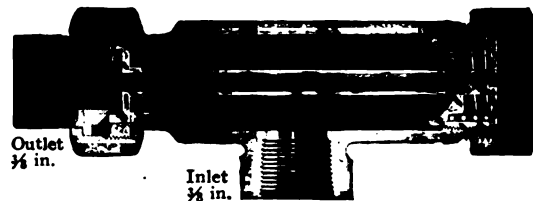


MONASH NO. 13 TRAP

Monash Telwen No. 7 Automatic Steam Main Vent.

This valve is a large and powerful expansion air vent made for the purpose of relieving steam mains or risers of air as it accumulates, thereby permitting free circulation of steam.

The Telwen feature in the valve enables one to see at a glance whether or not the screw binds. Once ad-



MONASH TELWEN NO. 7 AUTOMATIC STEAM MAIN VENT

justed, this valve will operate on high as well as low pressure.

It is 8 in. long, threaded for either $\frac{1}{2}$ -in. or $\frac{3}{4}$ -in. pipe connection.

How to Specify—The end of each steam main to have a Monash No. 7 Telwen automatic steam main vent attached, $\frac{3}{4}$ -in. connection.

AMERICAN STEAM GAUGE & VALVE MFG. CO.

ORIGINAL STEAM GAUGE COMPANY

Manufacturers of Gauges and Indicators

GENERAL OFFICES AND FACTORY

208-220 Camden Street

BOSTON, MASS.

BRANCH OFFICES

PITTSBURGH, PA., Jenkins Arcade Building
NEW YORK, N. Y., 84 Broadway, BrooklynCHICAGO, ILL., 25-27 South Jefferson Street
ATLANTA, GA., Candler Building

Products.

GAUGES: Steam, Air, Water, Compound Pressure and Vacuum, Ammonia, Hydraulic, Gas, Oil, Automobile, Locomotive, Duplex Air Brake, Steam Heat, Test, etc., both Index and Recording.

GAUGE BOARDS, to order; GAUGE TESTERS.

STEAM and GAS ENGINE INDICATORS.

Also manufacturers of Hydraulographs and Train-
graphs.For Special Valves and Steam Specialties, see
pages 1002-1003.

Experience.

Having been engaged in this line of business for seventy years, operating the largest plant of its kind in the world, this company offers its products for efficient and durable use throughout the industrial field.

American Single Spring Bourdon Pressure and Vacuum Gauge (Patented).

Gauges of this standard type manufactured and installed exclusively by this company until expiration of patent. Graduated to any pressure desired, not ex-



SINGLE BOURDON GAUGE



DOUBLE BOURDON GAUGE

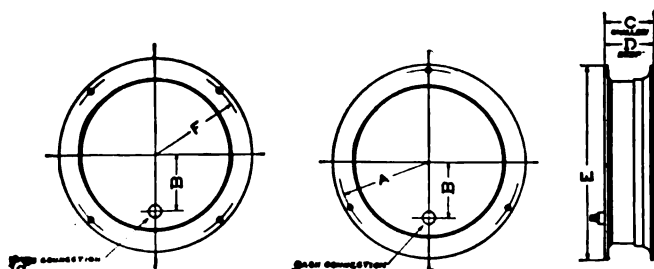


DIAGRAM OF AMERICAN GAUGE

DIMENSIONS OF CASE IN INCHES

Size, in.	3½	4½	5	5½	6	6½	8½	10	12
A	2¼	2½	2¾	3¼	3½	3¾	4½	5½	6½
B	1½	1¾	1½	1¾	2¼	2½	2¾	3½	3¾
C	2	2½	2½	2¾	2¾	2¾	3	3½	3¾
D	4½	5½	6	6½	7½	8½	10½	12½	14½
E									
F									

ceeding 500 lbs. for either steam or water. Graduations as high as 1000 lbs. furnished to order. Movement is of best non-corrosive metal, and springs are made of solid drawn tube of special mixture. A siphon should be used with each gauge on steam pressure.

Regularly furnished with silver finished brass dial; figures and graduations cut and filled with black enamel, or, if desired, black dial with silver figures will be furnished. Standard connection is ¼-in. male.

Cock furnished with all gauges up to 500 lbs., sizes 3 in. and larger.

Double Bourdon Pressure Gauge—For marine and portable work. It possesses rigid qualities, lessening vibration, and sensitiveness. Graduated for either steam or water to any pressure not exceeding 500 lbs.

American Compound Pressure and Vacuum Gauge (Patented).

Graduated by two mercury columns, indicating both pressure and vacuum.

The American combination gauge is for use in pumping stations to indicate height in feet, and corresponding pounds per square inch of water, in reservoir or standpipe.

When ordering, state maximum pressure on which gauge will be used.



FIG. 255



FIG. 256

AMERICAN COMPOUND PRESSURE AND VACUUM GAUGE

American Ammonia Gauge.

Specially adapted for ice and refrigerating machines.

New construction, tube being bored and turned from solid bar high grade tool steel. No leaky joints to give trouble. Sizes, 5 to 8½ in.; connection from bottom or back of case.

Send for further details.

FIG. 260
AMMONIA GAUGE

American Hydraulic Gauge (Patented).

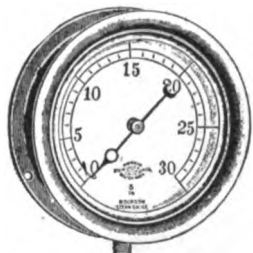
Used in best railroad shops, sugar refineries and cottonseed oil mills. Made for pressures from 500 to 20,000 lbs. per sq. in. Springs of heavy solid bar steel turned and bored to size. Furnished with back connections when desired.

FIG. 259
HYDRAULIC GAUGE**American Standard Test Gauge.**

An established standard gauge for exhaustive tests of gauges of all types, wherever made. Graduated on an open column of mercury and tested under most severe conditions. Extremely sensitive under all pressures and guaranteed to be absolutely correct.

FIG. 258
STANDARD TEST GAUGE**American House Heater Gauge (Patented).**

Bourdon single spring type. Constructed so as to prevent corrosion of the moving parts. Adapted for use in cellars, basements, etc. A siphon should be used with these gauges. Dial plainly marked with large figures.

FIG. 272
HOUSE HEATER GAUGE**American Altitude Gauge.**

Indispensable in connection with hot water heaters, for denoting height of water in tank or reservoir.

Short red hand is set at point on dial designating necessary height at which water should be kept in tank or reservoir.

Long black hand automatically registers actual height of water at all times.

Dial marked in feet instead of pounds.

FIG. 270
ALTITUDE GAUGE**American Recording Gauge.**

A superior instrument for recording all pressures or vacuum. Features of construction include high grade 7-jewel clock enclosed in inner dustproof case, and improved fountain pen requiring filling only every 30 days. In writing, always state working pressure.

This company also makes ammonia recording gauges (pressure and vacuum); duplex recording gauges, for registering two distinct pressures on one chart; also, gauges fitted with special movements for 1, 12 and 48 hours and 7-day records, etc.

FIG. 287
AMERICAN RECORDING GAUGE**American Non-corrosive Locomotive, Steam Heat, and Duplex Air Brake Gauges.**

These gauges represent the very highest type of standard equipment. They are absolutely guaranteed against any defects and are constructed especially to meet Interstate Commerce Commission requirements. Phosphor bronze is used instead of brass; the movements are accordingly practically wearproof. Made to the following specifications:

Heavy seamless drawn tube, rigidly inspected before assembling. Cast phosphor bronze connection plates reinforced at bearing points. Hard rolled phosphor bronze shoulder connection screws. Segment face $\frac{1}{4}$ in. wide, cast from special phosphor bronze composition.

Phosphor bronze hair springs, segment shaft, and one-piece pinion and pinion shaft. Both shafts are fitted to top and bottom plates with deep phosphor bronze bushings.

Short, direct connection which lessens vibration and wear and makes these gauges very rigid. Ring screwed down to shoulder and felt ring, making a dustproof joint.

The dials are made of hard baked enamel, easy to read and keep clean.

Illuminated Dial Gauges.

All American gauges can be made with illuminated dials, for use in darkened or obscure places, if desired.

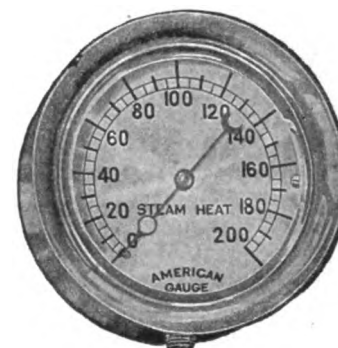
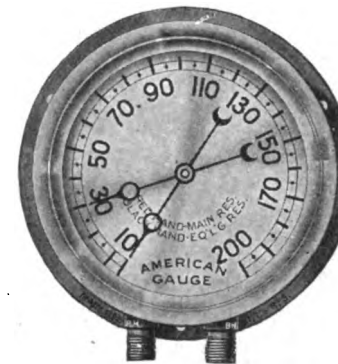
When Ordering Gauges.

(1) State figure number; (2) pressure and size of connection; (3) whether goods are to be iron, brass or nickelplated.

American Revolution Counter (Patented).

Operated by either a reciprocating or continuous rotary motion, counting *ahead* whichever way the shaft revolves. It works equally well on pumps where length of stroke varies, counter-crank being adjusted for shortest stroke. Construction details sent on application.

These counters are also made fitted in special oblong cases; also in square cases, for use with engines, pumps, grain scales, etc.

FIG. 264
LOCOMOTIVE GAUGEFIG. 266
STEAM HEAT GAUGEFIG. 265
DUPLEX AIR BRAKE GAUGEFIG. 284
REVOLUTION COUNTER

American Marine and Locomotive Clocks.

These 8-day clocks are made with ring hinged to case; fitted with lock and key, and any standard movement desired.

Designed for stationary plants, marine engines, locomotives, etc. Case is similar in style to that used on our standard gauges.

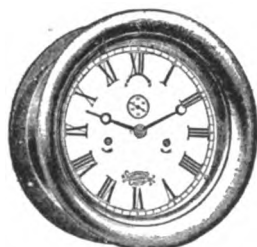


FIG. 282
MARINE AND LOCOMOTIVE CLOCK

American Gauge Boards.

For sets of instruments. Made in various shapes, of black walnut, cherry, mahogany, or plain oak boards; also of slate or marble.

For use in engine rooms of electric plants, steamships, mills, office buildings, mines, water works and factories.

American Dead Weight Gauge Tester (Patented).

This pump possesses all the advantages of the mercury column; enclosed in much smaller space; and eliminates use of test gauges, their repair and their return to factory for accuracy trials.

All tests are made with dead weights in 5-lb. units, furnished for any desired pressure up to 1,000 lbs.

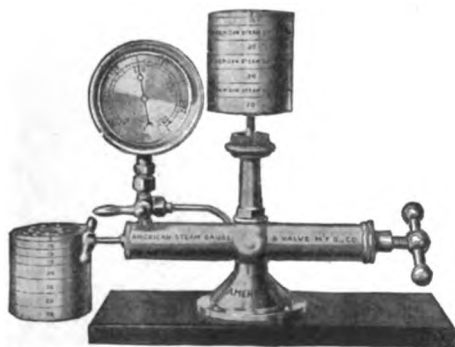


FIG. 312. DEAD WEIGHT GAUGE TESTER

Designed for testing all types of pressure gauges in railroad shops, mills, factories and other establishments where many gauges are in use. When shipped, pump is filled with a light mineral oil, ready for use. Directions for operating accompany each tester (Fig. 312).

Also made in the hydraulic types, for testing high pressure or hydraulic gauges. Equipped for pressures up to 5,000 and to 25,000 lbs. per sq. in.

Portable Gauge Testing Set.

These outfits are especially designed for the use of inspectors and traveling engineers.

Fig. 324 outfit has a test pump and a 3-in. test gauge with the following equipment: 1 hand puller, 1 hand set, 1 pair pliers, 1 screwdriver, and 2 connections of different lengths. Net weight, 9 lbs.



FIG. 324
PORTABLE GAUGE TESTING SET

American Thompson Improved Indicator.

Indicator shows graphically the exact conditions of pressure within cylinder, indicating adjustments in valve gear which may be required to insure economical operations and prolong life of engine.

Special Advantages—Indicator shows (1) pressure acting on piston; (2) drop in pressure between boiler and cylinder; (3) exact horsepower developed; (4) exact consumption of water; (5) waste of coal; (6) leaking piston and valve; (7) improperly set valve; (8) power demanded by full load; (9) power wasted at low load; (10) cost of running idle; (11) loss resulting from improper piping from boiler to engine and exhaust; and (12) like results in gas and ammonia work.

Drums—Made in sizes 1½ and 2 in.

Reducing Wheel Attachment—Wheel, made of aluminum, brass and steel, is to reduce accurately the motion of an engine crosshead to that required for a paper drum of an indicator.

Electrical Attachment—It consists of instruments furnished in pairs in a box, fitted with push button and two dry batteries.

Used in making tests of plants having two or more engines.

Ammonia Indicators—Standard construction is of all steel; 2-in. paper drum, ½-in. area piston. 1½-in. paper drum, ¼-in. area piston, can be furnished if required. Experience has taught us that all steel construction is best for ammonia work.

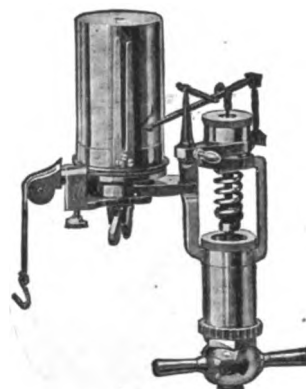


FIG. 477
Exposed Spring Indicator, Plain

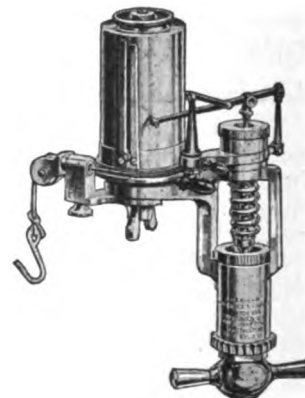


FIG. 478
Exposed Spring Indicator, with Detent Motion

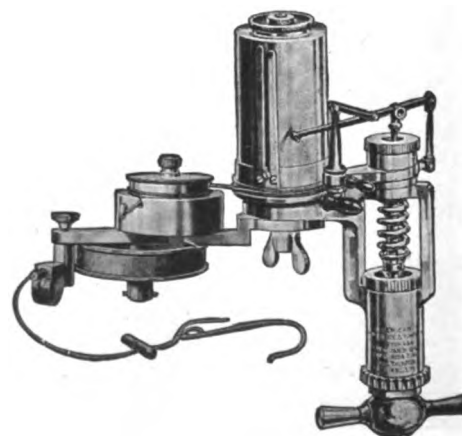


FIG. 479
Exposed Spring Indicator with Detent Motion and Ideal Reducing Wheel
AMERICAN THOMPSON IMPROVED INDICATORS

THE ASHTON VALVE COMPANY

Manufacturers of Pressure and Vacuum Gages

MAIN OFFICE AND WORKS

161 First Street, Cambridge 41
BOSTON, MASS.

BRANCHES

NEW YORK, N. Y., 137 Liberty Street

SAN FRANCISCO, CAL., 503 Mission Street

CHICAGO, ILL., 318 West Washington Street

Products.

PRESSURE and VACUUM GAGES.

For Pop Safety and Relief Valves, see page 1006.

Ashton Pressure and Vacuum Gages.

Ashton pressure and vacuum gages are conscientiously made of the best material. Solid drawn seamless tubes are used. The movements are non-corrosive, having German silver pinions and arbors. Each dial is accurately and separately made to exactly correspond with the spring and movement of the gage to which it is fitted. The graduations and figures are indented, so that they can be easily read, and will not wear off. The springs are well seasoned to prevent setting.

The No. 51 style pressure gage is commonly used on stationary boilers; is made in all sizes up to 24-in. diameter dial, and with either iron, brass or nickelplated case. The No. 52 style, with double spring, is similarly made; but more adapted for locomotive, marine or water pumping service where there is considerable vibration, or rapid fluctuation in pressure.

Recording pressure gages with 24-hour charts and graduated for any desired pressure are made in two styles, Nos. 73 and 74, and with brass or nickelplated cases. The latter is both registering and recording.

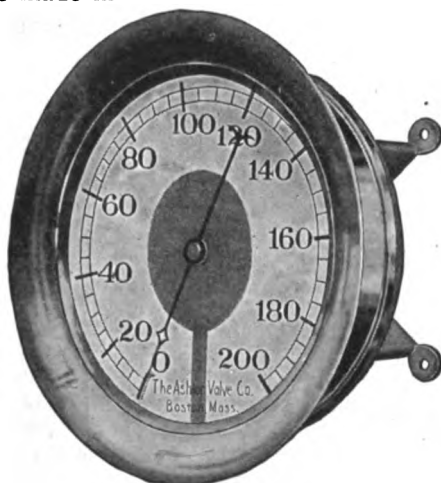
No. 69 is so constructed that an incandescent electric light may be placed behind it, and by means of a glass back the light is directed on to the ground glass dial. This is es-



NO. 51 PRESSURE GAGE



NO. 74 INDICATING AND RECORDING GAGE



NO. 69 ILLUMINATED DIAL GAGE

pecially valuable in poorly lighted boiler rooms, or for night operation.

No. 55 Ashton hydraulic pressure gage is constructed with heavy steel tube insuring great durability and accuracy. It is made suitable for any high pressure service over 1000 lbs. and with dial graduated in pounds pressure per sq. in. only, or tons on ram.



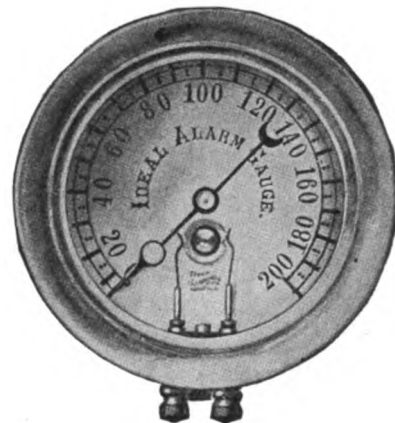
NO. 55 HYDRAULIC GAGE

No. 57 ammonia pressure gage is made with steel tube, and the other interior parts of iron. The dial is graduated to any desired maximum pressure, or pressure and vacuum. This gage is durable, accurate and sensitive in action, being guaranteed to give satisfactory service on any ammonia installation.



NO. 57 AMMONIA GAGE

No. 78 is a new design alarm gage combined with an automatic electric circuit closing attachment, which can be operated to give an electric bell alarm at any desired pressure and at any distance away from the gage.



NO. 78 IDEAL ALARM GAGE

Ashton Dead-Weight Gage Testers.

The Ashton dead-weight gage testers are made in several styles and capacities up to 1000 lbs. These furnish the most accurate and reliable method of testing pressure gages.

Engine Room Gage Frames and Tablets.

Furnished in slate, marble or wood, and in special designs of various dimensions to suit any required installation.



NO. 79 DEAD-WEIGHT GAGE TESTER

THE BRISTOL COMPANY

Recording Instruments
WATERBURY, CONN.

BRANCH OFFICES

BOSTON, MASS., Old South Building
PITTSBURGH, PA., Frick Building
CHICAGO, ILL., Monadnock Building

NEW YORK, N. Y., 114 Liberty Street
DETROIT, MICH., Book Building
ST. LOUIS, MO., Boatmen's Bank Building
SAN FRANCISCO, CAL., Rialto Building

Products.

BRISTOL'S RECORDING PRESSURE and VACUUM GAUGES; LIQUID LEVEL GAUGES; LONG DISTANCE TRANSMITTING and RECORDING SYSTEM; RECORDING THERMOMETERS; RECORDING PSYCHROMETERS; INDICATING and RECORDING ELECTRIC PYROMETERS; THERMOSTATS; TEMPERATURE CONTROLLERS; RECORDING VOLTMETERS, AMMETERS and WATTMETERS; RECORDING MILLIVOLTMETERS; ELECTRICAL and MECHANICAL TIME RECORDERS; RECORDING TACHOMETERS.

Also manufacturers of Recording Draft and Combination Gauges, Recording Shunt Ammeters, Frequency Meters, Counters, Bristol-Durand Radii Averaging Instruments.

For Belt Lacing, Safety Set Screws, etc., see page 1172.

Bristol's Recording Pressure and Vacuum Gauges.

For securing continuous night and day records of pressure or vacuum, for steam, air, gas and liquids. Charts furnished to read in pounds, ounces, inches, feet, metric or any desired units; for ranges from full vacuum to 12,000 lbs. per sq. in.

The construction of these instruments is extremely simple. On instruments for high ranges, the pen-arms are attached directly to the pressure tubes without employing gears, levers or other multiplying devices. The original form Model 11 case affords space for a long length of pen-arm with small angle of deflection to cover entire scale. Many instruments of this model have been in continuous service for 15 years without even being repaired.

Round form models can be furnished at somewhat lower prices than the original form.

Bristol's Recording Liquid Level Gauges.

For use where it is necessary or desirable to locate recording instruments at a higher or a lower level than the liquid to be measured. Especially valuable for automatically and continuously recording the depth or level of water or other liquids in tanks, water towers, reservoirs, etc. Differing from float gauges, these instruments are independent of freezing temperatures.

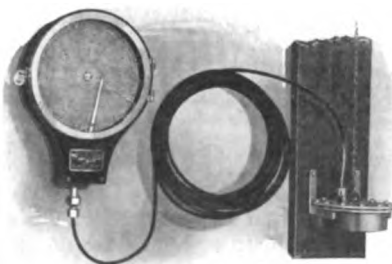
RECORDING LIQUID LEVEL GAUGE



RECORDING GAUGE
Original form—Model 11



RECORDING GAUGE
Round form—Model 60



TRADE-MARK
BRISTOL'S

REG. U. S. PAT. OFFICE

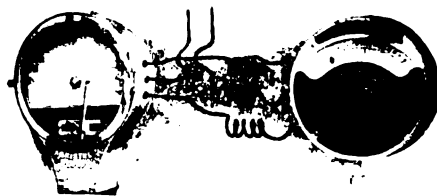
Bristol's Long Distance Transmitting and Recording System.

For transmitting electrically, over distances of many miles, records of pressure,

liquid level, temperature, mechanical motions, etc.

The needs for such an equipment are numerous in connection with water works,

central heating stations, hydro-electric plants, gas distribution systems, irrigation projects, etc.



LONG DISTANCE WATER LEVEL GAUGE

Bristol's Recording Thermometers.

For all commercial ranges of temperatures from 60° below zero to 800° Fahr.

Equipment furnished with plain sensitive bulb for use in dry kilns, etc. The bulb is located where the temperature is to be measured, and connected with flexible leads to the recorder, which may be placed in the most convenient location. Patented automatic compensators furnished when needed to insure accurate results.

Also furnished with bulbs having union and screw connections for recording temperatures of water or other liquids in closed spaces under pressure, such as boiler feed water, superheated steam, milk pasteurizers, etc.



RECORDING THERMOMETER
Model 311



RECORDING THERMOMETER
Moistureproof—Model 140

Bristol's Recording Wet and Dry Bulb Thermometers or Psychrometers.

For determining the degree of humidity or moisture in the atmosphere.

Two independent thermometers are mounted in one case and register on the same chart.

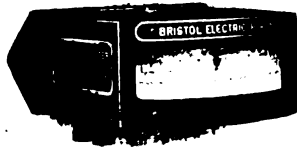
Equipped with a motor and fan, which keeps a good circulation of air over the bulbs. Also equipped with patented device for producing a continuous flow of water through wick to keep it moist.



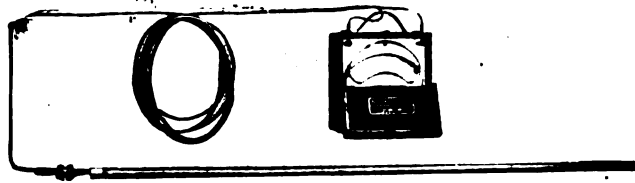
RECORDING
PSYCHROMETER

Bristol's Indicating and Recording Electric Pyrometers.

For ranges up to 3000° Fahr. The internal type cold end compensator exclusively applied to Bristol's pyrometers is one of the most radical improvements in thermo-electric pyrometry. High resistance Model 319 is especially suited for use in connection with furnaces for hardening high speed steel, also brick and pottery kilns and furnaces. Pyrometer may be installed a long distance



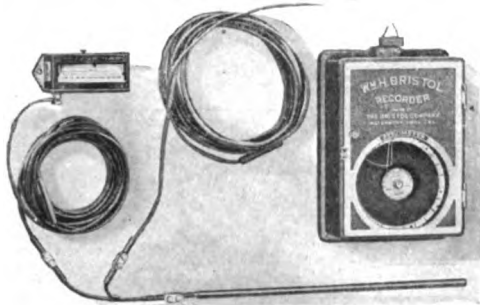
INDICATING PYROMETER
High resistance Model 319



PORTABLE INDICATING PYROMETER

from the furnace if desired. Portable instruments can be furnished, suitable for general checking both in shop and laboratory.

Combination units of Bristol's pyrometers are ex-



COMBINATION UNIT OF ELECTRIC PYROMETERS

tensively used, indicating instrument being located at the furnace to guide the operator, and recording instrument located in superintendent's office.

Bristol's Temperature Controllers.

For automatically controlling temperatures of ovens and furnaces heated by oil, gas or electricity. Models 176, 276 and 376 are used for temperatures up to 800° Fahr.; Model 473 for higher temperatures.

Bristol's Recording Electric Meters.

Bristol's recording voltmeters for all commercial ranges of D. C. and A. C. It is important to maintain uniform voltage for operating electric lights and for many other purposes. Records obtained with Bristol voltmeters show whether desired results are secured.



THERMOSTAT
Model 276



TEMPERATURE
CONTROLLER
Model 473 for high
temperatures



RECORDING VOLTMETER
Switchboard—Model 510

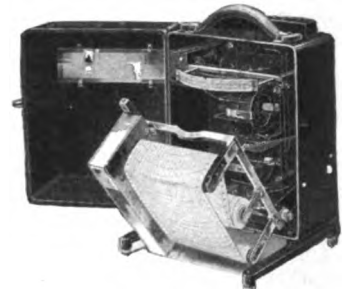


Fig. 573. RECORDING AMMETER
Portable—Model 612

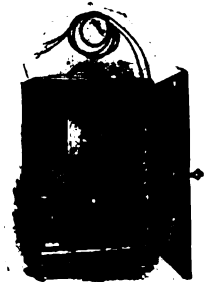
Bristol's recording ammeters, furnished in switchboard or portable type, provide continuous records of current on generator and feeder panels, for motor and transformer tests and to provide records of customers' current consumption.

Bristol's strip type recording wattmeter, portable model, designed for use on both polyphase and single phase alternating current. Convenient and practical for carrying about to points where it is desired to obtain records of consumption of electrical energy.

Bristol's recording millivoltmeters, equipped with high grade pivot jewel bearing movements, are extensively used for recording very minute potentials which are involved in electrolysis investigations.



RECORDING WATTMETER
Strip type—Model 725



RECORDING MILLI-
VOLTMETER
Portable type

Bristol's Operation Recorders.

For recording occurrence and duration of mechanical movements and machine operations.

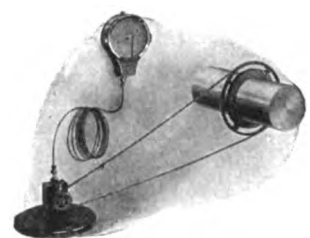
This strip type electric time recorder is designed to record 20 different operations on one chart. There are thousands of uses for this operation recorder in manufacturing plants. Easy to install.

Bristol's Recording Tachometers.

For recording speed of shafting, machines, engines, etc. Furnished in pneumatic type or electric for either A. C. or D. C. Simple in construction. Particularly suitable for use with paper machines and for use in connection with blowing engines at blast furnace plants.



ELECTRIC TIME
RECORDER
Strip type—Model 925



RECORDING TACHOMETER

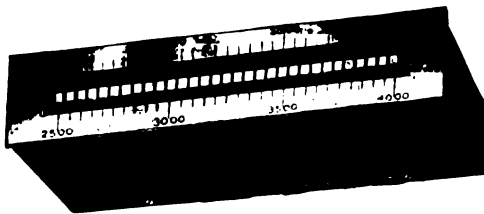
JAMES G. BIDDLE

Industrial and Scientific Instruments

1211-1213 Arch Street
PHILADELPHIA, PA.

Products.

"MEGGER" TESTING SETS and BRIDGE MEGGERS;
"JAGABI" HAND TACHOMETERS and HAND TACHOSCOPES; "FRAHM" VIBRATING-REED TACHOMETERS and FREQUENCY INDICATORS; "JAGABI" SLIDING-CONTACT VARIABLE RHEOSTATS.



"FRAHM" VIBRATING-REED HAND TACHOMETER
Bulletin 960

By merely holding in contact with machine under test, proper reed will vibrate. Made with one or two rows of reeds



"MEGGER" TESTING SET
Catalogue 940

For measuring insulation or conductor resistance directly in megohms or ohms. Portable, self-contained, rugged



"FRAHM" VIBRATING-REED TACHOMETER
Bulletin 955

For stationary mounting directly on machine. Indicates by means of a series of vibrating reeds tuned to respond to vibrations as received from machine. No gears, no belt, no electrical connections

Scope of Adaptability.

Biddle industrial and scientific instruments provide accurate means of securing technical information to aid in the efficient maintenance of all kinds of electrical equipment. These include:

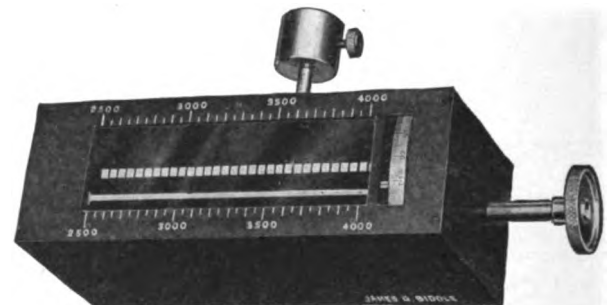
(1) Instruments for testing insulation resistance of generators, motors, transformers, switchboards, insulators, cables, feeders, interior wiring, etc.

(2) Frequency and speed indicating instruments for all purposes, especially for permanent mounting on steam turbines and other relatively high speed movers, and for service where portable meters are required.



"JAGABI" SLIDING CONTACT VARIABLE RHEOSTAT
Bulletin 885

Capacities up to 25 amperes. For regulating larger currents, compression carbon rheostat is recommended



"JAGABI" VIBROMETER
Bulletin 915

Tuned reeds with gauge to indicate amplitude of their vibration and provide means for comparison with vibration of machine



"JAGABI" MULTIRANGE
HAND TACHOMETER,
TYPE C
Bulletin 395

Operates on centrifugal principle. Indicator follows every variation as soon as point is applied to end of rotating shaft, showing r.p.m. on dial



"FRAHM" VIBRATING-REED FREQUENCY
INDICATOR
Bulletin 950

Reeds are actuated by an A.C. magnet which is excited from circuit, frequency of which is to be measured. Also made in portable type

THE BROWN INSTRUMENT COMPANY

Pyrometers, Thermometers and Recording Instruments

PHILADELPHIA, PA.

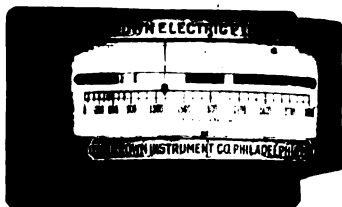
NEW YORK, 50 Church Street
DENVER, 1742 Champa Street
SAN FRANCISCO, 576 Mission Street

BRANCH OFFICES
PITTSBURGH, Oliver Building
CHICAGO, Conway Building
DETROIT, Ford Building

ST. LOUIS, Railway Exchange Building
LOS ANGELES, 363 New High Street
MONTREAL, CANADA, 223 Notre Dame Street, West

Products.

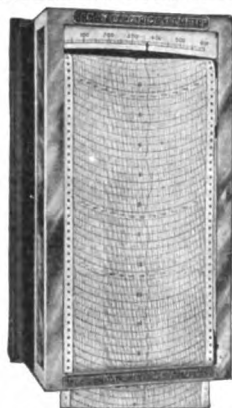
PYROMETERS; THERMOMETERS; GAUGES; TACHOMETERS and other SCIENTIFIC INSTRUMENTS.



HIGH RESISTANCE INDICATING PYROMETER



RECORDING PYROMETER



CONTINUOUS RECORDING PYROMETER



PORTABLE PYROMETER

High Resistance Indicating Pyrometer.

For measuring temperatures from 300° to 3000° Fahr. or equivalent centigrade. Operates on thermo-electric principle. Entirely unaffected by temperature changes along wire connecting thermo-couple to instrument. Also designed to automatically control or regulate temperatures of electric, gas or oil furnaces.

High Resistance Recording Pyrometer.

Keeps a continuous record, day and night, of temperatures. Eliminates guesswork. Gives executive a check on plant operation.

Continuous Recording Pyrometer.

Makes a continuous record of temperatures over a 2 months' period. It requires only the winding of an 8-day clock mechanism once a week. Made in types to record the temperature of 1, 2, 4, 6, 8 or 10 thermo-couples in different colors on one chart.

Portable Pyrometer.

Made in both high and low resistance types. Height, 7 in., width, 7 in., depth, 4½ in., weight, only 6½ lbs.

Recording Thermometers.

For measuring temperatures up to 800° Fahr. Operates on the principle of expansion of gas or liquid with change of temperature. Tubing can be 100 ft. long.

Readings are unaffected by atmospheric changes in temperature along tubing or at instrument. Makes a clear, accurate chart.



RECORDING THERMOMETER

Recording Pressure Gauge.

For recording all ranges of vacuum and pressure from a few ounces of water to 3000 lbs.

Operate through expansion or contraction of a helical hollow spring for high pressure and a series of diaphragms for lower pressures and vacuums. Positive and accurate.



RECORDING PRESSURE GAUGE

Time and Operation Recorder.

Extensively used for recording the time of operation of machinery, switches, valves, pumps and for recording the reversals of glass melting tanks, open hearth furnaces and annealing furnaces. Also for recording the time of starting and stopping of paper machines and other devices.



TIME AND OPERATION RECORDER

Other Brown Instruments.

Ammeters; draft gauges, electrical tachometers; mercurial tachometers; mercury gauges; milli-ammeters; milli-voltmeters; recording gauges; temperature controllers; mercurial thermometers; vacuum gauges; voltmeters; differential gauges.



BROWN ELECTRIC TACHOMETER



BROWN DRAFT GAUGE



BROWN MERCURIAL THERMOMETER INDUSTRIAL TYPE

THE FOXBORO CO., INC.

Manufacturers of Recording and Indicating Instruments

FOXBORO, MASS.

BRANCH OFFICES

NEW YORK, N. Y., 50 Church Street
CHICAGO, ILL., Monadnock Building
PITTSBURGH, PA., Park Building
PHILADELPHIA, PA., Stock Exchange Building

BIRMINGHAM, ALA., Brown-Marx Building
SAN FRANCISCO, CAL., 461 Market Street
TULSA, OKLA., 213 S. Cincinnati Avenue
MONTREAL, CAN., PEACOCK BROS.

Products.

FOXBORO RECORDING and INDICATING GAUGES for pressure and vacuum; RECORDING and INDICATING THERMOMETERS; RECORDING PSYCHROMETERS; AUTOMATIC TEMPERATURE RECORDER-CONTROLLERS; INDICATING and RECORDING LIQUID LEVEL GAUGES; DIFFERENTIAL PRESSURE RECORDERS; FLOW METERS for gas and liquids; RADIAL PLANIMETERS; REVOLUTION COUNTERS; CO₂ RECORDERS for flue gas analysis; GAUGE BOARDS.

Also manufacturers of Indicating and Recording Electric Pyrometers; Mechanical and Electric Time Recorders; Clocks; Indicating and Recording Tachometers; Siphon and Mercury Gauges; Air-speed Indicators; Airplane Thermometers.

Foxboro Gauges.

Recording—For steam, gas, water, air, oil, ammonia, brine, anything under vacuum or pressure; any range from full vacuum up to 20,000 lbs.; any unit of measurement: inches water, ounces, pounds, feet, metric units, etc. New inverted type does away with blotted records and dirty pen arms. All gauges are equipped with patented chart holder; micrometer adjustment pen arm; automatic release pen lifter. All cases round form and dust-tight.

Also 2-pen recording gauges furnished to record 2 separate pressures on one chart.

Bulletin BA-98-1.

Indicating—All movements are absolutely *non-corrosive* and independent of the case. Perfect alignment of working parts insures accuracy.

Ammonia gauges and hydraulic gauges for pressures over 1000 lbs. have nickel steel screwed tubes. Positively will not set or leak.

Bulletin BA-95-1.

Foxboro Thermometers.

Recording—Depend upon expansion of liquids, gas and the vapor tension of

volatile liquids for their action. Impossible to deteriorate with age.

No mercury used—effect of atmospheric conditions is thus eliminated. Connecting tube can be 300 ft. long and accurate results guaranteed.

The actuating movement is our improved helical tube movement. *No multiplying devices are used.*

Charts either even scale or increasing scale as desired.

Bulbs made to suit any kind of application. Special lead and acid resisting bulbs are made for the chemical industry.

Also 2-pen and 3-pen recording thermometers, to record on one chart 2 or 3 separate temperatures, can be supplied.

Bulletin No. BA-104-1.

Indicating—Designed to eliminate excessive breakage.

An instrument easy to read and of the long distance type as well as stem type.

No mercury—the same principle applies as in the recording thermometer.

Bulletin BA-104-1.

Foxboro Recording Psychrometers.

The principle is the same as in the recording thermometers, but there are 2 pens: one to record the dry bulb, and the other the wet bulb temperatures.

Furnished in 2 distinct types: self-contained, and long-distance as illustrated.

Applied successfully in many industries where drying is done, and where excess humidity is detrimental to production.

A special table furnished with each instrument makes determination of humidity very easy.

Bulletin BA-103-1.



RECORDING GAUGE
Sizes 8, 10 and 12 in. Any finish desired



INDICATING GAUGE
Sizes 2 to 24 in. Range, from full vacuum to 20,000 lbs. per sq. in.



RECORDING THERMOMETER
Sizes 8, 10 and 12 in. From — 60° to + 1000° Fahr., or corresponding ranges in Centigrade or Reaumur



INDICATING THERMOMETER
From — 25° to + 1000° Fahr., or corresponding degrees Centigrade or Reaumur



RECORDING PSYCHROMETER

Foxboro Automatic Temperature Recorder-Controller.

A new design in which the functions of two instruments have been combined and so co-ordinated that perfect synchronization is obtained. *The use of only one bulb to actuate both the recorder and the controller elements gives an accurate record of the controller operation.*



**AUTOMATIC TEMPERATURE
RECORDER-CONTROLLER**

Will operate valves from $\frac{1}{4}$ to 12 in. and on temperatures from -25° to $+1000^{\circ}$ Fahr. Set lever with crossarm at required temperature, and this temperature will be maintained automatically until setting is changed.



LIQUID LEVEL GAUGE



**DIFFERENTIAL
RECORDING GAUGE**
Guaranteed to give satisfactory results under pressures from 0 to 4-in. head of water and up to any desired differential pressure, and under static pressure up to 1000 lbs. per sq. in.

Valves designed to operate on either pressure or vacuum.

An improved form of rubber diaphragm motor is employed, which is so designed that, even under severe conditions, no undue stresses are set up in the diaphragm itself.

Bulletin BA-127 is all about this new instrument.

Foxboro Liquid Level Gauges.

Both indicating and recording types.

Primarily designed for recording varying levels of rivers, reservoirs, canals, forebays, tail races, etc.; but have been widely adopted for sewer work, weir measurements, and specific gravity recorders. Paper mills use them to record the height of stuff in Jordan stuff chests, etc.

They are not affected by ice formation; can be used on liquids other than water; guaranteed for accuracy and will be sent on trial.

Complete list in Bulletin No. BA-82-1.

Foxboro Differential Pressure Recorders and Orifice Meters for Gas.

The difference between two existing pressures can be accurately recorded by these instruments. Float type. Can not blow mercury.

Used extensively in connection with orifice plates, Pitot tubes and Venturi throats for measuring the flow of gases and liquids under pressure.

Complete orifice meters for measuring the flow of gases and liquids are supplied. A complete meter consists of a differential recorder, static pressure recording gauge, special flange union and orifice plate as shown. The

instruments are mounted on angle iron frame, with all necessary pipe fittings.

These meters are adaptable to many kinds of service.

Complete data in Bulletin No. BA-113.



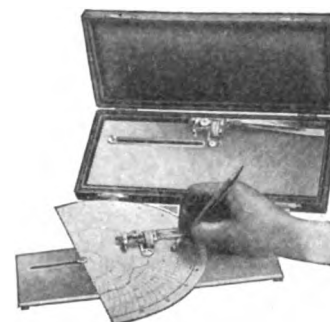
ORIFICE PLATE AND FLANGES

Foxboro Improved Radial Planimeters.

For averaging any kind of records on circular charts. A very convenient instrument. Gives mean ordinate in linear inches.

Made for us by Amsler & Son, Switzerland.

Complete information and instructions for use will be found in Bulletin BA-101.

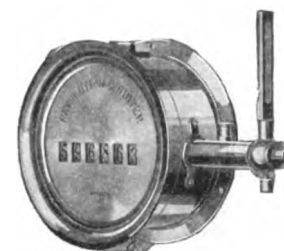


RADIAL PLANIMETER

Foxboro Revolution Counters.

For either right or left, rotary or reciprocating motions. Equipped with easily operated device for resetting to zero.

Can be built with capacity of 99,999,999. Round type furnished in sizes, 6, $8\frac{1}{2}$, 10 and 12 in. Send for Bulletin BA-95.



**REVOLUTION COUNTER
Round type**

Foxboro CO₂ Recorder.

Used for flue-gas analysis. Compact and rugged in construction. Simple, sure and accurate in operation. No rubber tubing to deteriorate. This is strictly a commercial machine and not a delicate laboratory instrument.

A neat dotted line on the chart shows amount of CO₂ in flue gas at a glance, affording ready means for observing the efficiency of firing.

Send for Bulletin BA-114.

Foxboro Gauge Boards.

This company is prepared to design and build to order neat attractive gauge boards for any combination of Foxboro instruments.

Complete proposals will be submitted on receipt of specifications.



CO₂ RECORDER

How to Specify.

Specify Foxboro recording and indicating instruments. Our Engineering Department is at your service.

PRECISION INSTRUMENT COMPANY

Recording and Indicating Instruments for Power and Gas Plants

FACTORY AND MAIN OFFICE

21 Halsey Street
NEWARK, N. J.

BRANCH OFFICE, DETROIT, MICH.

Products.

INDICATING and RECORDING GAUGES for Vacuum and Pressure, with scales in inches, pounds and millimeters of water, mercury and kerosene; COMBINED RECORDING and INDICATING GAUGES; DIFFERENTIAL DRAFT GAUGES; HYDRO-GAUGES; AUTOMATIC CO₂ RECORDERS, SO₂ RECORDERS; HAND ORSATS or FLUE GAS ANALYZERS; COAL CALORIMETERS; MICROMETER LEVEL GAUGES; RECORDING GAS CALORGRAPHS; SPECIFIC GRAVITY RECORDERS; LABORATORY TEST METERS.

Also manufacturers of Gas Collectors; Pitot Tubes; Venturi Tubes; Chemical Glassware.

Gauges.

Precision 2-in-1 Gauges—For use in natural draft boilers, showing the draft in the combustion chamber and the last pass or any other points of draft desired. Furnished in indicating or 24-hour recording types, in any range to meet requirements.



PRECISION 2-IN-1
INDICATING GAUGE



PRECISION 2-IN-1
RECORDING GAUGE

Precision 3-in-1 Gauges—For use with stokers with forced draft and are installed to enable the operating man to see at a glance the three vital points of draft in a boiler. Furnished in indicating or 24-hour recording types.



PRECISION 3-IN-1
INDICATING GAUGE



PRECISION 3-IN-1
RECORDING GAUGE

Precision 4-in-1 Gauges—For use in installations where an economizer is installed or with stokers having 2 compartments below the grates. All ranges to meet requirements.



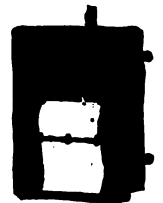
PRECISION 4-IN-1
INDICATING GAUGE

Precision 5-in-1 Gauges—For indicating the drafts in boilers where Cox or Harrington stokers are installed, enabling the fireman to read pressure and drafts at every part of the boiler. Dead beat construction under Precision patents.



PRECISION 5-IN-1
INDICATING GAUGE

Precision 60-day Tape Gauges—Supplied in ranges from 2-in. vacuum to any desired pressure. Dead beat construction. Used to record drafts at the boiler or steam pressure.



PRECISION
60-DAY TAPE
GAUGE

Precision Single Indicating Gauges—For indicating vacuums or pressures. Rugged in construction and of the well-known Precision dead beat type.

Supplied in inches, pounds and millimeters of water, mercury or kerosene.

Precision Hydro-Gauges—For gas plants are guaranteed accurate and reliable.



PRECISION SINGLE GAUGE

Precision 24-hour Recording Gauges—Guaranteed accurate. Dead beat construction. Ranges, 1 in. to 500 lbs. vacuum and pressure. In feet head for liquid levels. For coke oven use, can be supplied in millimeters of kerosene.



PRECISION 24-
HOUR RECORD-
ING GAUGE

CO₂ RECORDER**CO₂ Recorders.**

Automatically analyze flue gases and record on a 24-hour or 60-day chart. True orsat in principle. Reagent used is potassium hydroxide.

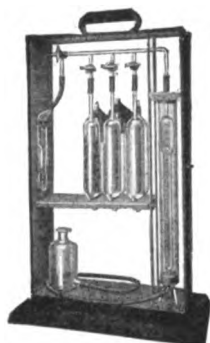
Simple in construction; accurate to .5 of 1% CO₂. Standard range, 0 to 20% CO₂. Also supplied in 0 to 10% for producer gas; 0 to 50% for blast furnaces and lime and cement kilns; 65% to 100% for soda ash manufacturers.

SO₂ Recorders.

Of the same general principle as CO₂ recorders, but adapted to analyze sulphur dioxide.

Standard Orsats.

Orsats in 1, 2, 3 and 4 tubes. Burettes graduated for 50 cc or 100 cc. All metal and glass construction. Analyze for CO₂, CO, O and H. Orsats for other readings can be supplied to specifications.

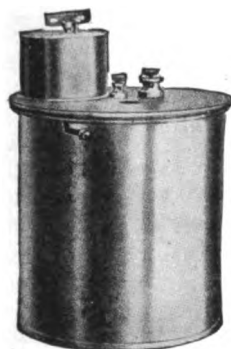


PRECISION 100 CC STANDARD ORSAT

Coal Calorimeters.

This company has been identified with the manufacture and sale of coal calorimeters for a number of years, and has developed simple and reliable patented instruments for determining the heating value of coal.

These instruments afford coal buyers the financial advantage of buying coal on a heating value basis from tests of coal offered for sale.



PRECISION COAL CALORIMETER

Combined Indicating and Recording Gauges.

Give the indication at a glance, also the permanent record of the condition on a 60-day tape chart. Made for either vacuum or pressure, direct reading or differential. Supplied with rewinding device for used chart, if desired. Case is of all-metal construction, black enamel. Bronze front furnished at extra cost.

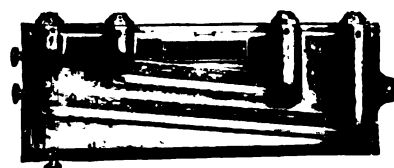


COMBINED INDICATING AND RECORDING GAUGE

Micrometer Level Gauges (Single and Double).

Combine rapid and accurate calibration with low maintenance and minimum chance of breakage. Absolutely

no strain is placed on the glass. Connection between glass and metal is through a simple seal.

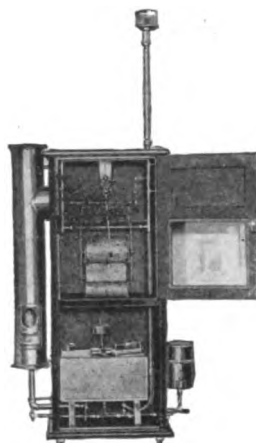


PRECISION DOUBLE MICROMETER LEVEL GAUGE

Recording Calorographs.

For recording on a 60-day chart the British thermal units of artificial, natural or producer gas. Automatically compensate for variations in temperature, specific gravity and pressure.

Accurate and reliable. Simple in construction and give permanent record.



PRECISION RECORDING CALOROGRAPH

Specific Gravity Recorders.

These instruments automatically record specific gravity of gases and are applicable for natural gas, producer gas, artificial gas and in the oil and gasoline fields.

They are accurate, simple and reliable.

24-hour disc or tape types.



PRECISION SPECIFIC GRAVITY RECORDER



LABORATORY TEST METER

Laboratory Test Meters.

Made in one general type as illustrated, with all brass construction to resist corrosion. Capacity, $\frac{1}{10}$ of 1 cu. ft. per revolution. Read fractional quantities direct.

Some Users of Precision Gauges.

Alabama Power Co., Benoit, Ala.
American Gas & Electric Co., Wellsburg, W. Va.
American Railways Co., Philadelphia, Pa.
Baltimore & Ohio Railroad, Baltimore, Md.
B. F. Goodrich Co., Akron, Ohio
Connecticut Light & Power Co., Waterbury, Conn.
Consolidated Gas & Electric Light & Power Co., Baltimore, Md.
Edison Electric Illuminating Co., Boston, Mass.
Endicott, Johnson Co., Endicott, N. Y.
Interborough Rapid Transit Co., New York, N. Y.
Lehigh Valley Transit Co., Allentown, Pa.
Little Rock Railway & Electric Co., Little Rock, Ark.
Louisville Gas & Electric Co., Louisville, Ky.
Midvale Steel Co., Philadelphia, Pa.
Minneapolis General Electric Co., Minneapolis, Minn.
National Tube Co., Lorain, Ohio
Pittsburgh & West Virginia Railways, Pittsburgh, Pa.
Tennessee Coal & Iron Co., Birmingham, Ala.
United Gas & Electric Corp., New York, N. Y.
Union Electric Light & Power Co., St. Louis, Mo.
West Penn Traction Co., Connellsville, Pa.

HOSKINS MANUFACTURING COMPANY

Pyrometers, Electric Furnaces and Heat Resistant Alloys

Buchanan Street and Lawton Avenue
DETROIT, MICH.

SALES OFFICES

BOSTON, MASS., Tremont Building
PITTSBURGH, PA., Oliver Building
SAN FRANCISCO, CAL., Sheldon Building

NEW YORK, N. Y., Grand Central Terminal
CHICAGO, ILL., Otis Building
CLEVELAND, OHIO, Sloan Building

Products.

PYROMETERS; ELECTRIC HEAT TREATING FURNACES; "CHROMEL" HEAT RESISTANT ALLOYS in the form of Wire and Castings.

Indicating and Recording Pyrometers.

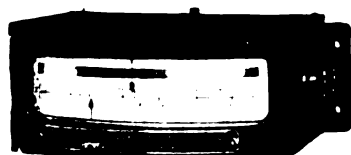
The main feature of Hoskins pyrometers is the fact that the user can make his own thermo-couples.

The advantages of this are understood when it is realized that this is practically the only part of the pyrometer equipment requiring renewal. Complete details about this feature and the instruments themselves are given in Catalogue 3-S.

Hoskins pyrometers of the indicating type, high resistance design, are provided with both milli-volt and temperature scales, supplied in ranges of 1000°, 1500°, 2000° and 2500° Fahr., and the equivalent Centigrade scales.

The recording pyrometer illustrated here makes a single 12- or 24-hour continuous temperature record. It records every 30 seconds, a metal point being pressed against a carbon sheet at the back of a translucent chart, thus making a series of dots. No ink is used.

Hoskins multiple recording pyrometer, not illustrated here, will make any number of temperature records from 1 to 10. Supplied in ranges of 1000°, 2000° and 2500° Fahr. The record appears very distinctly as a series of red inked dots on a green chart.



INDICATING PYROMETER,
TYPE HE



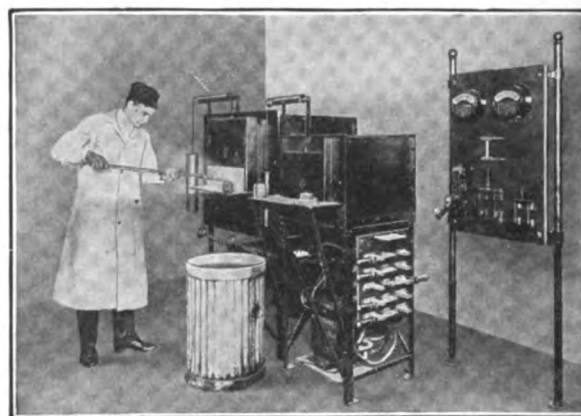
PORTABLE PYROMETER,
TYPE HA



RECORDING PYROMETER,
TYPE HR

Electric Furnaces.

The chief advantage of these furnaces is the very close and easy control of the temperature, and the practical elimination of "scale" on the parts being heat treated. They are especially advantageous in the heat treatment of tools and other small metal parts. The furnaces shown here are described in detail in Catalogues 80 and 101-S.



HOSKINS ELECTRIC HEAT TREATING FURNACES

Type FB—This furnace is the one shown on the right in the above illustration. Its maximum safe operating temperature is about 2000° Fahr., and its most common use is for the heat treatment of carbon steel parts or for preheating high speed steel. It operates only on alternating current, 110-, 220- or 440-volt line, and requires the use of a transformer. The temperature is controlled by a series of selective switches, shown mounted on the furnace stand. Made in muffle, crucible and tube designs.

DATA, TYPE FB MUFFLE FURNACE

Type and number	Chamber dimensions			Full load, kw.
	Width	Height	Length	
FB-202	4 1/4"	3"	9"	2.75
FB-204	7 3/8"	5"	12 1/2"	6.00
FB-205	12"	5"	12 1/2"	8.00
FB-206	12"	8"	19"	12.50
FB-207	12"	8"	26"	15.00
FB-208	12"	8"	33"	20.00

FB-202 requires the use of a rheostat, but the other sizes, FB-204 to FB-208 inclusive, do not.

Large furnaces can be supplied for heavy production.

Type FC—The Type FC furnace is the one shown at the left in the above illustration. In the muffle design, it produces temperatures up to 2500° Cent. and is designed primarily for the heat treatment of high speed steel. It operates on alternating current only and requires a transformer. The resistor material is a series of carbon strips, and by controlling the pressure of these plates against each other, the temperature can be very closely regulated.

DATA, TYPE FC MUFFLE FURNACE

Type and number	Chamber dimensions			Full load, kw.
	Width	Height	Length	
FC-204	6 1/4"	5"	12"	15.0
FC-206	12"	8"	18"	30.0

"Chromel" Castings.

"Chromel" is a pure nickel-chromium alloy that resists oxidation better than any other known commercial metal used for high temperature work. Tell us the problem.

PRECISION THERMOMETER & INSTRUMENT CO.

1434 Brandywine Street
PHILADELPHIA, PA.

Products.

"PRINCO" PRODUCTS which include:

THERMOMETERS for Laboratory, Factory and Power Plants; HYDROMETERS; HYGROMETERS; BAROMETERS; AUTOMATIC REGULATORS; VACUUM GAGES; CALENDER MICROMETERS.

Also manufacturers of Meteorological Instruments, Anemometers and Pyrometers.

PRECISION INSTRUMENT WORK—special and experimental.

Automatic Regulators.

Electrical for heavy duty.

Barometers (Government Standard).

Mercurial standard U. S. W. B. type.

Hydrometers.

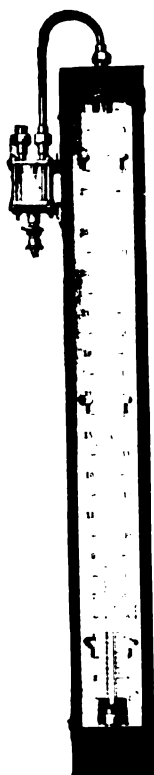
Plain and combination standard grades only, with individually calibrated hand written scales.

Hygrometers (Government Standard).

Wet and dry bulb hygrometers for the accurate determination of relative humidity.

Vacuum Gages.

Full column mercurial gages with trap.



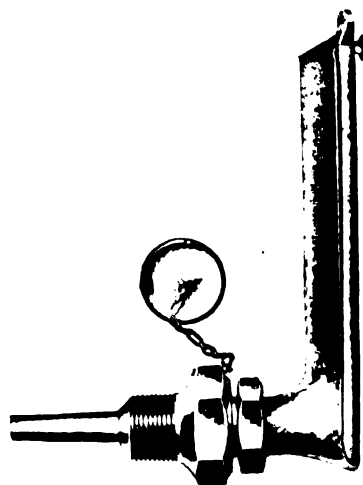
VACUUM
GAGE
Catalogue
No. 395

Calender Micrometers.

Indicating and recording, for use on calendering machines to indicate the thickness of paper, linoleums, etc.

Low Temperature Thermometers

Special chemical thermometers reading to—100 C. filled with tuluol, and to—200 C. filled with pentane.



Side View
"PRINCO" PRECISION TYPE THERMOMETER WITH SEPARABLE SOCKETS
Catalogue No. 333

Thermometers (Navy Standard).

Navy Department, Bureau of Steam Engineering, standard type thermometers.

Thermometers (Government Standard).

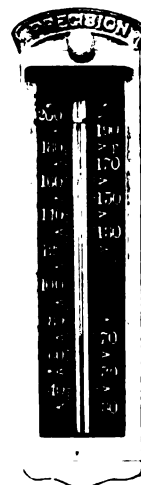
Armored	Glass angle	Pipe straight
Asphalt testing	Glass straight	Pocket
Bakers	Iron angle	Precision
Bake oven	Iron straight	Railway
Brass case	Japanning oven	Registering
Brine pipe	Kettle	Shiphold
Calorimeter	Laboratory	Size's registering
Cellar	Marine	Sterilizing
Chemical	Mash tub	Sugar
Cold storage	Mash pipe	Tin case
Cold test	Maximum	Standard
Confectioners	Maximum and minimum	Titer test
Copper case	Oil	Vulcanizing
Distillers	Oven	Weather bureau
Dough testing	Pasteurizer	
Electric alarm	Pipe angle	
Engineers		

Co-operative Service.

We also make many instruments to meet special requirements and do experimental Precision instrument work of all kinds.

Information with reference to prices and deliveries will be promptly and cheerfully furnished.

The catalogues which list and illustrate the products are, Bulletin "C," covering chemical thermometers, barometers, hygrometers, hydrometers and vacuum gages, and Bulletin "E," covering engineer's thermometers of all kinds. These will gladly be mailed on request.



Front View
"PRINCO" PRECISION TYPE THERMOMETER WITH SEPARABLE SOCKETS
Catalogue No. 333



KETTLE
THERMOMETER
Catalogue
No. 320

TAYLOR INSTRUMENT COMPANIES

Manufacturers of Industrial Thermometers, Regulators and Pyrometers

ROCHESTER, N. Y.

BRANCHES

NEW YORK, N. Y.

BOSTON, MASS.

CHICAGO, ILL.

WASHINGTON, D. C.

ST. LOUIS, MO.

PHILADELPHIA, PA.

TORONTO, CANADA

Products.

AUTOMATIC TEMPERATURE REGULATORS.

THERMOMETERS: Recording; Index Tycos Thermometers for any industrial application; Engraved Stem.

GAUGES: Recording, Mercury Column, Vacuum, and Absolute Pressure; Draft; Air Blast; Gas Pressure.

TEMPERATURE CONTROLS; ANEROID and RECORDING BAROMETERS; HYGROMETERS; AIRMETERS and ANEMOMETERS; HYDROMETERS; PYROMETERS.

Also manufacturers of Brine and Cold Storage, and Melting Tank Thermometers.

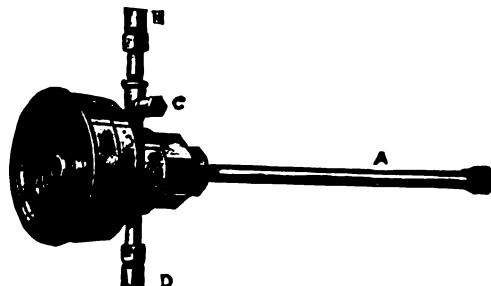


FIG. 1. TYCOS AUTOMATIC TEMPERATURE REGULATOR

For closed or open hot water tanks, for hot water house heaters, combined hot water tanks and heaters, plating baths, potash tanks, dye vats, vulcanizers, retorts, etc.

Furnished for operation with water or air pressure



FIG. 2. DUBL-DUTY TYPE TEMPERATURE REGULATOR

Furnished with flexible capillary tubing.

Case of regulator can be mounted at considerable distance from apparatus under control.

Controls temperature with bulb K-1 and discharges water of condensation from heater or coils with bulb K. Operates with compressed air



FIG. 3. TYCOS TEMPERATURE CONTROL, ELECTRIC CONTACT TYPE

For automatically controlling temperature of electrically heated apparatus, especially within limits of 40° below zero to 1000° above zero Fahr.



FIG. 4. Indicating TYCOS THERMOMETERS, CAPILLARY FORM

Can be supplied with any range of temperature within the limits of 40° below zero to 1000° above zero Fahr.

Fig. 5 has pen arm equipped with patent seal, which prevents adjustment by unauthorized persons. Chart is of practical dimensions with uniform scaling as wide as on so-called 12-in. charts



FIG. 5. Recording TYCOS THERMOMETERS, CAPILLARY FORM



FIG. 6. TYCOS PRESSURE AND VACUUM RECORDING GAUGE

Built with same case, clock movement, size chart, sealing device, etc., as used with Tycos recording thermometers, thus where mounted together, the two instruments harmonize



FIG. 7. TYCOS TRAVELING RECORDING THERMOMETER

Adapted for taking temperatures in pasteurizers where instrument is fully immersed. Every fluctuation of temperature that occurs in the product is recorded on revolving chart in the case, giving a continuous temperature record for every stage of the pasteurization process



FIG. 8. TYCOS RECORDING THERMOMETER, SELF-CONTAINED FORM

Specially adapted for recording indoor air temperatures.

Bulb or sensitive member inside of case. Sides of case well perforated to allow free circulation of air, making instrument sensitive



FIG. 9. TYCOS BI-RECORD RECORDING THERMOMETER

For obtaining temperature drop on brine, ammonia and hot water circulating systems.

2 pens, 2 flexible tubes and 2 bulbs. The 2 systems operate independently and continuous records of the temperatures to which bulbs are subjected are provided

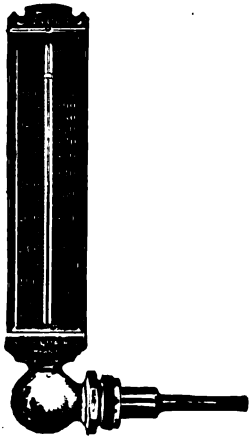


FIG. 10. Right Side Angle Form

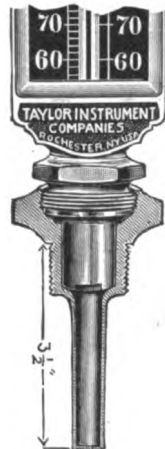


FIG. 11. Separable Socket Connection



FIG. 12. Union Connection, Pipe Threaded Hub Form

TYCOS ANGLE AND STRAIGHT STEM THERMOMETERS

Furnished in straight or variable angle stem and with vertical, inclined or reclining face forms.

Made in 3 scale-case sizes for 7-, 9- and 12-in. scale lengths. Intermediate and high range scales for superheated steam are in 12-in. case only. Flue gas thermometers made with 12-in. case and scale range of 210° to 950° Fahr. with 30-in. stem. Made with separable socket connection and union threaded hub connection as illustrated



FIG. 13. ARMORED ENGRAVED STEM THERMOMETER



FIG. 14. TYCOS HYDROMETER

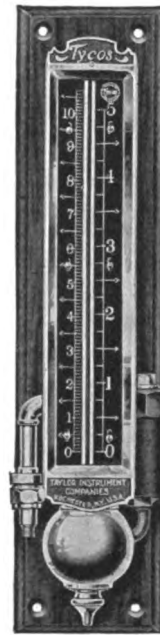


FIG. 15. Absolute Pressure
Indicates actual pressure of air remaining in vacuum apparatus

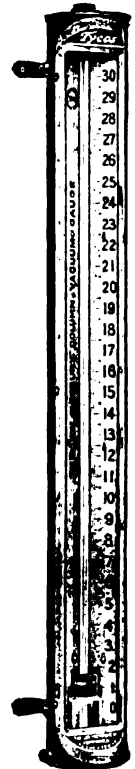


FIG. 16. Vacuum Pressure
Measure extent of existing vacuum below atmosphere

TYCOS MERCURY COLUMN GAUGES

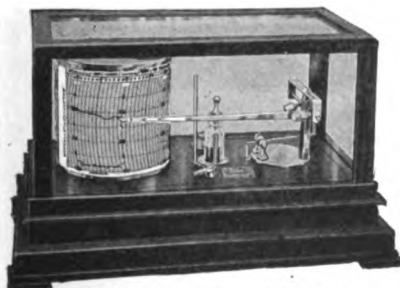


FIG. 17. TYCOS RECORDING BAROMETER

Indicating barometers furnished in brass case, compensated for temperature, also recording barometers which not only indicate present time atmospheric pressure but give a continuous record of every fluctuation in pressure for 7 consecutive days.

Adopted by U. S. Navy and U. S. Weather Bureaus



FIG. 18. TYCOS AIRMETER

Airmeters and anemometers made for measurement of air currents.

Equipped with disconnectors, patent zero setting attachments, jewelled movements, charts of correction, leather cases, etc.



FIG. 19. TYCOS ALTITUDE ANEROID

For ascertaining variations in gradients and levels and for measurement of hills and mountains. 2 1/4-in. diameter with silvered dial.

Adopted by U. S. Weather Bureau, U. S. Forest Service, U. S. Geological Survey, etc.



FIG. 20. TYCOS HIGH RESISTANCE WALL TYPE INDICATING PYROMETER



FIG. 21. TYCOS THREAD TYPE RECORDING PYROMETER
Rare metal and base metal, 50-day chart



FIG. 22. TYCOS PÉRY RADIATION PYROMETER

For long distance measurement of high temperatures. Temperature ranges are 800° to 2400° Fahr. and 1600° to 3000° Fahr. Centigrade and special scales also furnished



FIG. 23. TYCOS OPTICAL PYROMETERS

Like the Péry pyrometers these measure high temperatures at long distance. Made in three temperature ranges between 1300° and 4500° Fahr.

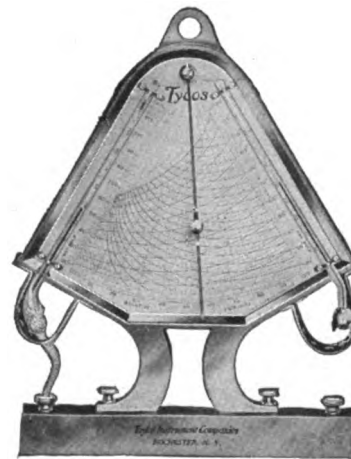


FIG. 24. Hanging Type Hygrodeik

Thermometer tubes mounted on chart, on side margins of which temperature scales are engraved. These correspond closely with accurate scales engraved on thermometers. Relative humidity, dew point and absolute humidity can be read off chart without reference to tables

TYCOS WET AND DRY BULB HYGROMETERS

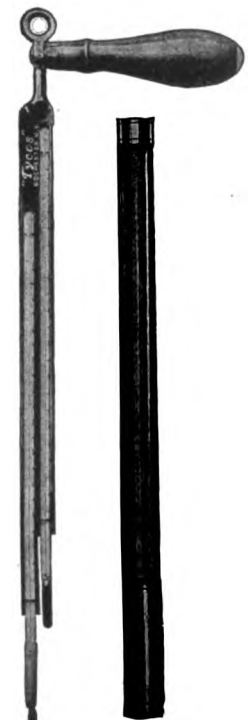


FIG. 25. Sling Psychrometer or Hygrometer

Tests made quickly and readings accurately obtained, as in whirling bulbs, they are subjected to a perfect circulation

THE SCHAEFFER & BUDENBERG MFG. CO.

Instruments for Measuring Pressure, Temperature, Power and Speed

MAIN OFFICE AND WORKS

BROOKLYN, N. Y.

BRANCH OFFICES

LOS ANGELES, CAL.

CHICAGO, ILL.

PITTSBURGH, PA.

PHILADELPHIA, PA.

Products.

GAUGES: Pressure, Vacuum and "Redline" Differential and "U" Draft.

RECORDING GAUGES: "Columbia" and "Schaeffer." GAUGE TESTERS.

INDICATING THERMOMETERS: "Crescent" and "Reform."

RECORDING THERMOMETERS: "Columbia" and "Schaeffer."

TACHOMETERS: Hand and Stationary.

COUNTERS: Indicating and Recording.

OPERATION RECORDERS.

CALORIMETERS: "Carpenter's" Separating and Throttling Steam.

Also Gauge Boards and Complete Equipment.

Gauges.

A complete line of pressure, vacuum and draft gauges for all purposes. Constructed on most approved principles with the best of material and workmanship.

Catalogue S-C 1.



GAUGE

Recording Gauges.

For accurately recording all pressure, vacuum or draft "Columbia" and "Schaeffer" recording gauges will meet the most exacting requirements.

The "Columbia" is furnished with "COLUMBIA" RECORDING GAUGE 8-in. or 12-in. charts making one revolution in 24 hours, 7 days, or other time periods.

The diameter of the "Schaeffer" chart is approximately 7½ ins.

Equipped with "Day and Night" border charts, removable and adjustable recording pen arm, non-corrosive and non-spilling glass pens, etc.

Catalogue S-C 100.

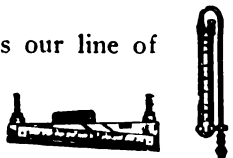


"COLUMBIA" RECORDING GAUGE

Draft Gauges.

In many designs and types is our line of gauges for measuring draft. Two of the most commonly used are here shown. Catalogue shows them all.

Catalogue S-C 75.



"Redline" Differential Type DRAFT GAUGES "U" Type

Gauge Testers.

Gauges must be accurate at all times and should, therefore, be periodically tested. Among the many types of S & B gauge testers for testing gauges of all types and capacity, there is sure to be an apparatus that is compatible with every need.

Catalogue S-C 50.

Calorimeters.

For determining the percentage of moisture in steam (which is an important factor in power plant testing) our throttling and separating calorimeters, designed by Prof. R. C. Carpenter, of mechanical engi-

neering fame, are used and recommended by most eminent mechanical engineers.

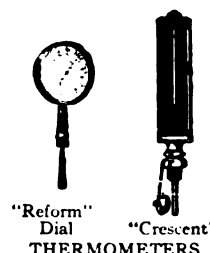
Catalogue S-C 700.

Thermometers.

Among our line of high grade "Crescent" thermometers will be found those used in every industry. Also other types of thermometers for diverse industrial requirements.

Also the "Reform" mercury-actuated dial face thermometer which can be had with rigid back or bottom connection or with flexible connection and for any temperature range up to 1000° Fahr.

Catalogue S-C 200.



"Reform" Dial "Crescent" THERMOMETERS

Recording Thermometers.

Give authentic records of temperature up to 1000° Fahr.

The "Columbia" has won universal approbation for its accuracy and durability. The "Schaeffer" is a less expensive offspring of the "Columbia." The latter can be furnished with 8-in. or 12-in. charts; the Schaeffer with chart approximately 7½ ins. in diameter.

Principal features of our recorders are mercury actuated, rugged construction, compensated, removable and adjustable recording pen arm, special insulation protecting the steel connecting tubing, "Day and Night" border charts, non-corrosive non-spilling glass recorder pens, etc.

Catalogue S-C 300.

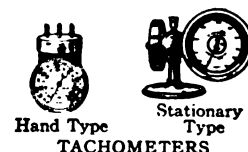


"COLUMBIA" RECORDING THERMOMETER

Tachometers.

For measuring speeds of shaftings, machines, motors, turbines, etc., directly in revolutions per minute, our line of American made tachometers is complete. Hand tachometers in several styles. Stationary tachometers for permanent connection of both indicating and recording types for all applications.

Catalogue S-C 23.



Hand Type Stationary Type TACHOMETERS

Counters.

Indicating and recording counters for diverse requirements, as well as operation recorders for recording the frequency, time of occurrence and duration of all mechanical operations, are illustrated in catalogue.

We are equipped to build special counters for special requirements.

Catalogue S-C 600.



SQUARE CASE COUNTER



ENGINE REGISTER COUNTER

THWING INSTRUMENT COMPANY

3352 Lancaster Avenue
PHILADELPHIA, PA.

BRANCHES

BOSTON, MASS., 141 Milk Street
CLEVELAND, OHIO, 10312 Olivet Avenue
CHICAGO, ILL., 342 Monadnock Block
DETROIT, MICH., 417 Lightner Building
LOS ANGELES, CAL., 716 South Hill Street

NEW YORK, N. Y., Grand Central Palace
PITTSBURGH, PA., 816 Ivy Street
SAN FRANCISCO, CAL., 155 Second Street
SEATTLE, WASH., 635 Burke Building
TORONTO, CAN., 227 Davenport Road

Products.

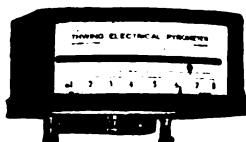
THWING THERMO-ELECTRIC and RADIATION PYROMETERS; RESISTANCE THERMOMETERS; INDICATING and SINGLE and MULTIPLE RECORDING SYSTEMS for measuring all temperatures between -250° to 3000° Cent. (-420° to 5500° Fahr.).

Thwing Multiple Recording System.

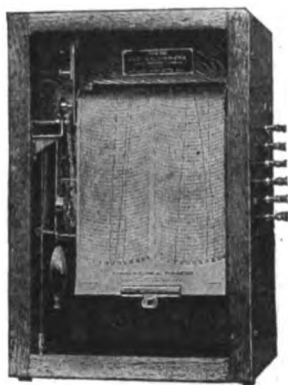
A Thwing multiple-record indicating and recording pyrometer system is a real necessity wherever heat conditions are to be measured or controlled.

The recorder in the office keeps the conditions at every heat source constantly under the manager's observation, warns of irregularities, checks inexperienced men, detects the shirkers and gives *permanent* records. These records afford the best possible means of determining and duplicating the ideal time and heat relation for perfect product, minimum fuel consumption and for maximum plant capacity, through completion of the process in the shortest possible time. The Thwing multiple system of recording produces 1 to 12 records on a single chart and thereby avoids extra expense of additional instruments, charts, etc.

The indicators at the heat sources enable attendants to keep their fires right at all times to avoid losses from overheating or underheating.



WALL PATTERN INDICATOR



6-RECORD RECORDER

Thwing pyrometers are made in the following types:

Type "A" (Thermo-electric)—For temperatures from 100° Cent. (200° Fahr.) to 1600° Cent. (2900° Fahr.).

Operation is based upon measurement of the electric current generated by insertion of the "hot end" of a thermo-couple into the temperature to be measured.

The thermo-couple is made of base metal or platinum, with outer protection of fused quartz, porcelain, clay, iron, etc., as conditions require, and when installed as directed will give continuously accurate results with very low expense for renewals.

Type "B" (Radiation)—For temperatures from 500° Cent. (925° Fahr.) to 3000° Cent. (5500° Fahr.).

This is the quickest acting pyrometer made and is

accurate to the highest temperatures. No part enters the fire nor does the operator have to get uncomfortably close to the heat. The construction is simple, practical and very durable; and as no focusing, leveling or reference to tables is required, readings can be taken in rapid succession.

Made for both portable and stationary use and particularly desirable for reading temperatures in furnaces, ovens, kilns, fire pits and within moving molten metal and other material.

Type "C" Resistance Thermometer—

For temperatures from -250° Cent. (-420° Fahr.) to 200° Cent. (400° Fahr.) and in special cases up to 425° Cent. (800° Fahr.).

This instrument is based upon measurement of the resistance to an electric current passing through a bulb of fine wire located at the point of temperature measurement. The resistance type is most used for measuring low temperature where the cold ends of a thermo-couple can not easily be kept at constant temperature.

Engineering Service.

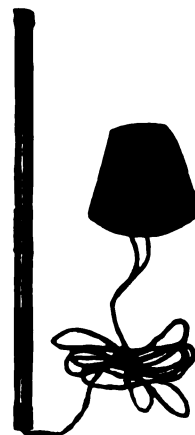
Wide experience and records of performance in about every imaginable temperature measurement peculiarly fit this company to offer correct advice. Gladly and *without charge* special reports will be rendered and desirable arrangements for difficult conditions suggested.

Literature.

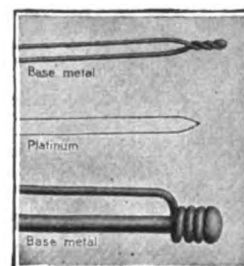
Literature with detailed description of any type of Thwing instrument and giving valuable hints on pyrometer selection and use will be sent free on request.



GOLD MEDAL AWARD
PANAMA-PACIFIC EXPOSITION, 1915



PORTABLE RADIATION PYROMETER



THERMO COUPLES

UEHLING INSTRUMENT COMPANY

Power Plant Economy Apparatus

CABLE ADDRESS
"UEHLINCO, NEW YORK"

2016 Empire Building
NEW YORK, N. Y.

BRANCH OFFICES, BOSTON AND CHICAGO

Products.

Manufacturers of RECORDING INSTRUMENTS, which include Uehling CO₂ Recording Equipment; Combined CO₂ and Temperature Recorders; Combined Barometer and Vacuum Recorders; Absolute Pressure Indicators; Pressure and Vacuum Recorders.

Also manufacturers of Hand CO₂ Machines, Pyrometers, Waste Meters, Differential Pressure Recorders, Draft Recorders and Indicators, Revolution Recorders, etc.

Uehling CO₂ Recording Equipment.

Uehling CO₂ recording equipment provides the simplest means for keeping continuous check on the fuel wasted up the chimney.

It is made up in both single and multiple form for either one boiler or a battery. With each unit is included a recorder which can be located in the office of the chief engineer or superintendent, and an auxiliary CO₂ indicator which can be located at the boiler front for the fireman's guidance, by means of which he can be held responsible for the record produced and thus for the fuel wasted up the chimney.

The continuous and uninterrupted record is made on an 8-in. circular chart, or on a rectilinear chart if desirable.

Absolute Pressure Indicator.

The fact that the accuracy of all vacuum measuring devices is affected by any change in barometric pressure led to the development of the Uehling absolute pressure indicator, which measures the absolute pressure in any chamber and is entirely independent of any change in atmospheric pressure.

Mercury is used as the indicating medium.

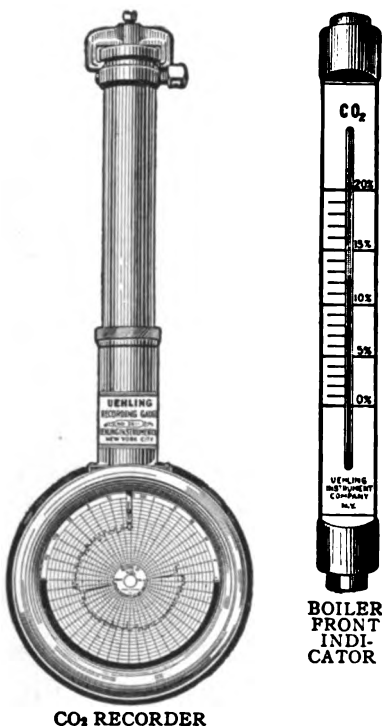


Uehling Recording Instruments.

The distinctive features of Uehling recording instruments are simplicity, accuracy and reliability. They are based on the hydrostatic principle, by the application of which all springs, levers and joint movements are avoided.

In addition to these important advantages, the hydrostatic principle permits of making the scale open between the limits where the readings are important and narrow where they are unimportant, or eliminating that part of the scale altogether which is of no use, thus utilizing the whole width of the chart for important readings.

The foregoing principles are illustrated by the drawings of Uehling vacuum recorder and Uehling pressure recorder reproduced herewith.

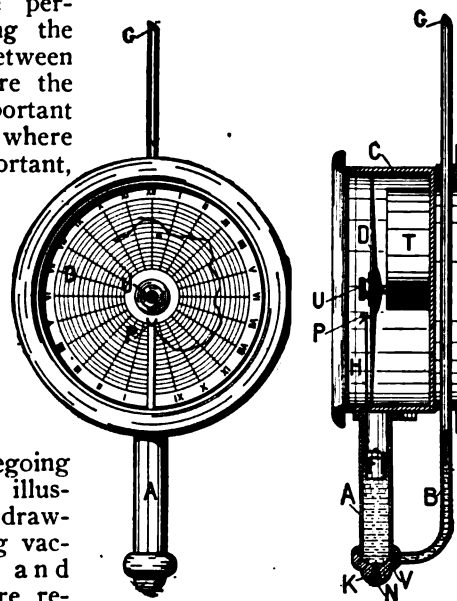


CO₂ RECORDER

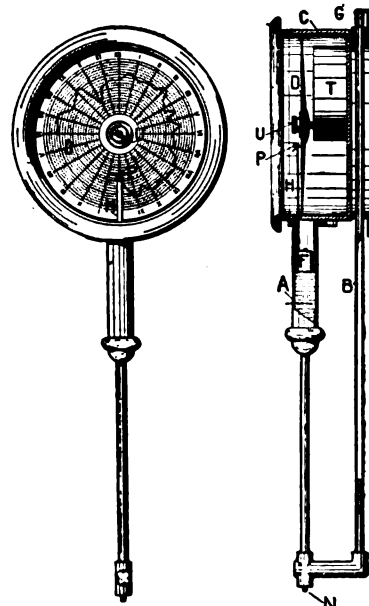
BOILER
FRONT
INDI-
CATOR



ABSOLUTE
PRESSURE
INDICATOR



UEHLING VACUUM RECORDER



UEHLING PRESSURE RECORDER

Combined Barometer and Vacuum Recorder.

For power plants, particular attention is drawn to the Uehling combined barometer and vacuum recorder which puts a record of both the barometric pressure and vacuum on the same chart. The distance between the two records, therefore, always represents the absolute back pressure.

This recorder is most accurate and is meeting with much favor as applied to condensing plants.

Special Instruments.

This company also has a department for designing and developing special instruments for special purposes.

AMERICAN DISTRICT STEAM COMPANY

Manufacturers of Steam Meters

GENERAL OFFICE AND WORKS
NORTH TONAWANDA, N. Y.

BRANCHES

CHICAGO, First National Bank Building

NEW YORK, 1777 Woolworth Building

SEATTLE, Hoge Building

Products.

ADSCO ROTOMETER.

ST. JOHN STEAM METER.

Also manufacturers of all material used in connection with the distribution and measurement of steam: Expansion Joints, Expansion Variators, Manhole Curbs, Special Collars, Anchors, Guides, Angle Fittings, Steam Traps, Steam Pipe Casing for Insulating, Underground Steam Mains, Gate Valves, Companion Flanges, Slotted Angle Flanges, Adjustable Annular Wedges, Meters for Steam or Liquids, Pressure Regulators, Water Heaters, Special Fittings for Underground Steam Mains, Tees, Crosses and Elbows.

Adsko Rotometer.

This is the latest development in condensation meters; accurate, noiseless, simple, easy to read and astonishingly light in weight.

It measures the flow of liquids not under pressure, such as condensed steam, oil, water, brine, or any liquid of low viscosity. A common use of the Rotometer is for the exact measurement of steam condensed in heating systems, particularly when steam is furnished from a Central Station.

It is remarkably accurate, all measuring parts are stamped from dies. There is nothing to get out of adjustment.

The Rotometer has a direct-reading counter. The case is locked, and sealed without any bolt heads, nuts or screw heads showing on the outside of the fully assembled meter.

One man can handle, install and inspect a Rotometer of large capacity. No bolts need be loosened or nuts or screws removed to take off the top casing, or to open the measuring compartments for inspection, or cleaning. Note convenient handle for carrying.

Nozzle inlet can be either front or back and outlet can be right or left. This makes installation easy.

All measuring chambers are pure copper. Case is American alloy-coated ingot iron. Nozzle is non-cor-

rosive metal. Bearings are of special design and never require oiling.

The Rotometer is made in the capacities shown in table (note the weights).

St. John Steam Meter.

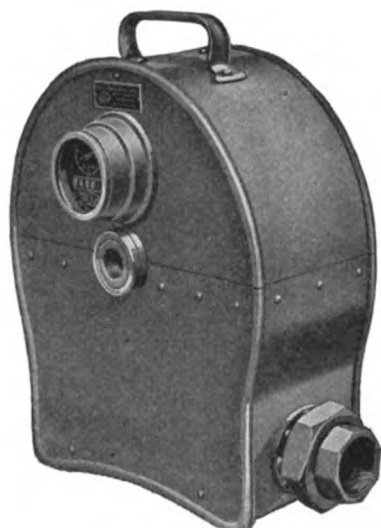
The St. John steam meter is designed for measuring the quantity of steam used in the operation of engines, pumps, blowers, heating systems, drying rooms and for other purposes. It is of great value in mill or manufacturing plants to determine the power required by the various departments or operations.

The St. John steam meter measures the flow of either saturated or superheated steam at all pressures and under steady or varying loads. It is simple in construction, has few parts, and its maintenance cost is practically nil. It is largely used also by the purchaser and seller of steam to determine the amount delivered, and is particularly adapted to this purpose for the

reason that the chart shows a complete continuous record of the steam used. The only moving part is the valve and spindle which floats in the current of steam. The vertical movement of the valve is transferred to the pointer, which indicates in horsepower the rate at which steam is being used. At the same time the brass pencil records the flow of steam on a metallic treated paper ribbon operated by clockwork at a speed of $\frac{1}{2}$ in. per hour.

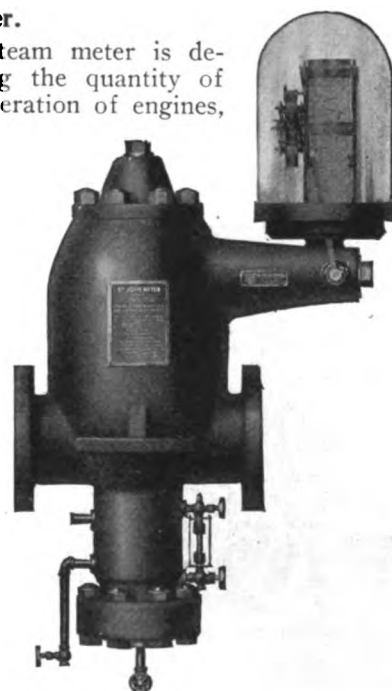
All meters have flanged ends and are furnished faced and drilled, A. S. M. E., extra heavy, unless otherwise ordered.

In Ordering Meters—State the purpose for which each is to be used, as well as the minimum and maximum quantities of steam to be measured, the steam pressure, degree of superheat, if any, and whether for use where flow will be steady or fluctuating.



ADSCO ROTOMETER

No.	Capacity per hour, lbs.	Net weight each, lbs.	Shipping weight, each, lbs.
350	350	21	31
750	750	26	39
1500	1500	32	48
3000	3000	65	84
6000	6000	137	160



ST. JOHN STEAM METER

Size, in.	Capacity at 100 lbs. pressure, b. h. p.	Size, in.	Capacity at 10 lbs. pressure, b. h. p.
1	27	4B	250
1½	55	5A	330
2	70	5B	440
3	110	6A	775
4A	165	6B	1000

BUFFALO METER CO.

Manufacturers of Oil Meters, Water Meters and Water Meter Accessories

2915 Main Street
BUFFALO, N. Y.

Products.

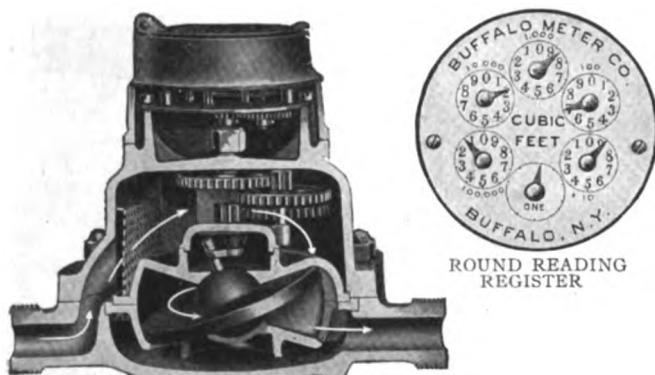
OIL METERS, WATER METERS, HOT WATER METERS. Portable Testing Water Meters; Gasoline Meters; Jet Meters for regulating flow to flush tanks; Curb Boxes for extension dial meters; Lock Boxes for enclosing $\frac{3}{4}$ -in. meters; Sealable Upright Pipe Meter Connections, Meter Reading Books, Office Meter Record Books.

Niagara and American Water Meters.

The American meter and the Niagara meter are of the disk type and differ only in their outer cases.

The Niagara meter has the outer casing made of a fine grade of cast iron, carefully galvanized. When a meter is frozen, one-half of the outer case usually breaks, thus relieving the inner and more expensive parts from injurious strain.

The American meter has the main outer casing made of bronze with either a galvanized iron base or



$\frac{3}{4}$ -INCH WATER METER, SECTIONAL VIEW

a bronze base. The galvanized iron base reduces the cost of the meter and also increases its rigidity.

The works are carefully made on the interchangeable plan from bronze composition, hard brass, hard rubber, and nickel bronze; they are protected by an internal strainer. The measuring chamber is of large capacity, and is fitted with a strong reinforced hard rubber measuring disk. All submerged bearings are protected against sand and sediment.

The meters may have either round reading or straight reading registers indicating cubic feet, gallons or liters at buyer's option.

GROSS PRICE LIST NIAGARA AND AMERICAN WATER METERS

Size of meter, in.	Greatest proper cap., U. S. gals. per min.	Niagara Meter only with all-galv. iron outside case	American Meter only with main case and galv. iron base	American Meter only with all-bronze outside case	Brass couplings per pair extra	Approx. Weight, meter and couplings boxed, lbs.
$\frac{3}{4} \times \frac{1}{2}$	20	\$16.00	\$18.00	\$20.00	\$1.00†	14
$\frac{1}{2} \times \frac{3}{4}$	20	16.00	18.00	20.00	1.50†	14
$\frac{3}{4}$	34	24.00	27.00	30.00	1.50†	20
1	53	35.20	39.60	44.00	2.20†	30
$1\frac{1}{4}$	75	48.00	54.00	60.00	3.00	40
$1\frac{1}{2}$	100	64.00	72.00	80.00*	4.00	60
2	160	96.00	108.00	120.00*	6.00	100
$2\frac{1}{2}$	240	140.00	157.50	175.00	8.75	150
3	315	192.00	216.00	240.00	Flanges no charge.	200

† In these sizes, quarter bent couplings may be furnished at the following prices per pair: $\frac{1}{2}$ -in., \$1.50; $\frac{3}{4}$ -in., \$2.00; 1-in., \$3.00.

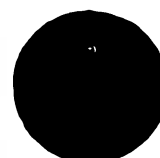
* $1\frac{1}{2}$ -in. and 2-in. all-bronze case meters may be furnished with internal standard pipe threads when specially ordered.

Niagara Oil Meters.

Niagara oil meters are used to measure fuel oil, lubricating oil, gasoline and oils of all kinds. They will operate by pump or gravity pressure of 1 lb. or more per sq. in. and with oil of any temperature.



OIL AND HOT WATER METER



STRAIGHT READING REGISTER

The register is all-metal straight reading type indicating U. S. gallons, imperial gallons or liters. Each meter is tested and adjusted to measure within 1% of absolute accuracy at its rated capacity.

GROSS PRICE LIST NIAGARA OIL METERS

Size of meter	*Capacity for continuous rates of flow per hour, U. S. gals.	†Size and kind of pipe connections	List prices
A	6 to 300	$\frac{1}{2}$ -in. unions	\$20.00
B	10 to 500	$\frac{1}{2}$ -or $\frac{3}{4}$ -in. unions	20.00
C	30 to 1000	$\frac{3}{4}$ -or 1-in. unions	30.00
DV	60 to 2000	1- or $1\frac{1}{4}$ -in. unions	44.00
EV	90 to 3000	$1\frac{1}{4}$ -or $1\frac{1}{2}$ -in. unions	60.00
FV	120 to 4000	$1\frac{1}{2}$ -in. unions	80.00
F	175 to 6000	$1\frac{1}{2}$ -or 2-in. unions	120.00
G	250 to 9000	2- or $2\frac{1}{2}$ -in. unions	160.00
G	250 to 9000	3-in. flanges	200.00

For all sizes of Niagara oil meters with large vertical dial add to these list prices \$20.00.

* These minimum quantities are the smallest rates of flow which the meters should be expected to measure accurately. The maximum quantities are the highest rates of flow for continuous operation without undue wear. Meters used only occasionally may be safely operated on flows twice the maximum quantities.

† The size of meter required is not determined by the size of pipe on which it is to be set, but by the flow to be measured. To facilitate setting on different sizes of pipes each meter may be furnished with either of the two sizes of openings and connections listed.

Niagara Hot Water Meters.

The Niagara hot water meter is similar in design to the Niagara oil meter, but has works of special construction to run in water of any temperature up to 250° Fahr.

GROSS PRICE LIST NIAGARA HOT WATER METERS

Size of meter	Capacity according to h.p. of boilers	†Size and kind of pipe connections	List prices
B	8 to 20 h.p.	$\frac{1}{4}$ -or $\frac{3}{4}$ -in. unions	\$20.00
C	10 to 40 h.p.	$\frac{3}{4}$ -or 1-in. unions	30.00
D	25 to 90 h.p.	1- or $1\frac{1}{4}$ -in. unions	44.00
EV	40 to 150 h.p.	$1\frac{1}{4}$ -or $1\frac{1}{2}$ -in. unions	60.00
E	50 to 200 h.p.	$1\frac{1}{4}$ -or $1\frac{1}{2}$ -in. unions	80.00
F	80 to 325 h.p.	$1\frac{1}{2}$ -or 2-in. unions	120.00
G	150 to 600 h.p.	2- or $2\frac{1}{2}$ -in. unions	160.00
G	150 to 600 h.p.	3-in. flanges	200.00
Battery 2-3 in.	300 to 1200 h.p.	4- or 6-in. internal threads	450.00

For all sizes of Niagara hot water meters with large vertical dial add to these list prices \$20.00.

† The size of meter required is not determined by the size of pipe on which it is to be set, but by the flow to be measured. To facilitate setting on different sizes of pipes each meter may be furnished with either of the two sizes of openings and connections listed.

BUILDERS IRON FOUNDRY

The Venturi Department

PROVIDENCE, R. I.

BRANCH OFFICES AND REPRESENTATIVES

NEW YORK, N. Y.

CHICAGO, ILL.

PITTSBURGH, PA.

DALLAS, TEX.

ATLANTA, GA., E. F. SCOTT & Co.

SAN FRANCISCO, CAL., N. B. LIVERMORE & Co.

PORTLAND, ORE., NORTHWESTERN EQUIPMENT Co.

TORONTO, ONT., CAN., ALLEN GENERAL SUPPLIES, LTD.

OTTAWA, ONT., CAN., GENERAL SUPPLY Co.

Products.

Manufactured by the Venturi Department: VENTURI METERS for liquids, gases, steam, etc.; VENTURI RATE of FLOW CONTROLLERS.

Also manufacturers of Venturi Chemical Feed Regulators; Loss of Head Gauges; Water Level Recorders; Barometric Type Mercury Manometer for testing work; Type Q S Register for air and gas; Effluent Controllers and Gauges for filtration plants, etc.

Venturi Meter Tube.

A Venturi Meter Tube is placed in a pipe line in the same manner as ordinary pipe. From the inlet to the throat the interior diameter gradually decreases and then gradually increases again to the full diameter at the outlet. The unrestricted passageway thus formed permits high differential pressure between inlet and throat with minimum friction loss. Annular pressure chambers are provided at inlet and throat. The throat is lined with bronze. Connection to the indicating, recording or registering instrument is simply made by two small pipes, one from the inlet and one from the throat chamber.



VENTURI METER TUBE

STANDARD VENTURI METER TUBES AND CORRESPONDING MEASURING RANGES FOR WATER

Diameter of pipe, in.	Catalogue number	Length of meter tube, ft.	in.	Pounds per hour		Gallons per minute	
				Min.	Max.	Min.	Max.
2	2½	1	11½	1360	17600	3	35
	2¾	1	10¼	1960	25400	4	55
	21	1	7	3470	45100	7	90
3	31	2	11	3470	45100	7	90
	31¼	2	7¾	5420	70400	11	140
	31½	2	4½	7820	102000	16	205
4	41¼	4	3¾	5420	70400	11	140
	41½	3	10½	9170	119000	18	240
	42	3	6	13900	181000	28	360
5	51½	5	1¾	9170	119000	18	240
	52	4	8½	13900	181000	28	360
	52½	4	2	21700	282000	44	565
6	62	5	11	13900	181000	28	360
	62½	5	4½	21700	282000	44	565
	63	4	10	31300	406000	63	810
12	124	11	0	55600	722000	110	1440
	125	9	11	86900	1129000	175	2260
	126	8	10	125000	1626000	250	3250
24	248	21	2			445	5780
	2410	19	0			695	9020
	2412	16	10			1000	13000
36	3612	31	4			1000	13000
	3615	28	1			1560	20300
	3618	24	10			2250	29300
48	4816	41	6			1780	23100
	4820	37	2			2780	36100
	4824	32	10			4000	52000

Type M Register-Indicator-Recorder.

This machine has the advantage of unusual ruggedness and extreme accuracy.

The Type M furnishes three distinct kinds of information: it indicates momentary rate of flow through the meter tube; permanently records this rate upon a large circular chart; gives the total quantity on a circular counter dial. Each register is graduated for the particular meter tube with which it is to be used.

For cold and hot water and other liquids, high pressure gases, steam, etc. Universally employed for main water supply lines, boiler feed, hot water heating systems, and many other important kinds of service.



TYPE M REGISTER-INDICATOR-RECORDER

Type M Indicator-Recorder.

The lower dial is 10 in. in diameter and indicates the rate of flow (pounds per hour, gallons per minute, etc.) through the Venturi Meter Tube. The upper dial records this rate continuously on a large circular chart. The interior mechanism is simply and positively actuated through large cast iron floats, resting on mercury columns, and rack and spur gearing.

The total quantity may be obtained by tracing the charts with a special planimeter manufactured by BUILDERS IRON FOUNDRY.

The Type M Indicator-Recorder may be used for the same kinds of service as the Type M Register and is also frequently employed for temporary installations at various points where it is desired to study the consumption or output through certain main pipe lines, or the efficiency of operation of important plant units.



TYPE M INDICATOR-RECORDER

Bulletins.

Bulletins describing the Venturi for hot and cold water, sewage, brine chemical solutions, oil, gas, air or steam sent on request.

SIMPLEX VALVE AND METER COMPANY

112 North Broad Street
PHILADELPHIA, PA.

Products.

SIMPLEX DEVICES for the Measurement and Control of Water, as follows:

Meter Registers for use with Venturi Tubes, Pitot Tubes, Weirs and Orifices; Meters for Measurement of Boiler Feed Water; Rate of Flow Controllers, Direct Acting and Indirect Types, for Mechanical, Slow Sand and Pressure Filters; Loss of Head and Rate of Flow Gages, Indicating, Recording and Combined Types, which do not require copper floats and their float pipes.

Also manufacturers of Elevation Gages, Indicating and Recording Types; "Head and Fall" or Water Level Recording Gages, for Water Wheel Plants; Portable Pitot Chart Recorders for Water Waste and Pump Slip-page Determination; Manometers for use with Venturi and Pitot Tubes; Automatic Air Valves; Combined Air and Vacuum Poppet Valves for Large Mains; Mercury Altitude Regulating Attachment for Hydraulic Gate Valves; Altitude Valves, Mercury or Float Operated, which prevent water hammer; Chemical Feeding Devices, for both Low Head and Pressure Service.

Simplex Meter Register.

Simplex meters, actuated by Venturi and Pitot tubes are adapted to filter plants, water works, pumping sta-

tions, powerhouses, gravity mains, sewage disposal plants and industrial plants. They lend themselves to the measurement of flow through gravity mains, and may be located in gate houses, pits or chambers, requiring only the removal of the chart and winding of the clock once a week.

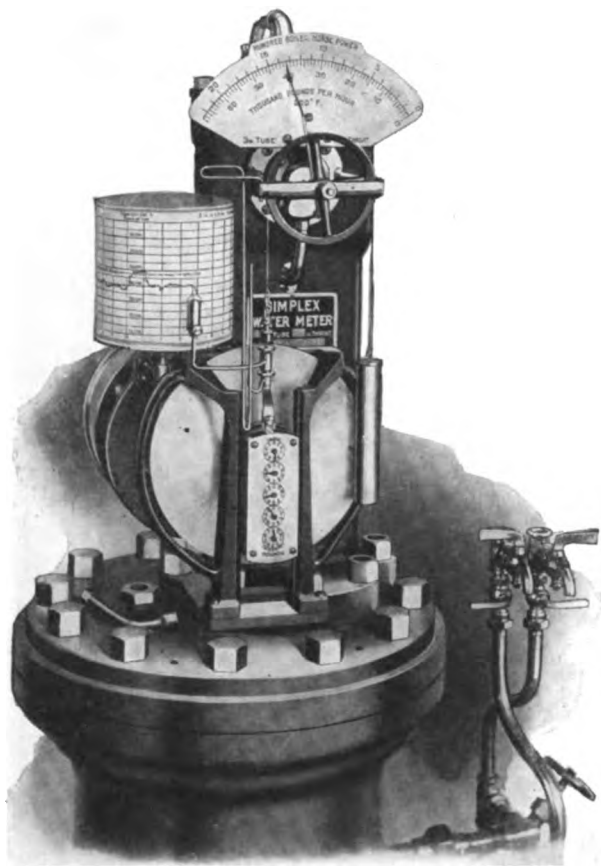
They are ornamental in appearance, and are equally suitable for placing in a pumping station or powerhouse, where they may be required to measure the flow from usual types of reciprocating and centrifugal pumps.

The same register may be used with any size Venturi tube, from a 1-in. boiler feed installation up to a steel or concrete conduit of large size.

In places where glass domes can not be used without too much danger of breakage metal covers are recommended. These are also applicable for replacing glass domes on the present meter registers when required, and they are furnished at a small additional cost.

The high degree of accuracy of Simplex meters at low velocities permits the use of Venturi tubes with large throats. This is of vital importance for many reasons, particularly as the loss of head due to friction through the Venturi tube varies directly as the fourth power of the diameter ratio.

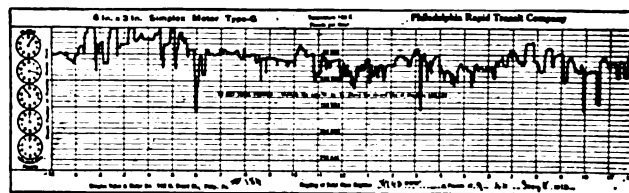
The Simplex meter is the most logical answer to date to the problem of flow measurement. Its con-



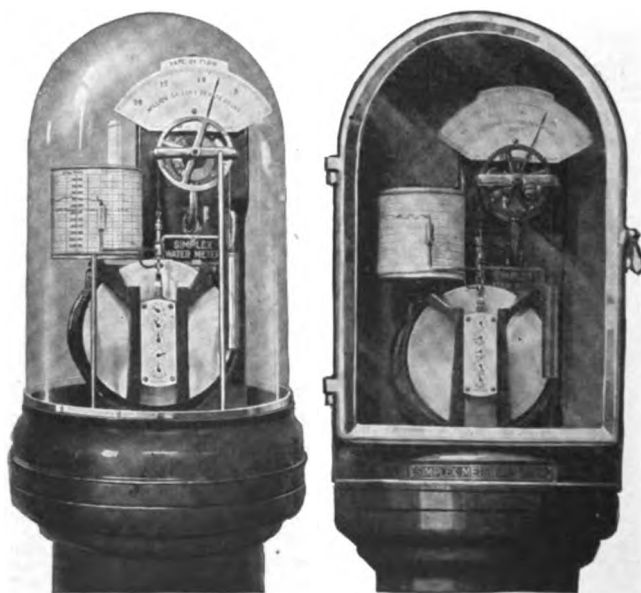
SIMPLEX METER REGISTER

Simple in construction, accurate over longest range, sensitive to small flows, all functions tested in place

SWEET'S CATALOGUE



GRAPHIC CHART OF SIMPLEX METER REGISTER



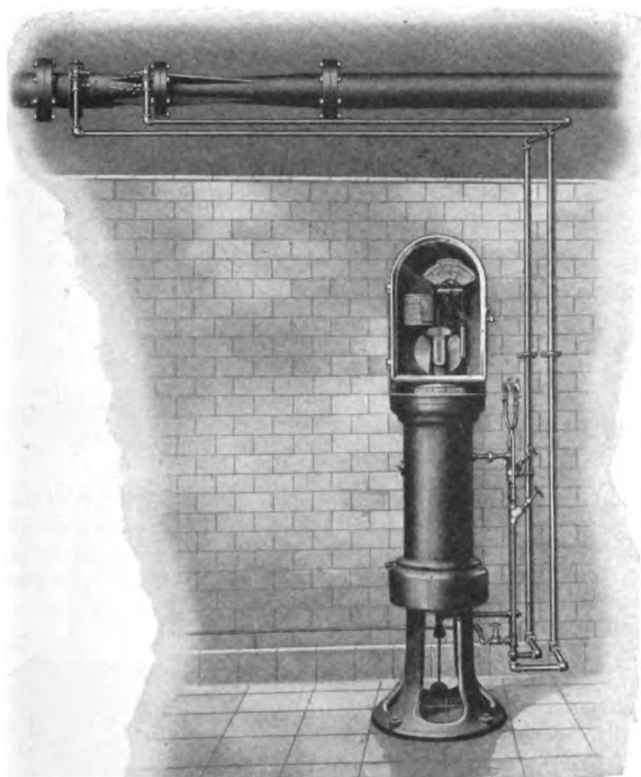
Glass Cover

Metal Cover

SIMPLEX METER REGISTER COVERS

Continued on next page

struction involves a minimum number of parts which are almost frictionless in operation.



SIMPLEX HOT WATER METER RECORDER

CAPACITY OF STANDARD VENTURI TUBES WITH SIMPLEX TYPE GD METER REGISTER FOR HOT WATER SERVICE

Diameter pipe, in.	Diameter throat, in.	Size tube, in.	Measuring capacity with Simplex meter register in pounds per hour with an average temperature of 200° F.	
			Maximum	Minimum
2	1	2 x 1	18,150	900
2	1	2 x 1	24,700	1,250
2	1 1/4	2 x 1 1/4	30,000	1,500
2	1 1/2	2 x 1 1/2	40,000	2,000
2	1 3/4	2 x 1 3/4	55,000	2,750
3	1 1/2	3 x 1 1/2	29,600	1,480
3	1 3/4	3 x 1 3/4	46,500	2,300
3	2	3 x 2	68,000	3,400
3	2 1/4	3 x 2 1/4	95,000	4,750
4	2 1/4	4 x 2 1/4	69,500	3,500
4	2 1/2	4 x 2 1/2	92,000	4,600
4	2 3/4	4 x 2 3/4	122,000	6,100
4	3	4 x 3	177,000	8,850
5	3	5 x 3	90,000	4,550
5	3 1/2	5 x 3 1/2	120,000	6,000
5	4	5 x 4	190,000	9,500
5	4 1/2	5 x 4 1/2	284,000	14,200
6	4 1/2	6 x 4 1/2	187,000	9,350
6	5	6 x 5	228,000	11,400
6	5 1/2	6 x 5 1/2	274,000	13,700
6	6	6 x 6	325,000	16,300
8	6	8 x 6	268,000	13,500
8	6 1/2	8 x 6 1/2	340,000	17,000
8	7	8 x 7	485,000	24,500
8	7 1/2	8 x 7 1/2	630,000	31,500
8	8	8 x 8	800,000	40,000
10	8	10 x 8	540,000	27,000
10	9	10 x 9	760,000	38,000
10	10	10 x 10	1,140,000	57,000
10	11	10 x 11	1,450,000	72,500

Simplex Pitot Tube Recorder.

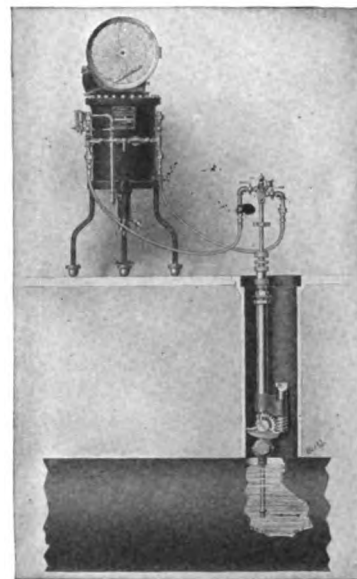
This company has a department which specializes in the investigation of flow in existing water mains and uses for its work the Simplex Pitot tube, manometer and portable chart recorder.

Investigation can be made of the flow into an entire city or in a small distribution system.

The portable recorder and rod shown by the illustration is in use by a considerable number of water departments, water corporations and industrial plants, who use it as a universal meter. It requires only that a corporation cock tap be made in an existing main and the rod, the manometer and recorder moved to the site.

A traverse of the pipe is first made to determine the relation between the mean velocity through the main and at the center. With this data in hand the total flow is readily computed from the chart record taken from the recorder.

The construction of the device embodies the same float principle as is used in the Simplex meter and the apparatus is capable of measuring flows between 1/2 ft. and 10 ft. per second.



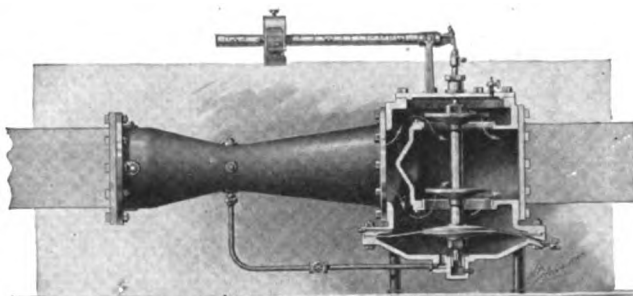
SIMPLEX PITOT TUBE CHART RECORDER

Simplex Rate Controller, Type "B."

The controller consists of a double disk balanced valve and a Venturi tube.

The water enters the Venturi tube and discharges into the valve body between the disks and their seat rings, and thence into the effluent main. The valve stem is carried upward through a stuffing box in the top cover and ends in a flexible connection attached to the short end of a lever mounted on knife edges. The long end of the lever supports an adjustable counterweight. The lower end of the valve stem is shouldered to receive supporting plates for a rubber diaphragm, and its bottom projection rides in a guide in the bottom cover.

By this construction the valve body has two compartments; that above the diaphragm through which the water flows in its way out under the valve disks, with comparatively low velocity, and the portion underneath the diaphragm, through which no water flows, but which is joined by a pipe connection to the throat of the Venturi tube.



SIMPLEX RATE CONTROLLER

Showing method of operation of valves, diaphragm and counterweight

YARNALL-WARING COMPANY

Manufacturers of Yarway Steam Specialties

7604 Queen Street

CHESTNUT HILL, PHILADELPHIA, PA.

BRANCH OFFICES AND REPRESENTATIVES

NEW YORK, N. Y.
CHICAGO, ILL.
PHILADELPHIA, PA.
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BOSTON, MASS.
ST. PAUL, MINN.

PORTLAND, ORE.

NEW ORLEANS, LA.
CLEVELAND, OHIO
HOUSTON, TEX.
SYRACUSE, N. Y.

Products.

YARWAY-LEA V-NOTCH RECORD-
ING LIQUID METER.

YARWAY SEATLESS BLOW-OFF
VALVE.

YARWAY DOUBLE TIGHTENING BLOW-OFF VALVE.

YARWAY ADJUSTABLE SPRAY HEAD.

YARWAY BOILER SKIMMER.

YARWAY HYDRAULIC VALVE.

YARWAY PIPE JOINT CLAMP.

YARWAY HOLTITE PIPE CLAMP.

YARWAY AIR COMPRESSOR UNLOADER.

YARWAY

TRADE-MARK

once. Serious trouble is forecasted so quickly that accidents may often be prevented and repairs made before a shutdown is necessary.

Measures continuously without interrupting or retarding any process.

More than 2000 Yarway-Lea meters in use in all parts of the world for measuring "water rate" in turbine plants, boiler feed water, make-up water, blow-down and heating system returns.

Hundreds of Yarway-Lea meters are being used in connection with feed water heaters.

Meter and recorder may be set on a different level from the measuring tank, either a floor above or below or at another part of the same floor near a common instrument board.

Hundreds more Yarway-Lea meters are being used to record the flow of water for municipal and irrigation systems, and also to measure and record the flow of liquids in manufacturing processes where definite quantity of liquid has to be measured while it flows.

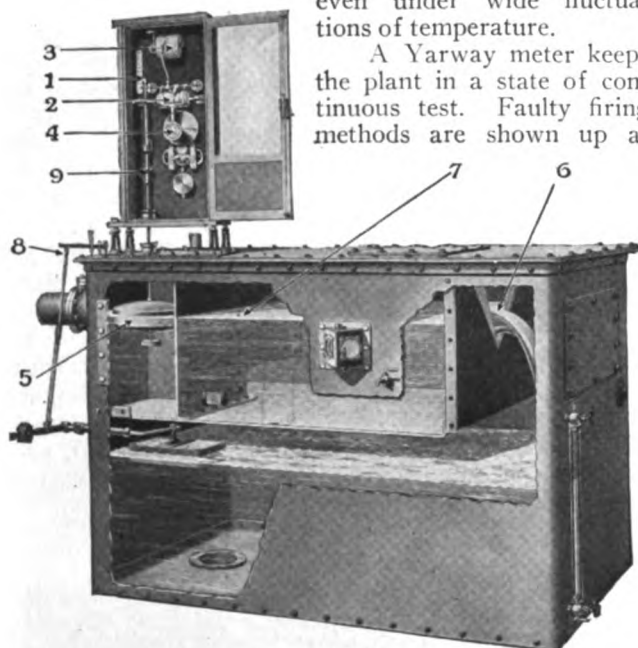
Measuring without interrupting or retarding the work not only increases production but lowers manufacturing costs.

Write for Bulletin L-40, which describes advantages, mechanism, parts, and tanks.

Yarway-Lea V-Notch Meter.

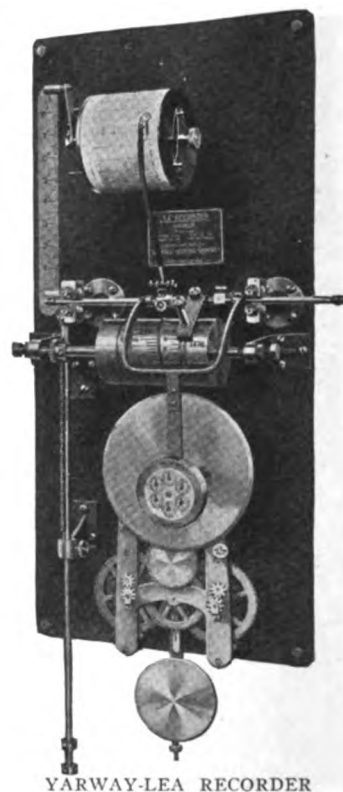
Measures liquids accurately while they are flowing and records their volume or weight. 98½% accurate, even under wide fluctuations of temperature.

A Yarway meter keeps the plant in a state of continuous test. Faulty firing methods are shown up at



YARWAY-LEA V-NOTCH METER

Liquid is admitted through control valve 8 to weir chamber 7. As level of liquid rises and falls, flowing through V-notch 6, float 5 connected to rackrod 9 also rises and falls, indicating flow in inches of head in scale 1, simultaneously showing rate of flow in pounds or gallons on cam drum 2, with permanent graphic chart record for any period of day on 24-hour chart 3. Integrator 4 gives record of total quantity of liquid handled since starting operation.



YARWAY-LEA RECORDER

Yarway Seatless Blow-off Valve.

No seat to leak. Nothing to cut or clog. Full, free opening through the valve. Packing is protected



DIFFERENT SIZES OF NOTCHES USED TO REGULATE FLOW THROUGH METER

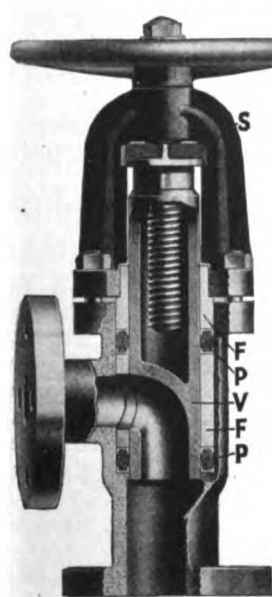
from action of the blow-off and is automatically compressed when the valve is closed. Many Yarway seatless blow-off valves have been in constant service 7 and 8 years without being repacked. Gradual opening—no danger of waterhammer.

Made both angle and straightway, screw or flange, extra heavy throughout and finished with all-iron, bronze mounted, or all-bronze body—for land or marine service. The standard blow-off valve in thousands of large plants in the United States and Canada.

Yarway Double Tightening Blow-off Valve.

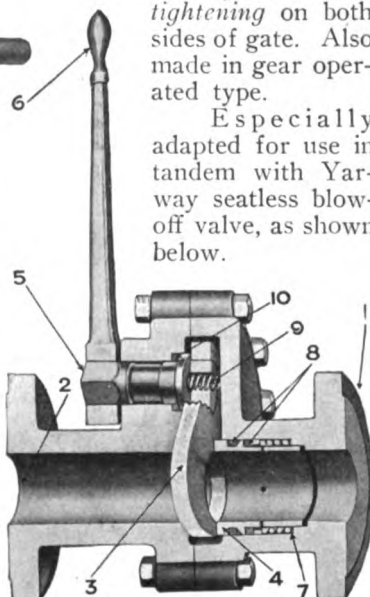
A quick opening valve of lever operated, swing gate type, with unique feature of sealing bushing on inlet side, making it *double tightening* on both sides of gate. Also made in gear operated type.

Especially adapted for use in tandem with Yarway seatless blow-off valve, as shown below.



YARWAY SEATLESS BLOW-OFF VALVE

In closing valve, shoulder S on plunger V engages the loose follower gland F, compressing packing P above and below the port, making an absolutely tight valve.



YARWAY DOUBLE TIGHTENING BLOW-OFF VALVE

- | | |
|---------------------|------------------------|
| (1) Body | (7) Sealing bushing |
| (2) Cap | (8) spring |
| (3) Disc | (9) Sealing bushing |
| (4) Sealing bushing | (10) packing rings |
| (5) Stem | (9) Stem spring |
| (6) Lever | |
| | (10) Stem packing ring |



YARWAY SEATLESS BLOW-OFF VALVE AND YARWAY DOUBLE TIGHTENING BLOW-OFF VALVE IN TANDEM ARRANGEMENT

Yarway Adjustable Spray Head (C. C. Thomas Patents).

A simple, unique, efficient spray head for use on cooling ponds, or wherever a liquid needs to be cooled rapidly.

Adjustable to any rate of flow or pressure, to varying atmospheric and temperature conditions.

Can be flushed out by operating levers from shore.

Many ponds have been equipped with Yarway spray heads in the United States and other countries.



YARWAY ADJUSTABLE SPRAY HEAD

Yarway Boiler Skimmer.

A successful device for the removal of scale-forming matter from the water in the boilers.

It is based on the thermal principle of circulation in heated water.

Leading plants are securing greatly increased steaming power from boilers equipped with the Yarway boiler skimmer.

Fifteen tons of solid matter removed from 7 boilers in one large plant in one year.

Bulletin S-1201A gives full information and may be had for the asking.



YARWAY BOILER SKIMMER

Yarway Hydraulic Valve (Caskey Patents).

A short lever, quick acting, easily operated valve, designed for high pressure work from 500 to 5000 lbs. per sq. in. The greater the pressure the tighter the valve. Can be repacked. Thousands in use in many industries.

Yarway Pipe Clamps.

For stopping pipe line leaks completely, permanently, and in short time—the Yarway pipe joint clamp for leaks at joints, the Holtite pipe clamp for leaks in straight sections. Either requires but a few minutes to apply. More than 25,000 sold.

Yarway Air Compressor Unloader (Richards Patents).

A power saver for the motor driven air compressor. Simple, automatic, cool running and long wearing. Hundreds in successful service for years.

Bulletins and Information.

All Yarway specialties are described at length in different folders and bulletins which will be sent for the asking.

PNEUMERCATOR COMPANY, INC.

15 Park Row
NEW YORK, N. Y.

EUROPE: KELVIN, BOTTOMLEY & BAIRD, LTD., GLASGOW, SCOTLAND

Product.

PNEUMERCATOR GAUGES for indicating the depth, weight, volume or specific gravity of any liquid or semi-liquid, fluid enough to seek its own level.

Trade-mark.

The coined word, "Pneumercator" is our registered trade-mark and is attached to all instruments sold by us, our representatives, or licensees under our patents throughout the world.

Principle of Operation.

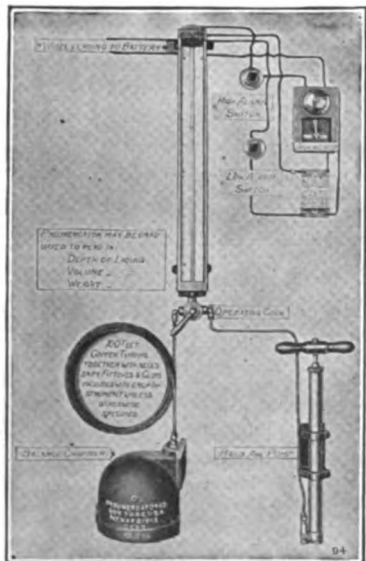
The operation of all models of Pneumercator gauges is based on the maintenance of a true hydrostatic balance between the head of liquid to be measured and a column of mercury or other indicating medium, the pressure being transmitted by air confined in a small connecting tube between the liquid and the gauge.

Construction.

(1) A balance chamber located in the liquid to be measured. (2) A mercury or other gauge or gauges, located wherever readings may most conveniently be taken. (3) A hand pump or other source of compressed air. (4) A control valve attached to the gauge, and connected by small piping to the balance chamber and to the source of compressed air.

Advantages.

A Pneumercator gauge installed in any tank will provide a perpetual inventory of the liquid stored in the tank—an accurate check on liquid put in or withdrawn from the tank. The gauge will operate with equal accuracy on tanks open to the atmosphere or under pressure or vacuum. The accuracy is not affected by changes in temperature of the liquid in the tank, or the temperature through the pipe line connecting the tank to the indicating portion of the apparatus. There are no floats, diaphragms or delicate mechanism of any kind to stick or get out of order.



TYPE STI
ELECTRICAL PNEUMERCATOR
GAUGE

Applications.

Can be applied on fuel oil tanks, acid tanks, molasses tanks, gasoline tanks, chemical storage tanks, stills, evaporators, automatic sprinkler tanks, automobile tank trucks, reservoirs, standpipes, flumes, tail races, dams, water works, tide fluctuations, etc.

Information and Prices.

As each Pneumercator gauge has to be made up for the specific purpose for which it is to be used, in order to advise and quote intelligently, it is necessary to have the following information:

Dimensions of tank (or tanks). Distance from tank to indicating portion of the instrument. Nature and specific gravity of the liquid to be measured.

Prices and full information furnished on request.

Type S. T. I. Electrical Pneumercator Gauge.

Standard S. T. I. type fitted with commercial annunciator which rings a bell and indicates visually when contents of tank reach a predetermined level.

The annunciator can be furnished for a high level alarm, low level alarm or both.

No electrical connections at the tank. Annunciator is actuated by the mercury in the gauge, obviating all danger by fire or explosion from short circuits.

Type "U" Adjustable Gauge.

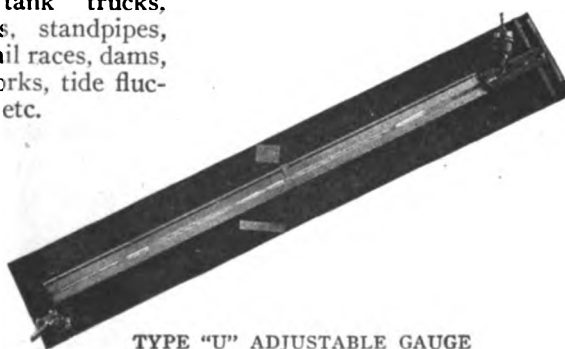
Adjustable to varying specific gravities and, when the movable indicating column is set with the pointer at the observed specific gravity, will accurately indicate tank contents in units of depth or volume, with a mark on the scale for each $\frac{1}{4}$ in. of tank depth.

This model can also be supplied with a vernier attachment by means of which the average specific gravity of the liquid can be found, and when the gauge is set at the indicated gravity it will read directly into the depth of the liquid.

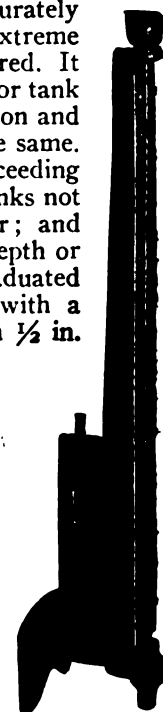
C. T. I. Pneumercator Gau

Meets the demand for a gauge to accurately indicate the contents of tanks where the extreme refinement of our other models is not required. It differs from other models of Pneumercator tank gauges mainly in its simplified construction and design. The principle of operation is the same.

Three sizes: No. 1 for tanks not exceeding 10 ft. in depth or diameter; No. 2 for tanks not exceeding 20 ft. in depth or diameter; and No. 3 for tanks not exceeding 30 ft. in depth or diameter. May be had with scales graduated in units of depth, weight, or volume with a mark on the scale corresponding to each $\frac{1}{2}$ in. of depth.



TYPE "U" ADJUSTABLE GAUGE



TYPE CTI
PNEUMERCATOR
GAUGE

THE AMERICAN METAL HOSE CO.

Manufacturers of Metal Hose and Tubing

WATERBURY, CONN.

SALES OFFICES

NEW YORK, N. Y., 173 Lafayette Street
PITTSBURGH, PA., Union Bank Building

BOSTON, MASS., 84 Batterymarch Street
CHICAGO, ILL., 29 East Madison Street

CANADIAN SELLING AGENT: LYTLE ENGINEERING Co., LTD., MONTREAL, CANADA

PACIFIC COAST AGENT: F. SOMERS PETERSON Co., SAN FRANCISCO, CAL.

Products.

AMERICAN FLEXIBLE METAL HOSE and TUBING.

Description.

American flexible metal hose is exactly what the name would imply, a hose made from metal, a flexible pipe. It is manufactured in a number of different patterns, but the underlying principle of all of them is the same. A continuous strip of metal is first rolled into the desired shape, then wound spirally over itself, a packing of asbestos or some form of cord fed into the groove during the winding process making it pressure tight.

While supplied for all classes of work, metal hose is primarily a hard-service proposition, and for all the heavy duties we furnish what is the best known of the various patterns we make—"Interlocked Construction," style BD15.



TRADE-MARK

Use.

For oil, steam, air, gas, gasoline, paint, varnish, etc.

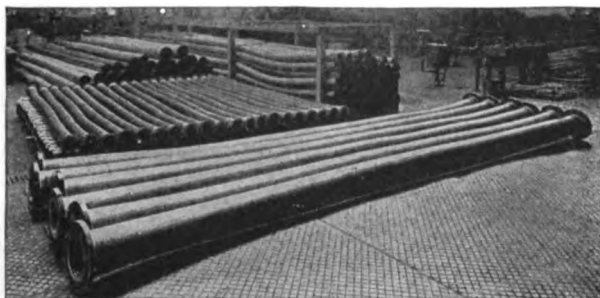
We recommend metal hose particularly for use where rubber hose can not be expected to last.

Steam Hose.

American metal steam hose is our BD15 bronze; it is not affected by steam at highest pressures, bends as readily as rubber hose and will last indefinitely longer. This hose is offered for any high pressure, hard service work, where a non-corrosive metal is necessary.

Oil Hose.

American metal oil hose is our BD15 steel. Oils and oil products have absolutely no effect on it. We can supply flexible metal oil hose in every size from 1/4-in. inside diameter which is used as feed line on machine tools to the 8-in. inside diameter hose employed in loading and unloading crude oil.



4-IN. AND 6-IN. FUEL OIL HOSE FOR U. S. NAVY READY FOR SHIPMENT

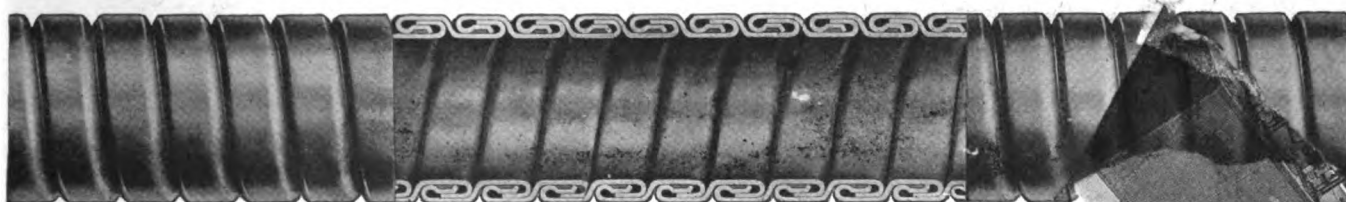


UNLOADING OIL TANK CAR WITH AMERICAN METAL HOSE

TABLE BD15 AMERICAN METAL HOSE

Diameters of hose, in.		Approximate bending diameter, in.	Weights, per foot lbs.	Test pressures per sq. in., lbs.	
Inside	Outside			Straight	Bent
1/4	3/8	4	.11	500	400
3/8	1/2	6	.25	500	400
1/2	5/8	7	.40	500	400
5/8	3/4	12	.80	500	400
3/4	7/8	14	1.00	500	400
1	1 1/4	18	1.50	400	300
1 1/4	1 3/4	22	1.75	400	300
1 3/4	2	26	2.75	300	200
2	2 1/4	32	3.15	250	150
2 1/4	2 3/4	38	4.50	250	150
3	3 1/2	44	6.75	200	75
4	4 1/2	50	8.75	200	75
5	5 1/2	56	11.00	150	75
6	6 1/2				

Above test pressures are from latest U. S. Naval specifications on flexible metal hose and are used by us as standard.



SECTION OF 3/4-IN. BD15 INTERLOCKED HOSE

S. F. BOWSER & COMPANY, INC.

Pumps, Tanks and Oil Storage Systems

FORT WAYNE, IND.

BRANCH AND SALES OFFICES

TORONTO, CAN., S. F. BOWSER COMPANY, LTD.

ALBANY, N. Y.

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DENVER, COLO.

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FORT WAYNE, IND.

KANSAS CITY, MO.

PARIS, FRANCE

SYDNEY, AUSTRALIA

DALLAS, TEX., S. F. BOWSER & COMPANY OF TEXAS

MEMPHIS, TENN.

MINNEAPOLIS, MINN.

NEW YORK, N. Y.

PHILADELPHIA, PA.

PITTSBURGH, PA.

SAN FRANCISCO, CAL.

ST. LOUIS, MO.

WASHINGTON, D. C.

THE HAGUE, HOLLAND

BUENOS AIRES, A. R.

Products.

COMPLETE SYSTEMS for the STORAGE and CONTROL of OILS and GASOLINE; HAND and POWER DRIVEN SELF-MEASURING GASOLINE and OIL PUMPS; OIL and GASOLINE STORAGE TANKS; OIL FILTERING and CIRCULATING SYSTEMS, DRY CLEANERS' NAPHTHA STORAGE and DISTRIBUTING SYSTEMS.

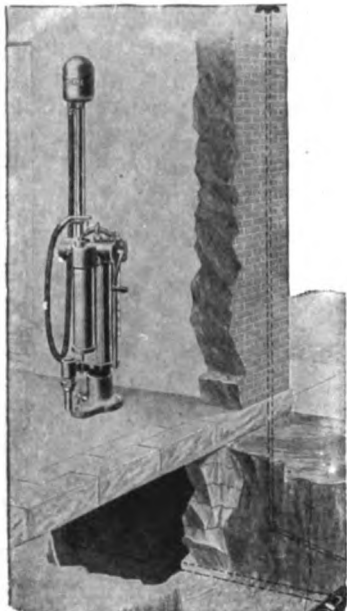


FIG. 101. 5-GAL. PUMP CONNECTED TO UNDERGROUND TANK FOR GASOLINE

Also manufacturers of Cutting Oil Reclaiming Systems, Filling Station Equipment, Fuel Oil Systems, Self-measuring Kerosene Pumps, Tanks for Underground Storage, Paint Oil Storage and Handling Systems, Railway Oil Storage, Reclaiming Systems for Oil, Rubber Cement Tanks and Pumps; Wheel Tanks for Lubricating Oil, Gasoline and Cutting Oil.

Gasoline and Oil Pumps, Tanks and Storage Systems.

Pumps—Pumps measure accurately quantities of 5 gals. down to 1 pt. at a stroke, intermediate quantities

BOWSER
TRADE-MARK

as desired. Designed for direct connection on tanks or to tanks installed at a distance, inside building or underground. Handle all oils that can be pumped. Gasoline pumps furnished with filter, hose nozzle, discharge register, meter and other accessories as required.

Tanks—Rectangular or cylindrical, of galvanized steel; for installation inside buildings or underground; storage capacities from 65 gals up. Specifications and quotations on large tanks, furnished on request. All tanks for the storage of volatiles are buried underground. The equipment examined, approved and labeled by the Board of Underwriters.

Portable Outfits for Gasoline, Lubricating Oil and Cutting Oil.

For indoor or outdoor use; to be moved wherever needed.

Indoor Stationary Equipment for Paint, Lubricating and Other Oils.

Equipment furnished with pumps on tanks; or with tanks in basement, pumps to be on first floor or upper floors, as desired.

For the storing of paints we also furnish agitator outfits in single or battery form. By agitating the paint before drawing it from the tank, it is kept at a uniform consistency.

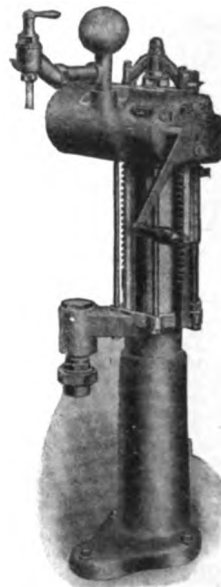


FIG. 106. PUMP FOR LUBRICATING AND OTHER OILS

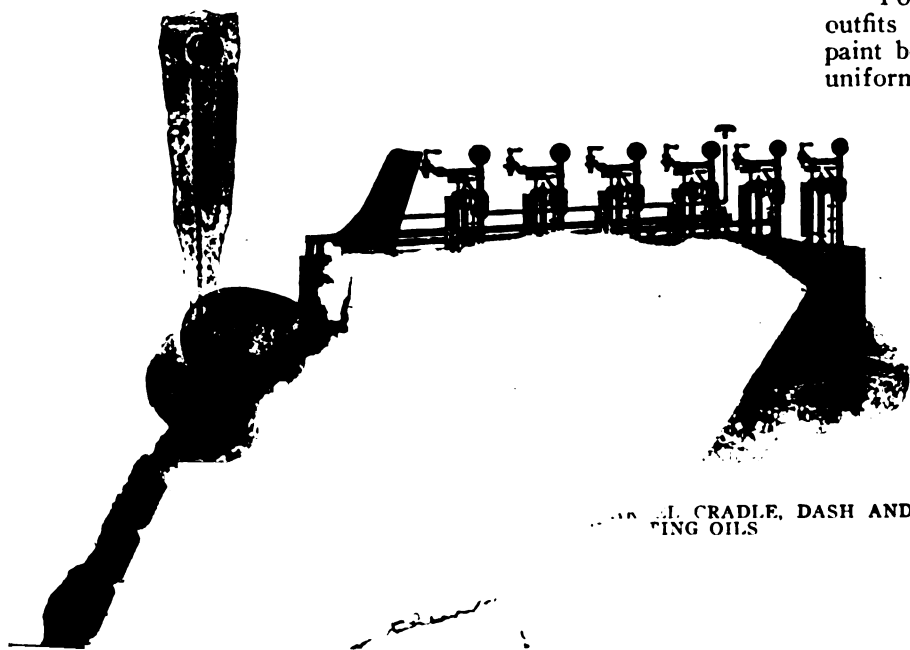
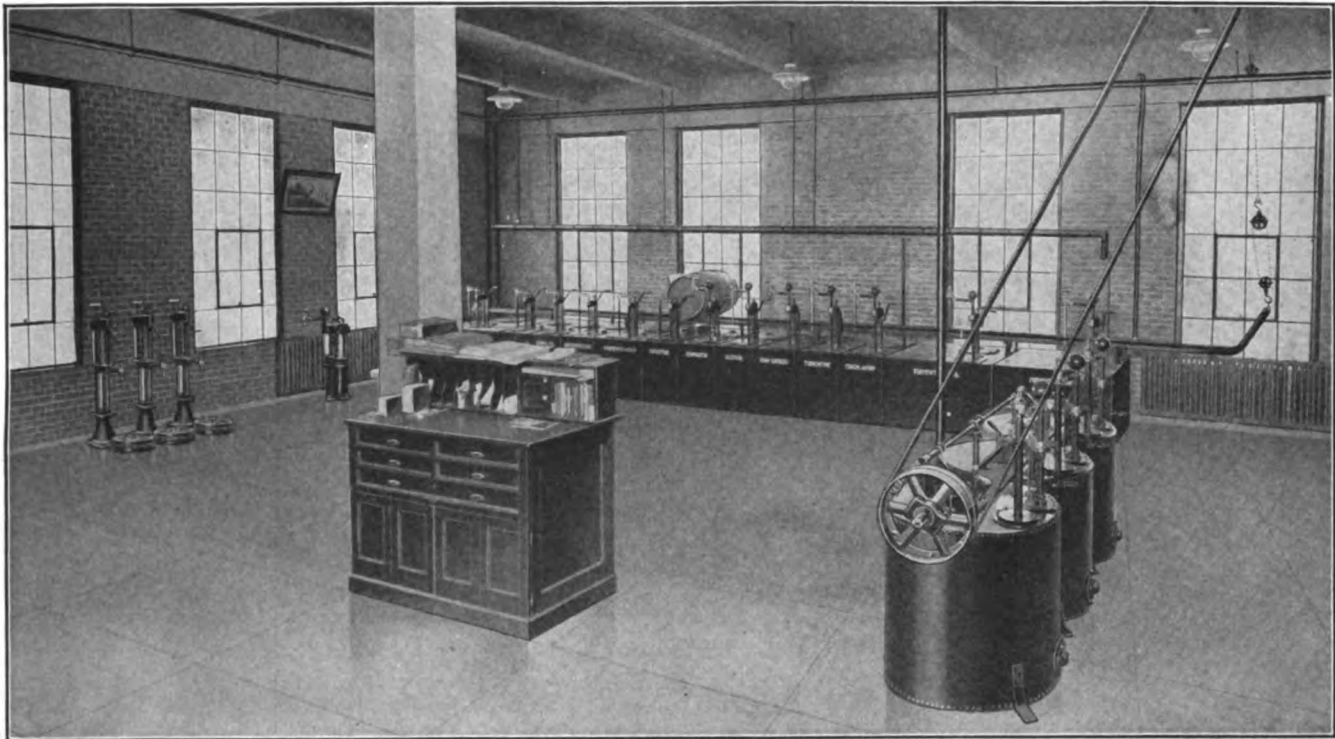


FIG. 154. PORTABLE LUBRICATING OIL OUTFIT



FIG. 154. PORTABLE LUBRICATING OIL OUTFIT

Continued on next page



REPRESENTATIVE OIL HOUSE

Showing paint oil and lubricating oil equipment, agitator tanks and self-measuring pumps connected to large storage tanks in basement and underground

Oil Filtering and Circulating Systems.

The system illustrated is automatic in operation. Oil is fed in continuous streams to bearings, collected, carried to the filter, cleaned, returned to overhead gravity tank and fed again to bearings. This gives a continuous round of clean oil. For reciprocating engines or similar machinery, horizontal steam turbines and other types. Also filters to take care of oil in batches only.

Naphtha Storage and Distributing Systems for Dry Cleaners.

"Standard" or "Premier" styles. Tanks installed underground, as many as necessary, of any desired capacity; cone bottom for settling naphtha. Pumps discharge naphtha as desired to washers, still, washer to washer, back to tanks, etc.

Power Pumps.

Rotary type, for operation by belt or direct motor connection; varying styles and capacities to meet existing conditions and requirements.

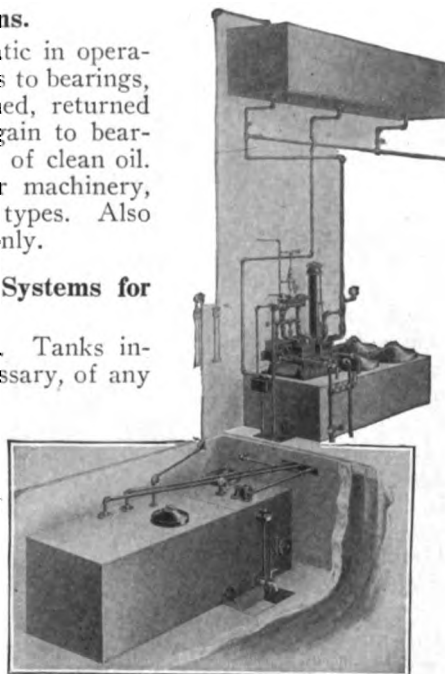


FIG. 6-F. OIL FILTERING AND CIRCULATING SYSTEM

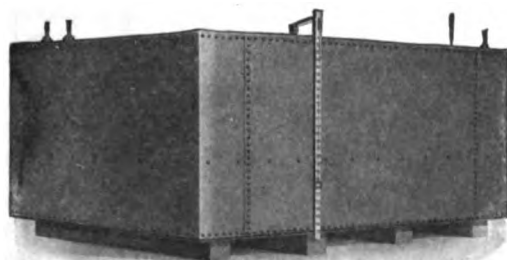
Engineering Service.

Assistance in planning and designing new oil-house, to include oil storage and distributing systems, and oil handling equipment for buildings already constructed. Complete survey of present conditions made and recommendations given as to probable savings complete oil handling systems will effect.

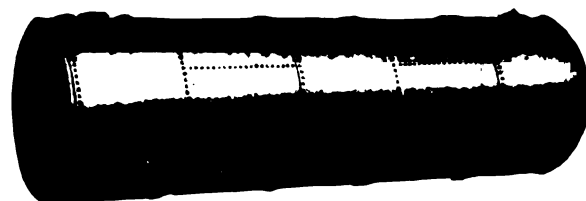
This service is furnished to all manufacturing industries, mines, mills, shops, power plants, railroads, garages, filling stations, office buildings, or wherever oils are used.

Bulletins.

Complete details giving the construction, operation and dimensions of each of our outfits are given in our bulletins. These bulletins are gladly furnished on request either from our home office at Fort Wayne or our branch offices.



RECTANGULAR TANK



CYLINDRICAL TANK

WAYNE OIL TANK & PUMP CO.

726 Canal Street
FORT WAYNE, IND.

BRANCH OFFICES

ALBANY, N. Y., Industrial Building
ALEXANDRIA, LA., 1406 Third Street
ATLANTA, GA., 1221 Candler Building
BALTIMORE, MD., 2103 North Fulton Avenue
BOSTON, MASS., Publicity Building
BUFFALO, N. Y., 234 Saranac Avenue
CHICAGO, ILL., 350 Old Colony Building
CINCINNATI, OHIO, 705 Lyric Building
CLEVELAND, OHIO, 1833 East Thirteenth Street
COLUMBUS, OHIO, 137 East Gay Street
DALLAS, TEX., 1911 Commerce Street
DENVER, COLO., 1606 Broadway
DETROIT, MICH., 4616 Woodward Avenue
GRAND RAPIDS, MICH., 402 Kortlander Building
GREAT FALLS, MONT., 414 First Avenue, North
JACKSON, MISS., 110 Roach Street

WASHINGTON, D. C., 534 Southern Building

INDIANAPOLIS, IND., 217 North Pennsylvania Avenue
KANSAS CITY, MO., 1333 McGee Street
LOS ANGELES, CAL., 830 South Los Angeles Street
MEMPHIS, TENN., 245 Monroe Street
MINNEAPOLIS, MINN., 827 Hennepin Avenue
NEW ORLEANS, LA., 635 Baronne Street
NEW YORK, N. Y., 1780 Broadway
OMAHA, NEBR., 312 Finance Building
OKLAHOMA CITY, OKLA., 321 North Broadway
PHILADELPHIA, PA., 1012 North Broad Street
PITTSBURGH, PA., 304 Union Arcade
RICHMOND, VA., 524 West Broad Street
ROCHESTER, N. Y., 35 Locust Street
SALT LAKE CITY, UTAH
SAN FRANCISCO, CAL., 631-33 Howard Street
TOLEDO, OHIO, 518 Devon Place

Products and Services.

GASOLINE and OIL STORAGE SYSTEMS;
HEAVY METAL STORAGE TANKS; OIL FIL-
TRATION SYSTEMS; METAL MELTING FUR-
NACES.

Also manufacturers of Furnaces for
Forging and Heat Treating.

A national organization with offices in thirty-four
American cities. Repair stocks and expert service at
your command. Representatives everywhere.

Modern Method of Liquid Storage.

Barrel or drum storage of liquids (oils, paints, gaso-
line, etc.) is responsible for a large loss of profits.
There is waste from spigot drippage; the fire hazard of
unprotected oils and oil soaked floors; theft and unau-
thorized use; ruined bearings from dust
and dirt; no definite check on consump-
tion; and loss of the portion undrained
from every "empty." And there is a greater
loss from time wasted in securing oils.

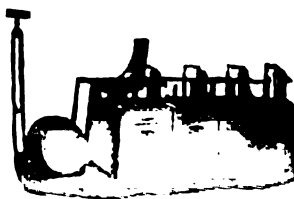


PORTABLE
TANK FOR
LUBRICAT-
ING OIL

Wayne liquid storage systems for
mines, powerhouses, mills, factories, rail-
road shops and stores, eliminate this loss.
Central storage in steel tanks provides
adequate protection from dirt, fire, drip-
page and theft. Pumps measure and
dispense at a crank turn any desired
quantity. Gauges and meters keep an
automatic inventory of supply and con-
sumption. Long distance pumps or portable outfits de-
liver the liquid where it is needed.

Unit Storage System Provides for Expansion.

Wayne tanks are sepa-
rate and independent units.
They are uniformly 30 in.
high and 40 in. long, vary-
ing only in widths to meet
desired capacities. A bat-
tery of these tanks (designed
for underground, cellar or
first floor use) is the proper

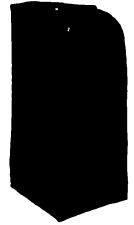


STATIONARY TANK FOR
LUBRICATING OILS

Wayne
Liquid Storage
Systems
TRADE-MARK

installation where a number
of oils or liquids are kept on
hand. Additional tanks may
be added at any time or un-
necessary tanks removed,
without disturbing the others.

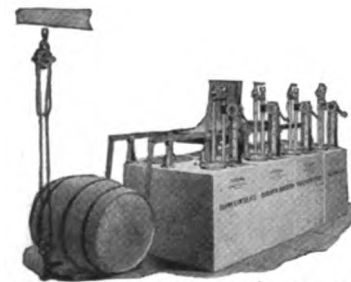
A barrel track, cradle, hoist and
drainer enable one man to drain barrels
easily and completely.



LUBRICAT-
ING OIL
OUTFIT

Quality Construction Throughout.

Wayne equipment is built for continued service and



FIRST FLOOR PAINT OIL OUTFIT

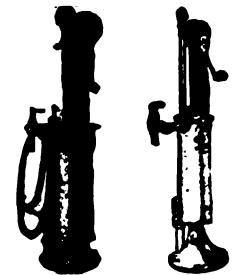
is guaranteed for two
years. It is constructed
entirely of metal. The
tanks are made of soft
tank steel, galvanized,
closely riveted or spot-
welded, and all seams
flushed with solder in-
side and out. The
openings are reinforced
and heavy angle brac-
ing is riveted on the
inside of the tanks. All

tanks are carefully tested and guaranteed oiltight.

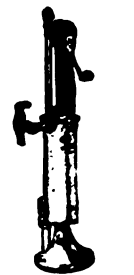
The pumps are accurate, quick and dependable.

The pump bracket and discharge
pipe are very rigid and fastened
to the tank top with heavy
screws. The nozzle stops the
flow when pumping ceases and
prevents dripping. Each pump is
equipped with a lock preventing
unauthorized use. The valves
are solid brass, carefully ma-
chined, ground to seat, and rig-
idly inspected at each step.

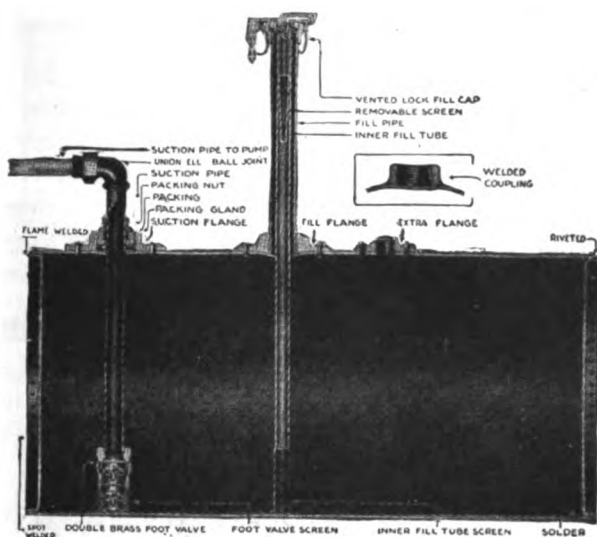
Each tank is provided with
a drip pan under the nozzle.
This consists of a heavy ring
riveted to the tank top. In this



PUMP FOR
GASOLINE
AND OILS



MEASUR-
ING PUMP
FOR DRAW-
ING OILS
FROM CEL-
LAR STOR-
AGE



STEEL UNDERGROUND GAS, OIL AND LIQUID STORAGE TANK

is hung the galvanized drip pan proper which has a $\frac{3}{4}$ -in. hole in the center and is covered with a cast iron grate. This cover is provided with a padlock.

Oil Burning Furnaces for Metal Melting.

For melting brass, bronze, copper, aluminum, nickel, gold, silver and other non-ferrous metals. Also for reduction of cyanide precipitates.

These Wayne metal-melting furnaces attain a new standard in rapid heats at right temperatures; strong, sound, castings, minimum loss of metal, and economical use of fuel.

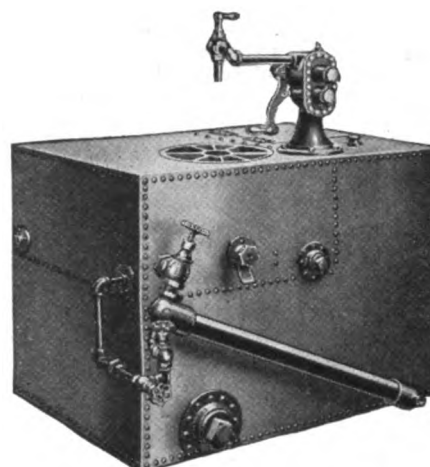
The burners tilt with the furnaces continuing the fire while pouring, protecting the metal and maintaining it at an even temperature. The whole or part of the melt may be poured or held without chilling, overheating, or oxidizing. Working conditions for the operator are ideal.

In the crucible type the crucibles are never removed or handled by tongs, are never subjected to sudden temperature changes and consequently are much longer lived.

Complete system planned and installed by competent engineers and covered by a Wayne guarantee.

Oil Filtration Systems for Every Need.

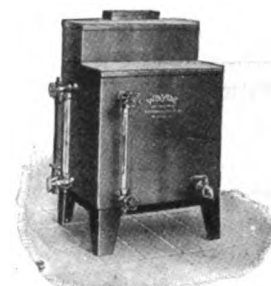
The Wayne line of oil filters includes: hand batch filters for filtering small quantities of oil; cutting oil



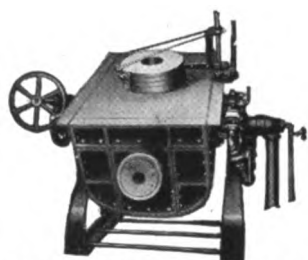
TYPE B CUTTING OIL FILTER

filters, the only filter designed specifically for renewing cutting oil in pans under machine tools and for purifying cutting oils after they are received from centrifugal chip separators; circulating oil filtration systems for power-houses, ring bearings, mill drive shafts, etc.; and turbine batch filters.

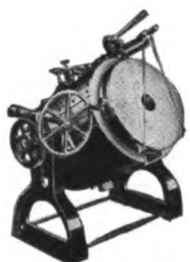
Wayne filtration systems have culminated from years of experience, exhaustive experiments under actual working conditions, and the knowledge of skilled lubrication engineers. They embody vital improvements in mechanical arrangement, adjustment and operation. *They are easily cleaned.* They entirely reclaim used lubricating oils and cutting compounds and make possible their repeated use. They assure better lubrication and eliminate burned bearings. They save man power.



TYPE H HAND BATCH FILTER



METAL MELTING FURNACE, TILTING NON-CRUCIBLE TYPE

METAL MELTING FURNACE, TILTING SELF-CONTAINED CRUCIBLE TYPE
200, 350 and 375 lbs. per heat

TYPE C CIRCULATING OIL FILTER

Competent Engineering Service.

Wayne goes farther than merely building the best possible equipment for storing and dispensing industrial liquids, for filtering oils and for forging, heat-treating and melting metals. Proper installation of these systems is a specialized engineering problem. Wayne maintains a corps of skilled engineers for this purpose. Their vast fund of knowledge and experience is at your command without cost or obligation in advising and planning correct installations for any requirement.

THE BURT MANUFACTURING CO.

Manufacturers of Oil Filters

601 High Street
AKRON, OHIO

Products.

"BURT" OIL FILTERING SYSTEM; CROSS OIL FILTERS; RESERVOIRS; OIL PUMPS.

Also manufacturers of American Oil Filter for use with gas or gasoline engines; Gary Oil Filter; Double Unit Oil Filter for two kinds of oil; Warden Oil Filter which utilizes any kind of filtering material.

For "Burt" Ventilators and Exhaust Heads, see pages 352-53.

"Burt" Oil Filtering System.

In the system illustrated in Fig. 1D, the oil is fed to the different bearings by gravity from the overhead oil reservoir. After passing through the bearings, it is piped to the oil filter or filters in the basement, and after being purified it is again pumped to the reservoir, making the process

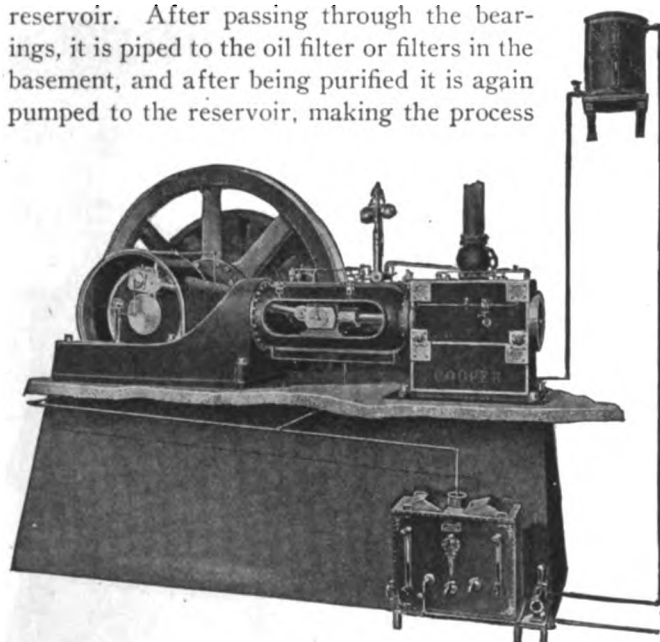


FIG. 1D. "BURT" OIL FILTERING SYSTEM
Usual method of installing gravity outlining system

automatic and requiring only very slight attention.

The "Burt" oil filtering system can be constructed and put into operation by any engineer. This company will furnish the oil filters, oil reservoirs and the oil pump.

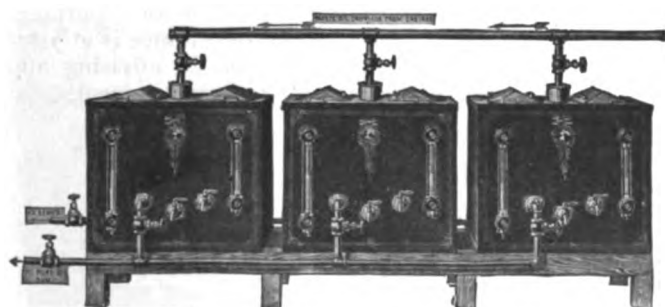


FIG. 2D. THREE FILTER UNITS CONNECTED AND OPERATED
AS ONE FILTER

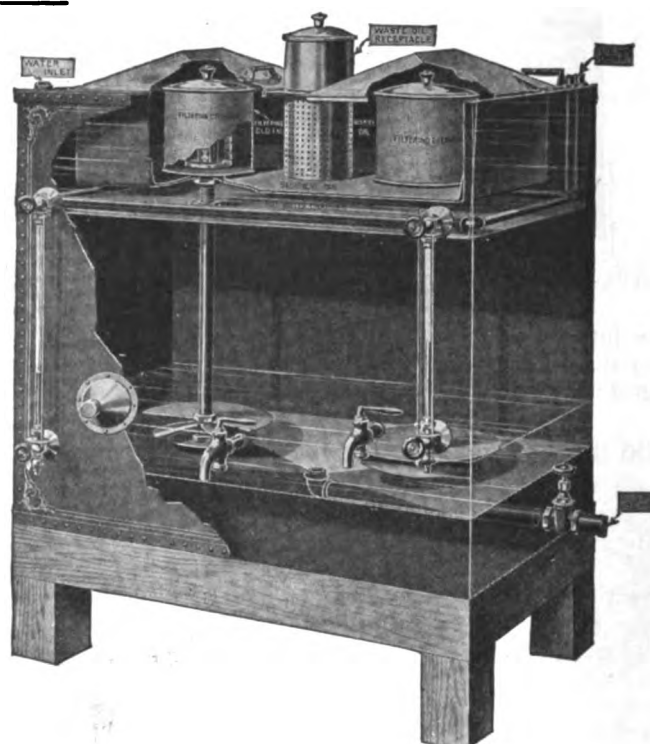


FIG. 3D. "BURT" UNIT OIL FILTER
Sectional view

DATA, "BURT" UNIT OIL FILTER

Size	Units	Filtering capacity per 24 hours, gals.	Pure oil cham-ber, gals.	Waste oil cham-ber, gals.	Water cham-ber, gals.	Dimensions			Price
						Length, in.	Width, in.	Height, in.	
No. 15 D	1	250 to 400	90	20	40	42	28	36	\$160. 00
No. 16 D	2	500 to 800	180	40	80	84	28	36	320. 00
No. 17 D	3	750 to 1200	270	60	120	126	28	36	480. 00
No. 18 D	4	1000 to 1600	360	80	160	168	28	36	640. 00
No. 19 D	5	1250 to 2000	450	100	200	210	28	36	800. 00
No. 20 D	6	1500 to 2400	540	120	240	252	28	36	960. 00

Strictly net, f. o. b. Akron, Ohio.

The Cross Oil Filter.

Introduction—The larger portion of lubricating oil is not consumed by the machinery, but passes through the bearings, drips away and is lost, except in cases where special provision has been made for gathering the waste oil by means of drip pans or buckets placed under the bearings. This waste oil frequently amounts to from 50% to 90% of the whole quantity used; but if gathered and caused to pass through one of the Burt filters, all dirt, grit and other impurities will be eliminated, and the waste oil can then be used over again on the finest machinery with perfect safety.

It is well known that a flowing oil, fed freely, will reduce friction to a lower point than a heavier oil fed slowly. It is true economy to have all the oil passages of liberal size, so as to provide free and copious lubri-

cation. Where a filter is employed, free flowing oil may be used with minimum waste, and a resulting extension in the life of the machinery.

The most important part of an oiling system is the filter. The Cross oil filter is recommended for filtering engine and common machinery oils. The Nos. 1R, 2R, and 3R sizes are made as shown in Fig. 1D; No. 4R and larger sizes are illustrated in Fig. 4R (without connection for oiling system). Very little steam (exhaust) is required, and if the filter is kept in a warm place it will not be necessary to make steam connections. The object of using heat is to increase speed and capacity of filter.

Operation—Waste oil is poured into chamber A (Fig. 4R). It then passes into chamber B, through layer of waste, which collects all the heavier impurities. Thence it passes through perforated bottom of chamber B, downward in direction shown by arrows into tube C, and from there to filter plate D, where increased weight of water has a tendency to keep oil back in tube C. However, pressure of oil in chamber B forces it down and it spreads out across underside of plate D in a *very thin film* which constantly changes surface and grows thinner as it travels from center to outer edge of plate, thus exposing every particle of waste oil to action of water. Oil then flows over and under plates 1D and 2D, going through same process in each case. When oil leaves filter plate 2D it is in a finely divided state of separation and thoroughly mixed with water, which washes it out, and, from which all the remaining impurities are separated by gravity and settle in chamber E, whence they can be removed through cock No. 3. From plate 2D, oil again filters through stratum of filtering material F, and from there it rises to chamber G, the reservoir containing the purified oil. It is then drawn off as required from cock No. 1.

In some cases the Cross filter will need to be cleaned only once in three or four months, while in others it

must be done about once a month. Filtering waste in chamber B can be instantly removed without interference with pure oil supply.

Practically no attention is required after filter is started, and first cost is the only expense, excepting a few cents per year for waste.

"Style A"—Recommended where lubricating oil is used in very large quantities and where, in the interest of economy, pipe connections are made by means of gate valves so that the filtered oil can be pumped to any part of the plant desired.

The "Style A" filter is used by some of the largest power plants in the world, and is so constructed that it can be used with or without an oiling system.

Filter can be used with or without water.

"Style B"—In many power plants water becomes mixed with waste lubricating oil, and considerable difficulty is often experienced in filtering this mixture. "Style B" filter is recommended for this problem, and is guaranteed to separate water automatically from waste oil and at the same time to clean the oil so that it can be used over and over again.

The "Style B" filter will also take condensed water and oil from oil separators and exhaust heads and successfully separate the oil from the water and filter the oil perfectly, so that the reclaimed cylinder oil will make an excellent lubricant for pumps and other machinery, but is not recommended for re-use in the cylinders of steam engines.

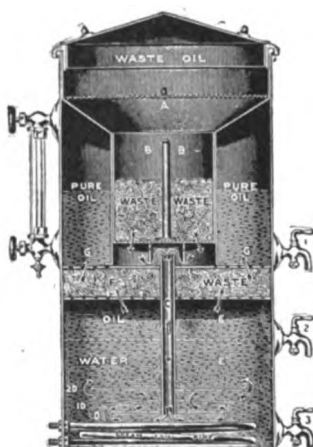


FIG. 4R. CROSS OIL FILTER
Sectional view

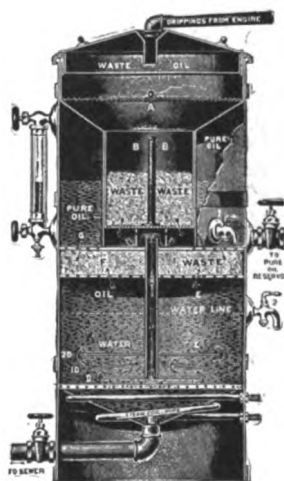


FIG. 5A. CROSS OIL FILTER,
"STYLE A"
Sectional view

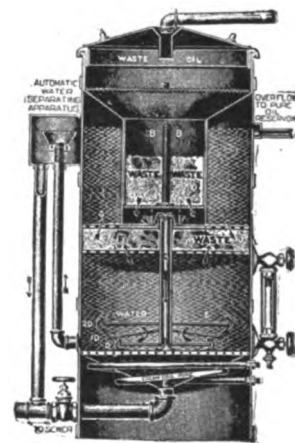


FIG. 6B. CROSS OIL FILTER,
"STYLE B"
Sectional view

DATA, CROSS OIL FILTER

Size	Filtering cap. per 24 hours, gals.	Holding cap. dirty oil, gals.	Diam., in.	H'ght., in.	Cap. pure oil chamber, gals.	Net wgt., lbs.	Gross wgt., lbs.	Diam. of crate, in.	H'ght. of crate, in.	Price
No. 1R	20 to 30	7	18	30	11	36	100	24	32	\$37.00
No. 2R	5 to 10	3	12	26	3	22	60	19	28	25.00
No. 3R	40 to 50	17	24	36	20	72	170	33	40	75.00
No. 4R	60 to 70	26	30	54	37	163	350	54	57	90.00
No. 5R	70 to 90	32	33	56	49	196	409	54	59	110.00
No. 6R	100 to 120	45	35	60	60	220	450	66	61	130.00
No. 7R	120 to 150	52	35	74	75	250	500	66	76	160.00
No. 8R	150 to 200	57	40	76	90	350	680	72	76	190.00

Strictly net, f. o. b. Akron, Ohio.

DATA, CROSS OIL FILTER, "STYLE A"

Size	Filtering cap. per 24 hours, gals.	Holding cap. dirty oil, gals.	Diam., in.	H'ght., in.	Cap. pure oil chamber, gals.	Net wgt., lbs.	Gross wgt., lbs.	Diam. of crate, in.	H'ght. of crate, in.	Price
No. 1A	20 to 30	7	18	36	11	63	108	24	38	\$45.00
No. 3A	40 to 50	17	24	42	20	100	200	33	46	80.00
No. 4A	60 to 70	26	30	54	37	163	350	54	57	100.00
No. 5A	70 to 90	32	33	56	49	196	409	54	59	120.00
No. 6A	100 to 120	45	35	60	60	220	450	66	61	135.00
No. 7A	120 to 150	52	35	74	75	250	500	66	76	165.00
No. 8A	150 to 200	57	40	76	90	350	680	72	76	200.00

Strictly net, f. o. b. Akron, Ohio.

DATA, CROSS OIL FILTER, "STYLE B"

Size	Filtering cap. per 24 hours, gals.	Holding cap. dirty oil, gals.	Diam., in.	H'ght., in.	Cap. pure oil chamber, gals.	Net wgt., lbs.	Gross wgt., lbs.	Diam. of grate, in.	Height of grate, in.	Price
No. 1B	20 to 30	7	25	36	11	70	150	31	38	\$50.00
No. 2B	5 to 10	3	18	30	3	30	78	25	32	35.00
No. 3B	40 to 50	17	31	42	20	96	246	40	46	97.00
No. 4B	60 to 70	26	37	54	37	190	410	51	57	110.00
No. 5B	70 to 90	32	40	56	49	215	348	61	59	130.00
No. 6B	100 to 120	45	42	60	60	226	484	73	61	160.00
No. 7B	120 to 150	52	42	74	75	270	500	73	76	175.00
No. 8B	150 to 200	57	47	76	90	395	730	79	76	220.00

Strictly net, f. o. b. Akron, Ohio.

Reservoirs for Oiling System.

These reservoirs are furnished by THE BURT MANUFACTURING CO. for use with their oil filters. They are made of galvanized iron (same quality as used in the oil filters), fitted with inlet and outlet pipes, overflow pipe, cover, and oil gage. Each tank is handsomely decorated in gold to correspond with filters.

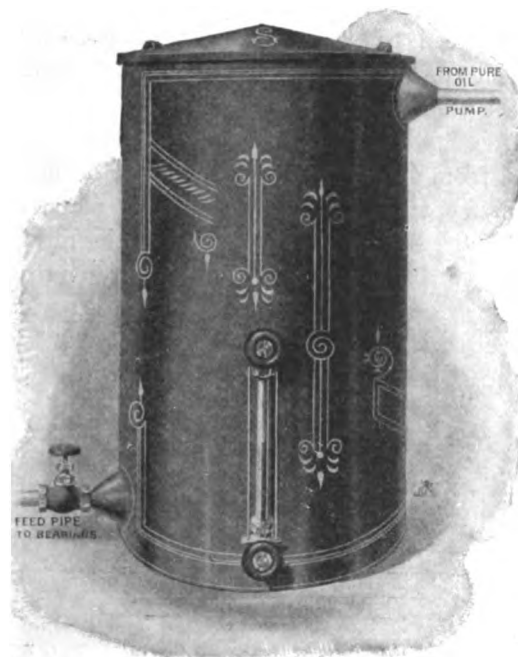


FIG. 7A. "BURT" RESERVOIR FOR OILING SYSTEM

DATA, OIL RESERVOIRS

Cap., gals.	Inlet, in.	Outlet, in.	Overflow, in.	Height, in.	Diam., in.	Price
25	1 1/2	1 1/2	1 1/4	23	18	\$15.00
50	1 1/2	1 1/2	1 1/4	35	20 1/2	21.00
70	1 1/2	1 1/2	1 1/4	36	24	26.00
100	3/4	3/4	1	44	27 1/2	30.00
140	3/4	3/4	1	48	30	32.00
180	3/4	3/4	1	48	33 1/2	40.00
250	1	1	1 1/4	61	35	46.00
300	1	1	1 1/4	73	35	55.00
350	1	1	1 1/4	85	35	60.00

Strictly net, f. o. b. Akron, Ohio.

At prices quoted any size inlet and outlet pipes will be furnished. If desired, steam coil pipes can be furnished at slight extra expense.

Special reservoirs of any size or shape, and of any gage iron desired, made to order. Prices and blue prints on compartment oil tanks on application.

Oil Pump for Oiling System.

This duplex oil pump is especially designed for use in connection with oiling systems. Working parts are all easy of access, and are made to gage. Rods are put in on the separate principle, and are fastened at the center by a special device which permits of one rod being easily removed without disturbing the other.

This pump is economical in the consumption of steam, can be started at any point of the stroke, and consequently there is no danger of its being on dead center. The valve arrangement is especially adapted for a continuous service.

With each pump is included a lubricator, all necessary air and drain cocks, wrenches, etc. Every pump is tested at factory and guaranteed.

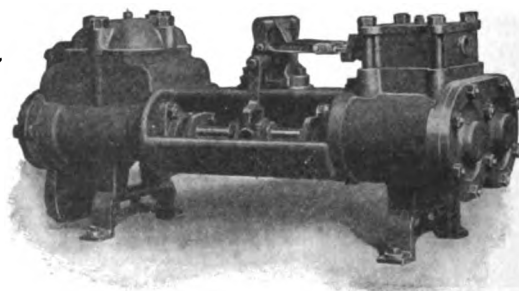


FIG. 8E. "BURT" OIL PUMP FOR USE IN OILING SYSTEM

DATA, DUPLEX OIL PUMP

No.	Size, in.	Proper strokes per min. of one piston, varying with kind of work and pressure	Gallons delivered per min. by both pistons at stated number of strokes	Steam, in.	Exhaust, in.	Suction, in.	Discharge, in.	Price
2E	2 1/4 x 1 1/4 x 2	100 to 250	2 1/4 to 6	3/4	1 1/2	3/4	1 1/2	\$100.00
3E	3 x 2 x 3	100 to 250	8 to 20	1 1/2	1 1/2	1 1/4	1	125.00
4E	3 1/4 x 2 1/4 x 4	100 to 200	14 to 28	1 1/2	1 1/2	1 1/2	1 1/4	150.00
5E	4 1/2 x 2 1/4 x 4	100 to 200	20 to 40	3/4	1	2	1 1/2	175.00
6E	4 1/2 x 3 x 4	100 to 200	25 to 50	3/4	1	2	1 1/2	200.00

Strictly net, f. o. b. Akron, Ohio.

Thirty Days' Trial.

THE BURT MANUFACTURING CO. will send one or more oil filters to any responsible house on 30 days' trial, subject to approval in every respect. If it is found, upon trial, that they do not reduce lubricating oil bills at least 50%, or that the filters fail to meet every claim made for them, they may be returned and this company will pay freight charges both ways.

Guarantee.

THE BURT MANUFACTURING CO. expressly agrees to repair or replace, free of charge, any oil filter, exhaust head or ventilator, sold by them, which shall at any time be found to have been defective in workmanship or material.

References.

A comprehensive list of satisfied users of Burt filters will gladly be sent on request.

DETROIT LUBRICATOR COMPANY

DETROIT, MICH.

Products.

SIGHT FEED LUBRICATORS; FORCE FEED OILERS; OIL and GREASE CUPS.

Also manufacturers of Oil Gages; Air and Priming Cups; Water Gages; Fusible Plugs; Radiator Valves.

Sight Feed Lubricators.

Detroit lubricators are made in a sufficient variety of styles to properly lubricate the valves and cylinders of all types of steam engines, steam pumps, air compressors, etc. Scientifically designed, each for its purpose; afford efficient and constant lubrication; all parts made of proper metal and replaceable at a small cost.

Cored heating passage filled with steam at all times lubricator is in operation, maintaining oil at even temperature, keeping it in a thoroughly liquid condition and permitting no fluctuation in rate of feed. Lubricator is well fitted for feeding heavy oils.



DOUBLE CONNECTION SIGHT FEED LUBRICATOR



SINGLE CONNECTION SIGHT FEED LUBRICATOR

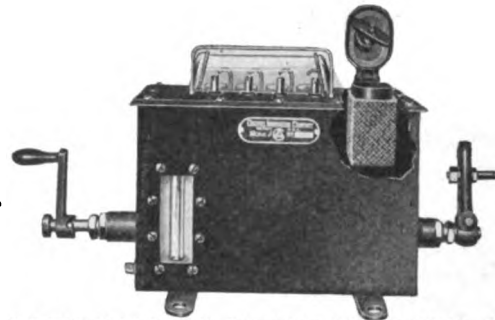


SIGHT FEED AIR COMPRESSOR LUBRICATOR

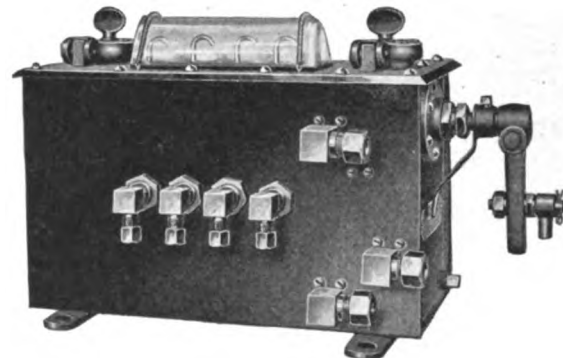
Force Feed Oilers.

For mechanical lubrication of gas, oil, gasoline, and steam engines, air compressors, machine tools, etc. Composed of one or more pumping units, one unit to each feed. Entire mechanism is contained in tank or reservoir and easily accessible for cleaning or inspection. Oiler driven by some moving part of the engine or machine which also automatically controls the speed at which it is driven. Made in large variety of ways and with different drives, etc., for different service requirements.

In addition to one or two lubricating compartments Detroit oilers can be made with a separate compartment



FOUR-FEED MODEL "J" DETROIT FORCE FEED OILER
Showing filler opening and screen

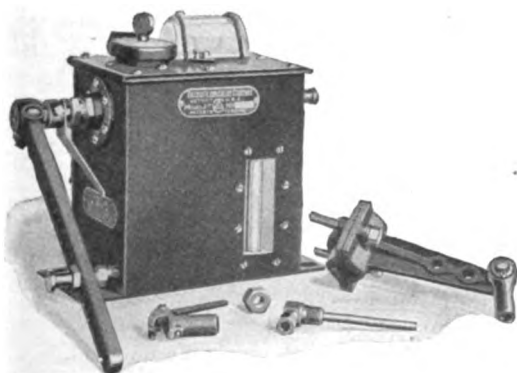


FOUR-FEED MODEL "JT" FORCE FEED OILER WITH GRAVITY DISCHARGE FUEL PUMP
Rear view showing lubricating feeds, fuel feeds and overflow

for handling fuel—pumping it from an underground storage tank or other safe place into the fuel compartment from which point it is either forced or flows by gravity to the engine cylinder.

Glass Body Oil Cups.

For use on machinery and bearings of all kinds. Made in both cast and pressed brass, in all sizes with sight feed; sight and set feed; sight feed, set feed and stop feed features, as specified. Particularly adaptable to service where use of mechanical oilers is unnecessary. Construction insures oilers standing up under heavy service at all times. A very desirable feature is a patented slide fitted over oil filler opening which automatically closes when released, preventing dirt or other foreign substances from getting into oil.



ONE-FEED MODEL "JTS" DETROIT FORCE FEED OILER FOR STEAM ENGINES

This oiler is designed for high pressure work. Furnished complete with necessary fittings for installation



TWO-FEED MODEL "J" DETROIT FORCE FEED OILER



DETROIT PRESSED BRASS GLASS BODY OILER WITH WICK FEED



DETROIT PRESSED BRASS GLASS BODY OILER WITH SET FEED, SIGHT FEED, AND STOP FEED FEATURES

ESTABLISHED 1863

GREENE, TWEED & CO.

Manufacturers of Automatic Force Feed Lubricators

109 Duane Street
NEW YORK, N. Y.

TELEPHONE CONNECTION

Product.

ROCHESTER AUTOMATIC LUBRICATORS.

Application.

For the lubrication of the cylinders of all types of steam engines and pumps as well as air and ammonia compressors.

Construction.

Working parts are made of steel, and all bearings case hardened.

The mechanism of the Rochester automatic lubricator is compactly centered in a steel pump block, the principal working parts being enclosed and protected from dirt, grit, etc.

This block with all the mechanism can be almost instantly detached and removed, giving easy access to all the working parts for cleaning, repairing, etc., without disturbing the bowl or reservoir attached to the engine.

Driving Mechanism.

The clutch drive, while positively noiseless, is absolutely positive.

Notwithstanding the fact that the drive is a clutch drive, there is a regulating device whereby can be induced more or less lost motion of the actuating arm.

The clutch drive Rochester is especially adapted for use on high speed engines, having been used with great success on an engine running at 800 r.p.m.

Ratchet drive lubricators can be furnished if desired, at an advance of \$2.00 over the list prices for the clutch drive model.

Regulation.

Each feed regulated independently. Not affected by temperature, pressure or vacuum.

Improved Vacuum and Check Valve.

One of these check valves is furnished with each feed of every Rochester lubricator.

Special steel check valves and nipples, for use on ammonia cylinders, will be substituted if so specified on the order.



IMPROVED VACUUM AND CHECK VALVE

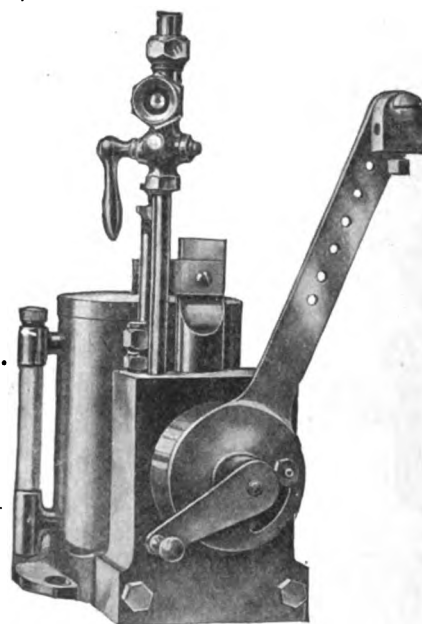
Sizes.

Made in all sizes from 1 pt. to 2 gal., and with any number of feeds from 1 to 8.

All sizes fully nickelplated.

Also made with 2 compartments, for use where different kinds of oil are used in the different cylinders

of the same machine, as in the case of air compressors, ice machines, etc.



2-PINT SIZE SINGLE FEED LUBRICATOR—CLUTCH DRIVE MODEL

**LIST PRICES, FOR CLUTCH DRIVE MODEL
FOR STATIONARY AND MARINE ENGINES AND PUMPS**

1-pint single feed.....	\$25.00
2-pint single feed.....	30.00
3-pint single feed.....	35.00
1/2-gallon single feed.....	40.00
1-gallon single feed.....	45.00
2-pint double feed.....	45.00
3-pint double feed.....	50.00
1/2-gallon double feed.....	55.00
1-gallon double feed.....	60.00
2-gallon double feed.....	75.00
1/2-gallon triple feed.....	70.00
1-gallon triple feed.....	80.00
2-gallon triple feed.....	90.00
1/2-gallon quadruple feed.....	90.00
1-gallon quadruple feed.....	100.00
2-gallon quadruple feed.....	105.00
1-gallon quintuple feed.....	120.00
2-gallon sextuple feed.....	130.00
2-gallon septuple feed.....	140.00
2-gallon octuple feed.....	150.00

Advance these list prices \$2.00 for the ratchet drive model.

FOR AIR COMPRESSORS AND ICE MACHINES

3-pint double feed, 2-compartment.....	55.00
1-gallon double feed, 2-compartment.....	65.00
1-gallon triple feed, 2-compartment.....	85.00
1-gallon quadruple feed, 2-compartment.....	105.00

Advance these list prices \$2.00 for the ratchet drive model.

Prices include a multiplus sight feed, a vacuum and check valve and a steam nipple with each feed of every lubricator; also a connecting rod and connection for connecting the lubricator to the engine, pump or compressor.

Some Prominent Users:

American Steel & Wire Co.	National Tube Co.
Atlas Portland Cement Co.	Pennsylvania Railroad Co.
Carnegie Steel Co.	Procter & Gamble Co.
E. I. du Pont de Nemours & Co.	John A. Roebling's Sons Co.
International Silver Co.	Tennessee Coal, Iron & Railroad Co.
National Cash Register Co.	Tiffany & Co.

McCORD MANUFACTURING COMPANY, INC.

Force Feed Lubricators and Gaskets

DETROIT, MICH.

BRANCH OFFICES

NEW YORK, N. Y.

WASHINGTON, D. C.

CHICAGO, ILL.

Products.

FORCE FEED LUBRICATORS and "McKIM" COPPER-ASBESTOS GASKETS.

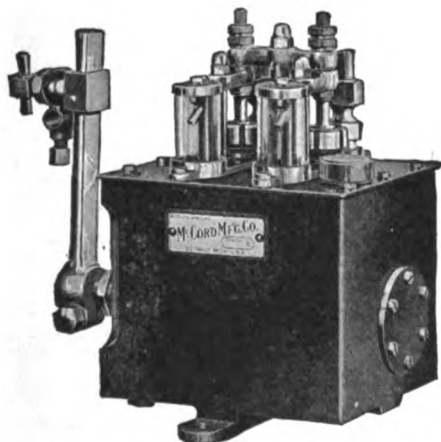
McCord Force Feed Lubricators.

The McCord force feed lubricator is made in from 1 to 14 feeds, and has a separate pump for each feed. Each pump has individual adjustment. It has constant sight feeds, which show exactly how much oil is being pumped to each bearing, and the flow can be adjusted from one drop to a full stream per stroke.

It is positive and automatic in action and operates in perfect synchronism with the engine or pump it is lubricating. It is not affected by viscosity of oil, variations in steam pressure or length of feed line.

ADVANTAGES—In addition to its standard features, such as positive sight feeds without pressure, separate pumps capable of individual adjustment for each feed, forced delivery of oil against pressure up to 1,000 lbs., etc., it has special advantages not found in any other device, as follows:

Internal mechanism—all working parts immersed in oil; auxiliary hand crank for accelerating feed; drop forged operating lever; reversible end bearing, so that lubricator can be driven from right or left hand end; heating chamber; plug for draining reservoir. (See catalogue for details.)



McCORD FORCE FEED LUBRICATOR
Class B, 2 feeds

CAPACITIES AND PRICES

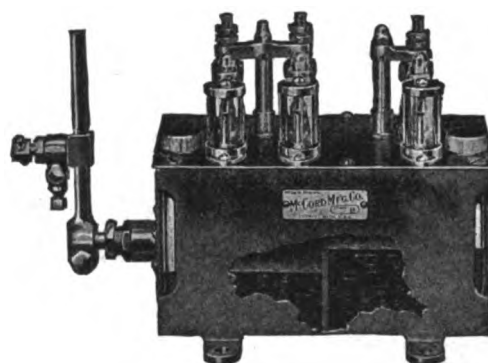
Capacity	Feeds	List	Capacity	Feeds	List
1 quart	1 feed	\$25.00	1 gallon	5 feeds	\$57.00
1 quart	2 feeds	30.00	1 1/2 gallon	6 feeds	63.00
2 quarts	1 feed	28.00	1 1/2 gallon	7 feeds	75.00
2 quarts	2 feeds	35.00	1 1/2 gallon	8 feeds	82.00
2 quarts	3 feeds	42.00	1 1/2 gallon	9 feeds	90.00
2 quarts	4 feeds	49.00	1 1/2 gallon	10 feeds	96.00
1 gallon	1 feed	33.00	2 gallons	11 feeds	108.00
1 gallon	2 feeds	39.00	2 gallons	12 feeds	115.00
1 gallon	3 feeds	45.00	2 gallons	13 feeds	125.00
1 gallon	4 feeds	51.00	2 gallons	14 feeds	135.00

Write for discount.

There is positively no pressure in sight feed; all working parts are of the best drop forged steel and operate in oil. Rotary or ratchet drive, finished in black enamel and nickel or black enamel and brass. Straightway spring check valves. Heating chamber and auxiliary hand crank furnished, as extras, when specified.



McCORD FORCE FEED LUBRICATOR
Class B, 14 feeds
Lubricates an entire plant from one point



McCORD DOUBLE COMPARTMENT LUBRICATOR
Feeds two kinds of oil

Especially adapted to Diesel engines, air compressors (steam or electric), ice machines, and high speed steam engines

CAPACITIES AND PRICES

2 quarts	2 feeds	2 and 1 feed in each	\$44.00
2 quarts	3 feeds	2 and 1 feed in each	50.00
2 quarts	4 feeds	2 feeds in each	57.00
1 gallon	2 feeds	1 feed in each	47.00
1 gallon	3 feeds	2 and 1 feed in each	34.00
1 gallon	4 feeds	2 feeds in each	60.00
1 gallon	4 feeds	3 and 1 feed in each	65.00
1 gallon	5 feeds	3 and 2 feeds in each	70.00
1 gallon	5 feeds	4 and 1 feed in each	70.00
1 gallon	6 feeds	4 and 2 feeds in each	75.00

Write for discount.

"McKim" Copper-asbestos Gaskets.

A pliable copper casing surrounding an asbestos packing, designed and constructed to withstand the ravages of heat, pressure and chemical action. Guaranteed not to spread or blow out and to withstand any pressure or superheat. May be re-applied repeatedly. "McKims" are saving from 50% to 80% of gasket maintenance in thousands of plants. Write today for free samples.



"McKIM" GASKET

MICHIGAN LUBRICATOR COMPANY

3601-3651 Beaubien Street
DETROIT, MICH.

Products.

GLASS BODY OIL CUPS; BRASS OIL CUPS and GREASE CUPS, LUBRICATORS for steam engines, air compressors and bearings; MULTIPLE OILERS.



satisfactory. Sells in great quantities.

The Plain Engine Lubricator—The old reliable. For steam engines it screws directly into the steam chest. May also be used on bearings.

Glass Body Oil Cups.

Model 12A glass body oiler is used by leading machine tool builders everywhere. Substantially made and neat in appearance. Rate of feed is easily adjusted and not disturbed by starting or stopping. Contents of reservoir and rate of feed both clearly visible at all times. Standard finish is polished brass. Nickelplated may be had if desired.

STANDARD LIST, MODEL 12A OILERS

Cat. No.	12A1	12A2	12A3	12A4	12A5	12A6	12A7	12A8	12A9
Cap., oz.	3/4	1	1 1/2	2 1/2	4	6	10	16	32
Thread, in.	3/8	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/2
Glass diam., in.	1 1/4	1 3/8	1 5/8	2	2 3/8	2 5/8	3 1/8	3 1/2	4 1/8



GLASS BODY OIL CUP, MODEL 12A

Brass Oil Cups and Grease Cups.

Models 5K and 10K—The regular well-known plain brass oil cups. Can be supplied with tubes for wick feed.



MODEL 5K OILER



MODEL 10K OILER



MODEL 174B GREASE CUP



MODEL 175B GREASE CUP

STANDARD LIST, MODELS 5K and 10K

Size No.	00	0	1	2	3	4
Cap., oz.	1/4	1/2	3/4	1	1 1/4	1 3/4
Diam., in.	1/2	3/4	7/8	1	1 1/8	1 1/4
Thread, in.	3/8	1/2	3/4	1	1 1/4	1 1/2

Models 174B and 175B—Heavy cast brass grease cups with accurately machined threads. Deliver the grease to the bearings without wasting it around the threads. Model 174B is screw cap type and Model 175B screw plunger type.

STANDARD LIST, MODEL 174B

Size No.	000	0	1	2	3	4
Cap., oz.	1/4	1/2	3/4	1	1 1/4	1 3/4
Thread, in.	1/8	1/4	3/8	1/2	3/4	1

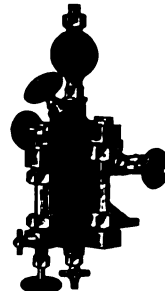
STANDARD LIST, MODEL 175B

Size No.	175B0	175B1	175B2	175B3	175B4
Cap., oz.	1/4	1/2	3/4	1	1 1/4
Thread, in.	1/8	1/4	3/8	1/2	3/4

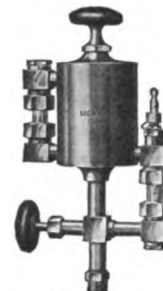
Lubricators.

The Cyclone—A steam engine lubricator known the world over. We have manufactured it continuously for over 30 years. Supplied in either nickel or brass finish.

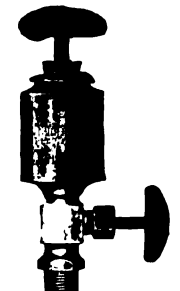
The Duke—Our air compressor lubricator. Highly



CYCLONE LUBRICATOR



DUKE LUBRICATOR



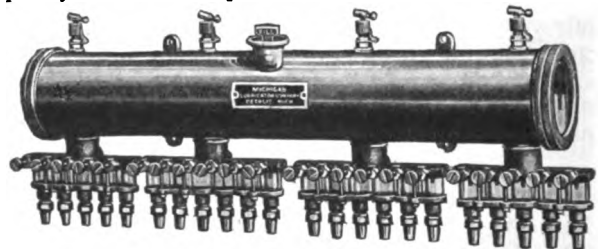
PLAIN ENGINE LUBRICATOR

CAPACITY AND THREAD OF LUBRICATORS

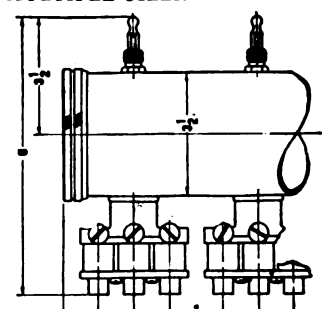
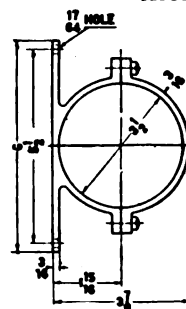
Cyclone—1/4 pt. x 1/2", 1/2 pt. x 1/2", 1/2 pt. x 1/2", 1 pt. x 1/2", 1 qt. x 1/2".
The upper connection on all sizes is threaded 1/4".
Duke—1/4 pt. x 3/8", 1/2 pt. x 3/8", 1/2 pt. x 1/2", 1 pt. x 1/2", 1 qt. x 1/2".
Plain Engine—1/4 oz. x 3/8", 1 oz. x 3/8", 1 1/4 oz. x 3/8", 1 1/2 oz. x 3/8", 2 1/2 oz. x 1/2", 4 oz. x 1/2", 5 oz. x 1/2", 10 oz. x 3/4".

Michigan Multiple Oilers.

Made in any number of feeds. Feeds grouped in units of from 2 to 6. Each feed has its own adjustment and each unit its snap lever shut-off. Oil is led to the various bearings by small tubes. Cheaper than the small oilers it replaces. Dimensions for any size given below. Capacity about 6 oz. per feed.



MICHIGAN MULTIPLE OILER



GENERAL DIMENSIONS MULTIPLE OILERS



MICHIGAN LUBRICATOR COMPANY'S FACTORY, DETROIT, MICH.

For Further Information.

Concerning any items on this page write for General Catalogue 208. We also make pet cocks, oil gages, valves, automobile engine brass fittings and a complete line of lubricators, all fully described in Catalogue 208.

SHERWOOD MANUFACTURING COMPANY

Brass Founders and Finishers; Engineering Specialties

1702-1716 Elmwood Avenue
BUFFALO, N. Y.

BRANCH OFFICES

NEW YORK, 220 Broadway BOSTON, 49 Federal Street LONDON, GREEN & BOULDING, LTD., 28 New Bridge Street, E. C.

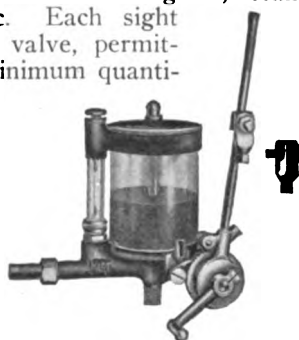
Products.

"SHERWOOD" DOUBLE TUBE AUTOMATIC INJECTORS; "EAGLE" EJECTORS; "HART" FORCE SIGHT FEED OIL PUMPS; "FELTHOUSEN" HAND CYLINDER OIL PUMPS.

Also manufacturers of "Buffalo" Automatic Injectors; "Sherwood" Acid Ejectors; "Buffalo" Boiler Oil Injectors; "Buffalo" Cylinder Lubricators; Automatic Crank Pin and "Buffalo" Oil Cups; Multiple Oilers; Oil Gauges; Lubricating Devices; "Niagara" and "Sherwood" Plain Brass Grease Cups; "Buffalo" and Screw Feed Compression Grease Cups; "Engineer's Favorite" Flue Cleaners; "Duplex" Flue Scrapers; "Favorite" Steam Flue Blowers; "Dean" Automatic Rotary Flue Scraper; Three-Way Indicator Cock; "Felthousen" Improved Ball Gauge Cock; "Safety" Hose Connections; Fusible Plugs; Oxygen and Co₂ Cylinder Valves; Bearings and Bushings, alloy, brass or bronze; Brass and Bronze Castings to Specifications; Metal Specialties to order.

"Hart" Force Sight Feed Oil Pump.

For force feed lubrication of steam engines, steam pumps, air compressors, etc. Each sight feed has independent needle valve, permitting accurate regulation of minimum quantity of oil delivered to each feed; eliminates waste. Plungers have constant length stroke regardless of amount of oil pumped. Large, easy reading sight feed glass, always at atmospheric pressure. All "Hart" pumps tested against steam pressure before shipment.



"HART" FORCE SIGHT FEED OIL PUMP

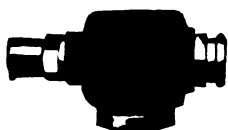
DATA, "HART" FORCE SIGHT FEED OIL PUMPS

Capacity	Size of glass, in.		Price			Capacity	Size of glass, in.		Price			
	Diam.	Height	One-feed	Two-feed	Three-feed		Diam.	Height	One-feed	Two-feed	Three-feed	Four-feed
1/2 pt.	3	3	\$16.00			2 qts.	5	6	\$35.00	\$45.00	\$50.00	\$60.00
1 pt.	3 1/2	4	20.00	\$30.00		3 qts.	5	8	40.00	50.00	55.00	65.00
1 qt.	4	5	25.00	35.00	\$40.00	1 gal.	6	8	50.00	55.00	65.00	75.00
3 pts.	4 1/2	6	30.00	40.00	45.00							

Right-hand pumps are always shipped, unless left-hand are particularly specified.

"Eagle" Ejector.

Designed for raising water from deep wells and pumping out holds of vessels, the "Eagle" Ejector handles up to 15,000 gals. per hour, and is operated by a comparatively small amount of steam. It has no moving parts; is constructed of brass and bronze castings and is not subject to corrosion.

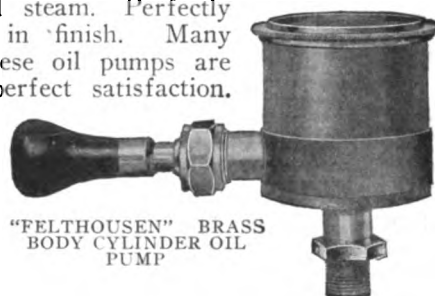


"EAGLE" EJECTOR

SWEET'S CATALOGUE

"Felthousen" Hand Cylinder Oil Pumps.

For lubricating engine and steam pump cylinders, etc.; simple in construction; any one can readily understand their use. There are two check valves between oil and steam. Perfectly made; elegant in finish. Many thousands of these oil pumps are in use giving perfect satisfaction. Every engine should have one of these pumps whether provided with automatic lubricator or not.



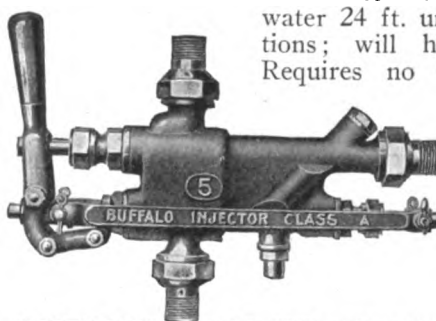
DATA, "FELTHOUSEN" HAND CYLINDER OIL PUMPS
Screw top or strainer top

Size	Brass body					Glass body				
	Side outlet	3	04	4	8	5	3	04	4	5
Bottom outlet	03	6	7	9			03	6	7	
Capacity, pts.	1/8	1/4	1/2	1	3		1/4	1/2	1	3
Pipe thread, in.	3/8	3/8	3/8	3/8	1/2		3/8	3/8	3/8	1/2
Price, polished brass	\$6.00	7.00	9.00	11.00	25.00		6.00	7.00	9.00	25.00
Price, nicked	\$6.50	7.50	9.75	11.75	26.00		6.50	7.50	9.75	26.00

"Sherwood" Double Tube Injector, Class "A."

A double tube or compound injector, comprising two sets of jets. One set acts as ejector; lifts water, supplying it to second set, which does the forcing.

Operated by one lever; works on any pressure from 25 to 200 lb. or more. Lifts water 24 ft. under proper conditions; will handle hot water. Requires no valve in either



"SHERWOOD" DOUBLE TUBE INJECTOR

DATA, "SHERWOOD" DOUBLE TUBE INJECTORS, CLASS "A"

Size	Size connections, in.		Capacity, gals. per hr.	Horsepower	Price
	Suction and delivery	Steam			
5	1 1/2	1 1/2	130	8 to 12	\$25.00
5 1/2	1 1/2	1 1/2	180	12 to 25	28.00
7	2	2	250	20 to 35	35.00
9	2 1/2	2 1/2	350	30 to 45	40.00
9 1/2	1	3/4	450	40 to 60	50.00
11	1	1	575	60 to 80	55.00
13	1 1/4	1	725	75 to 100	60.00
13 1/2	1 1/4	1 1/4	900	90 to 125	65.00
15	1 1/2	1 1/4	1260	120 to 175	85.00
15 1/2	1 1/2	1 1/4	1700	150 to 235	100.00
17	2	1 1/2	2200	200 to 300	120.00
19	2	1 3/4	2800	250 to 360	135.00
21	2 1/2	1 3/2	3500	350 to 500	150.00
23	3	2	5000	750 to 950	225.00

E. B. BADGER & SONS CO.

Spray Equipment Water Cooling Systems and Air Washers

BOSTON, MASS.

NEW YORK OFFICE, 101 Park Avenue

CHICAGO OFFICE, 616 South Michigan Avenue

Products.

WATER COOLING SYSTEMS; AIR WASHERS; SPRAY PONDS.

Also manufacturers of Air Conditioning Apparatus; Air Coolers; Smoke Washers; Odor Condensers; Gas Scrubbers; Humidifiers; Spray, Sewage and Aerating Nozzles; Spray Equipment for acid plants.

For Expansion Joints, see page 424.

Water Cooling Systems.

Adapted to cooling condensing water for steam power plants, stills, evaporators, etc., for re-use and are especially useful where water is scarce. When cooling water for steam power plants they are guaranteed to cool the water sufficiently to afford an average vacuum better than 28 in. based on modern condensing equipment and good operating conditions. Systems can be operated at 6 lbs. pressure and will cool to or below atmospheric temperature.

Nozzle—As a result of extensive experience with spray plants, this company has developed a nozzle scientifically designed for spraying large volumes of water at low pressures with highest efficiency. Each spray nozzle is fitted with the improved turbine center. The design of this center is such that a rapid rotating motion is imparted to liquid passing through it, producing a strong centrifugal action and causing liquid to break up into fine spray as it leaves nozzle.

At 5 lbs. pressure spray issues in the form of an inverted solid cone composed of particles that, while fine, will settle within the spray pond limit; at 7 lbs. pressure liquid is broken up into a mist producing the greatest cooling possible at low pressures. Note large opening through center and short, free water passages—former prevents clogging, latter increases cooling efficiency of the nozzle as well as its capacity. The inside of shell and vanes is finished smooth, and all water passages are made as large as possible to reduce friction loss of water passing through nozzle.

There are no moving parts to wear out, all parts of the nozzle being stationary and only water rotating. Liability to clog is reduced to a minimum by providing a large waterway through nozzle. Ordinarily made of high grade bronze but other metals can be used when necessary for spraying acids, alkalis, etc.

Strainers—Efficiency of spraying for most processes depends on fineness of spray which is made possible only by an efficient straining device. The company's duplex strainers have incorporated in them the latest developments in

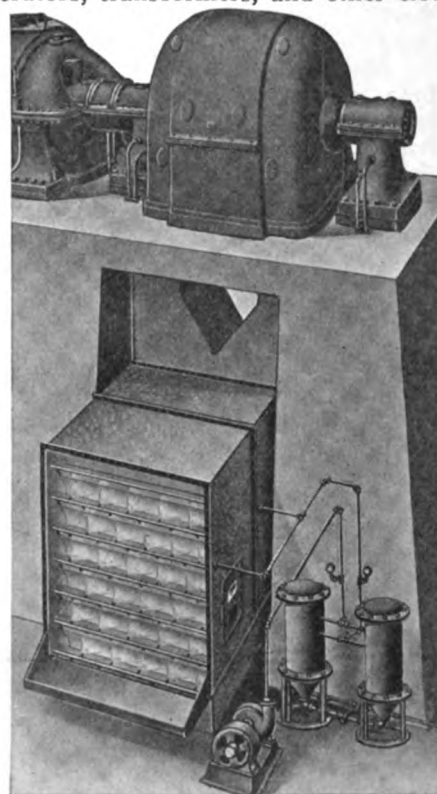
strainer construction, permitting ease of cleaning, reversal of flow, removal of solid matter without stopping operation, and are designed to prevent clogging due to electrolytic action. This high development makes possible the use of sprays where it would otherwise be impracticable.

Air Washers.

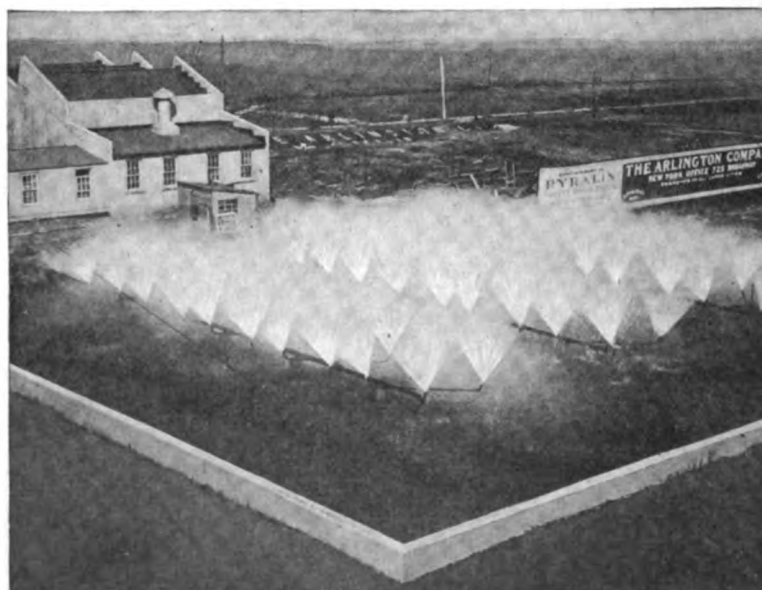
Adapted to cooling and cleaning air for ventilation of turbo-generators, transformers, and other electrical and mechanical equipment; wherever cool, clean air of even temperature and humidity is required for successful operation of processes. These washers cool air to its wet bulb temperature, removing 98% of suspended dust. They are applicable to the recently developed closed system of turbo-generator ventilation whereby the air is re-circulated, thus eliminating all introduction of dirt into the generator with the air. Compact in design they require little space.



NOZZLE



AIR WASHER



COOLING POND

EDWIN BURHORN CO.

Cooling Towers and Steel Plate Construction

25 West Broadway
NEW YORK, N. Y.

Products and Services.

COOLING TOWERS: "Burhorn" and "Packers'" Types.

Also, Tanks for all purposes, Stacks, Breechings, Hoppers, Penstocks, Coal Bunkers, and other Steel Plate Constructions; Gray Iron Castings, including Stoker Parts, Grate Bars, Retorts, etc.; Brass Castings, Steel Castings.

Engineers, Manufacturers and Contractors.

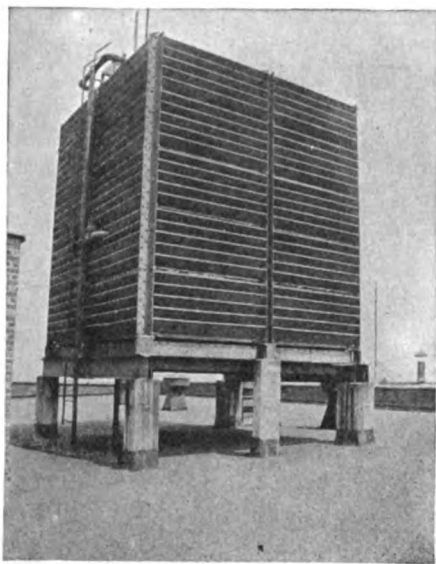


"Burhorn" Cooling Towers.

The tower is provided at the top with a main trough, the two sides of which are notched for discharge of the water into a series of distributing troughs.

Cooling Surface—The cooling surface is made up of units of proper size and number to suit the capacity of the tower. Each unit consists of parallel troughs notched on the two sides, resting on parallel pieces running at right angles. These pieces stiffen the troughs so that they will maintain their level when full of water.

This system causes the water to seek its level in the troughs regardless of how it enters, and the water then leaves the troughs through the notches throughout their entire length uniformly.



"BURHORN" COOLING TOWER

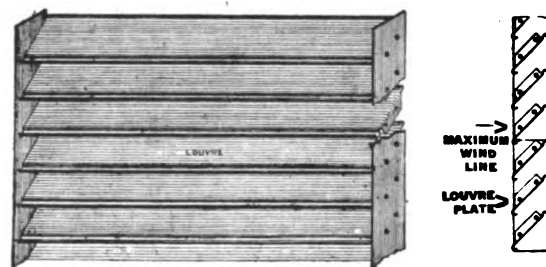
The trough decks are arranged in series, one directly below the other, alternately at right angles. This method counteracts the tendency of the wind to blow the water to leeward side of tower, so that no matter in which direction the wind may blow, the water is always broken up into fine particles, and the maximum water surface is exposed to the surrounding air. This arrangement guarantees efficiency in cooling, and economy of water for make-up purposes.

Louver System—All four sides of the tower are fitted with a patented system of louvers, fitted with troughs so arranged that water that may lodge in the louvers is returned to the tower system as shown.

Construction—The steel frame of the tower is made up of 6 by 6 by $\frac{3}{8}$ -in. corner posts fitting into heavy base plates, thoroughly braced and tied together with angles which support the steel channels carrying the cooling surface.

Winter By-pass—Purchaser of towers receives right to use, without royalty, patented winter by-pass system. When the temperature is below freezing the by-pass should be used.

Foundation—The tower is a complete unit. The purchaser will furnish the necessary foundation and the supply pipe to the dis-



Isometric View End Section
"BURHORN" LOUVER SYSTEM, PATENTED

tributing header at the top of the tower and the discharge pipe from the collecting pan. Foundation plans furnished on request.

Economy—The saving in the use of this cooling tower can be estimated approximately by comparing the cost of the make-up water (1% for every 10° the water is cooled) with the cost of water necessary without the cooling tower.

Durability—The standard "Burhorn" tower is made of heavy structural steel framework, and louvers and cooling surface made of heavy gauge galvanized steel. The structural material should last at least 20 years if properly taken care of. The galvanized material should ordinarily last from 5 to 10 years under favorable conditions. Should the operating conditions be unfavorable, the cooling surfaces and louvers would be made of "Matola" metal, which would add about 10% to the cost of the tower, but would guarantee a life of the entire apparatus of at least 15 years, and if properly taken care of, should last indefinitely.

Patents—The important features of these cooling towers are covered by patents, but no extra price is added for same.

Tests—The following tests show cooling results under summer conditions for refrigerating apparatus:
TYPICAL TEST ON A "BURHORN" COOLING TOWER

Date	Time	Water temperature, deg.		Air temperature, deg.		Direction of wind
		To tower	From tower	Wet bulb	Dry bulb	
July 10	4:00 P. M.	87	70	68	84	N. W.
July 11	3:30 P. M.	78	68	65	88	W.
	4:00 P. M.	78	65	64	85	W.
	4:15 P. M.	74	66	64	84	W.
July 14	11:30 A. M.	73	65	62	78	N. W.
	1:45 P. M.	76	69	67	81	heavy wind N. W.
	4:45 P. M.	77	70	67	82	wind slight S. W.
July 15	7:30 A. M.	75	68	64	71	slight W.
July 17	3:15 P. M.	79	73	70	81	S. E.
	4:15 P. M.	79	73	70	86	S. E.

Co-operative Service.

Further information gladly furnished on request.

SPRAY ENGINEERING COMPANY

"Spraco" System for Cooling Condensing Water

93 Federal Street
BOSTON, MASS.

Products.

"SPRACO" SYSTEM for Cooling Condensing Water.

Also manufacturers of Humidifiers; Park and Lawn Sprinklers and Complete Irrigation Systems; Sewage Nozzles; Aerating Nozzles; Flow Meters; Mixing Nozzles; Sprayers for High Temperature Cement.

For Air Washers and Pneumatic Painting Equipment, see page 536.

General Description.

Wherever water has to be cooled for condensers, water jackets, evaporators or transformers, a "Spraco" system, in connection with a properly designed cooling pond, will be found to be the most efficient, the simplest and most economical to operate. It costs much less to install than any other system of cooling water; and where there is an existing pond, cost is limited to the "Spraco" system itself, consisting of nozzles, special equipment and piping.

In the "Spraco" system, the hot water is thrown into the air as a *completely atomized* spray, thus exposing the greatest possible surface for cooling effect, and reducing the temperature of the water sufficiently to permit of its being used over and over again, even in tropical climates. This makes the plant independent of a water supply, so that in considering a plant location, this consideration can be ignored in favor of other more important factors, such as fuel, raw materials, or markets. It also affords a simple remedy by which many power plants, now handicapped with hot condensing water, can reduce their operating expense. An earthen pond of inexpensive construction often meets all requirements; and where ground space is limited, a "Spraco" system can be installed, with satisfactory results, on the roof of a building.

With the "Spraco" system it is possible to obtain an average vacuum of 28 in. the year round in almost all parts of the United States. The great cooling capacity of the "Spraco" system has led to its adoption by many of the largest power plants.

The yearly saving effected by the "Spraco" cooling system will generally pay a 50% return on its cost.

Power Requirements.

By reason of improvement in the "Spraco" nozzles, the power to operate sprays has been reduced fully 50% of what was formerly thought necessary. Under ordinary conditions, power necessary to operate sprays will average less than 1½% of the power generated by engine, whereas the average cooling tower will require for operation about 3% of power generated. It should be noted that spray creates a circulation of air, thus saving the power required to operate fans for this purpose.

Water Loss.

The average yearly loss of water with this system will approximate less than 1½% of condensing water used. As boiler feed will average about 2% of condensing water, it is apparent that the addition of condensed steam to pond supply, where jet condensers are used, will more than make up water losses.

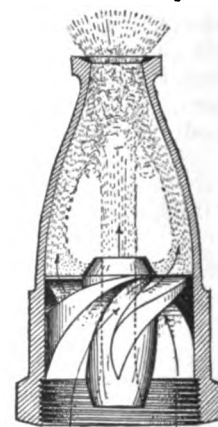


Cooling Capacity.

The results obtained by the "Spraco" system, given on this page, show the cooling which can be obtained and the resulting vacuum. Under average hot weather conditions, temperature of cooled water will approximate temperature of the air, and in hottest summer hours will be from 2° to 6° Fahr. lower than surrounding air.

"Spraco" Nozzles.

"Spraco" nozzles are provided with removable turbine centers having large passageways. Centers are held stationary in the nozzles, so that there are no moving parts to wear out, and the water, in passing through, is given a rapid rotating motion. A high grade of bronze, smooth finished, is used for both shell and center, and ample metal is provided at all wearing points, assuring long life.



SECTIONAL VIEW OF "SPRACO" NOZZLE

RESULTS OF TESTS ON A TYPICAL SPRING DAY
Relative humidity, 79%; average barometer, 30.35 in. mercury

Time of day	Temperature of air	Temperature of water		Vacuum obtained, inches mercury
		Before spraying	After spraying	
7 A.M.	56°F.	99°F.	82°F.	28.3
8	59°F.	100°F.	85°F.	28.3
9	62°F.	101°F.	86°F.	28.2
10	64°F.	103°F.	88°F.	28.15
11	66°F.	104°F.	88°F.	28.15
12	68°F.	104°F.	90°F.	28.05
1 P.M.	70°F.	104°F.	87°F.	28.
2	72°F.	104°F.	88°F.	28.05
3	74°F.	104°F.	88°F.	28.05
4	73°F.	104°F.	88°F.	28.05
5	70°F.	105°F.	88°F.	28.05

Co-operative Service.

The SPRAY ENGINEERING COMPANY is prepared to accept the responsibility for design and construction of an entire "Spraco" system, including pond, where desired, and to guarantee results. Their engineering force has had extensive experience in all details of power plant design, and has installed many hundreds of cooling systems in nearly every state of the Union and 18 foreign countries.



ROOF "SPRACO" SYSTEM, BOSTON ICE CO., BOSTON, MASS.

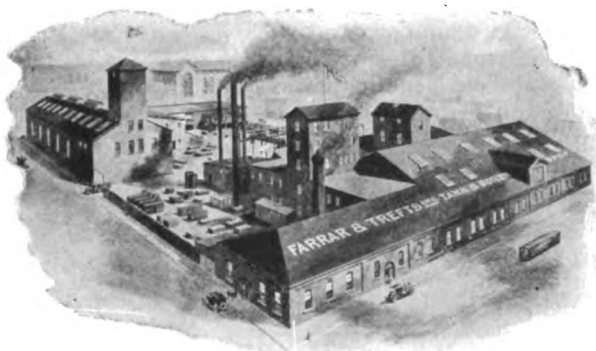
ESTABLISHED 1864

INCORPORATED 1911

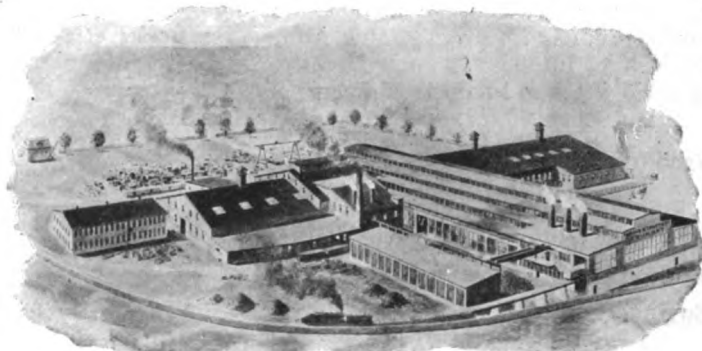
FARRAR & TREFTS, INC.

Steel Tanks, Boilers and Grey Iron Castings

Illinois and Perry Streets
BUFFALO, N. Y.



TANK AND BOILER SHOP



FOUNDRY AND MACHINE SHOP

Products.

Fabricators of STEEL PLATE WORK, manufacturers of CHEMICAL APPARATUS and producers of CASTINGS.

Steel Plate Work:

Boilers, Stacks, Tanks and other Welded or Riveted Steel Plate Construction.

Chemical Apparatus:

Dryers, Stills, Evaporators, Kettles, Filter Presses, Vats, Mixers, Jacketed Tanks for steam, oil or water.

Castings:

Grey Iron, Semisteel, Acid Resistant and Municipal; Grate Bars.

Miscellaneous:

Patterns, Forgings, Blacksmithing, Machine Work, Electric or Acetylene Welding.

Service.

The Laboratory and the Engineering Departments have complete control of the operations and processes throughout the entire organization.

These two departments have at their disposal a vast

amount of valuable data which will be useful in determining exact requirements and plans.

The Plant.

The boiler and tank shop, and the foundry and machineshop are equipped with modern machinery that has proved most efficient for the execution of any work entrusted to this company. The new foundry, erected during 1917, and enlarged in 1919, has a daily capacity of 200 tons of castings. Single castings up to 50 tons each can be poured in this foundry.

The Organization.

The executives have had many years of experience in this business, and the knowledge gained through the production of chemical apparatus and castings, and the fabrication of steel plate work insures satisfactory results to their clients.

The engineering force is made up of experienced and technically trained men.

A skilled metallurgist, in charge of the laboratory, has direct supervision of the foundry.

All operations throughout the entire plant are directed by competent superintendents.



STEAM CHEST



VALVE BODY

DOVER BOILER WORKS

Steel Plate Construction

SALES OFFICE
52 Church Street
NEW YORK, N. Y.

WORKS:
DOVER, N. J.

Products and Services.

RIVETED or WELDED STEEL PLATE CONSTRUCTION which includes: Storage Tanks for liquids, compressed air, vacuum and heating; Stacks, Flues, Penstocks, Riveted Pipe, Flumes, Chutes, Hoppers, and all kinds of Riveted Steel and Iron Equipment.

BUILDERS, ENGINEERS and CONTRACTORS.

Facilities.

The plant of the DOVER BOILER WORKS is located at Dover, N. J., only 40 miles from New York, and is modern, efficient and completely equipped for turning out the work in which this company specializes.

Engineering Service.

A corps of engineers of long and successful experience in designing and constructing steel plate equipment, is maintained at the New York office of this company.

It is the work of these experts to check carefully all plans submitted and to furnish specifications, estimates and designs that meet requirements to the fullest degree. If plans submitted to this department do not seem best adapted, changes and improvements will be suggested.

This work can best be done from blue prints furnished by customers. When necessary, however, designs for equipment will be submitted, based on rough sketches by engineers or plant superintendents.

Materials.

Dover products are made of mild open hearth steel, usually referred to as soft steel. The tensile strength is from 55,000 to 65,000 lbs., and the shearing value 45,000 to 50,000 lbs. These materials are exceedingly homogeneous, invariably uniform in thickness and texture, and free from flaws and defects.

Tanks and Stacks.

Laying Out—The plates, heads and shapes used are laid out and all holes located on the flat, by expert layers-out, all of whom have been especially trained. Nothing is left to chance and the work assembles with surprising and gratifying exactness.

Punching—All material is heavily center punched and then punched by expert punch operators.

Rolling or Bending—All rolling and bending are done cold, so as not to set up heat strains in the material. Our powerful rolls will handle material up to 1-in. thickness. Cold bending is done on a 200-ton hydraulic press.

Flanging—Standard or special flanged work is handled with ease by the flanging department, while hydraulic flanging machine and large heating furnaces enable the turning out of large work of first quality at a low cost.

Riveting—Wherever possible, the work is riveted up on hydraulic riveters. Pressures from 50 tons to 100 tons are used, depending on the size of work. This form of riveting is the best the art affords.

Calking—After riveting, tanks are calked with pneumatic calking machines, by skilled operators, using round nosed calking tools.

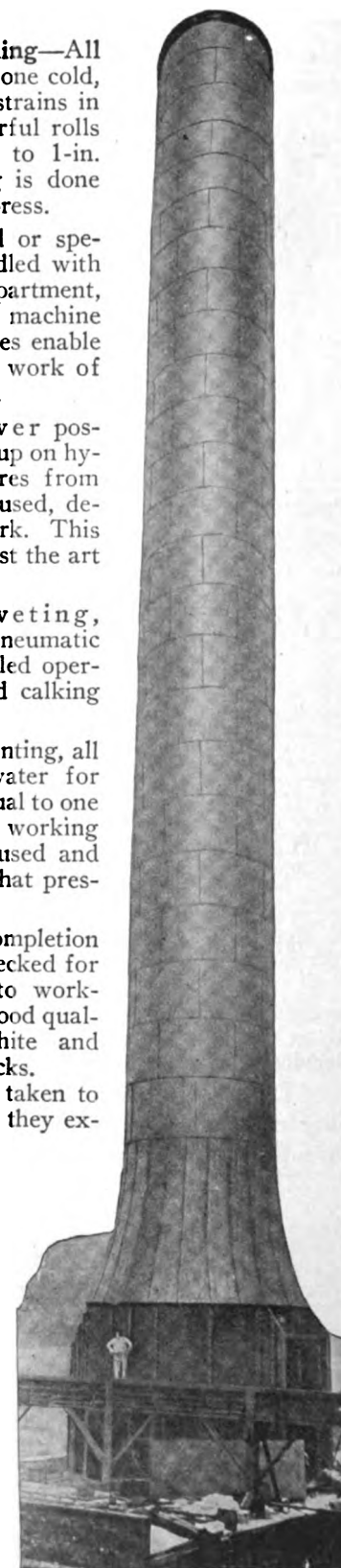
Testing—Before painting, all tanks are tested with water for tightness. A pressure equal to one and one-half times the working pressure for the test is used and tanks are made tight at that pressure before shipment.

Inspection—At completion all work is thoroughly checked for accuracy, inspected as to workmanship, painted with a good quality paint usually graphite and loaded on cars on our tracks.

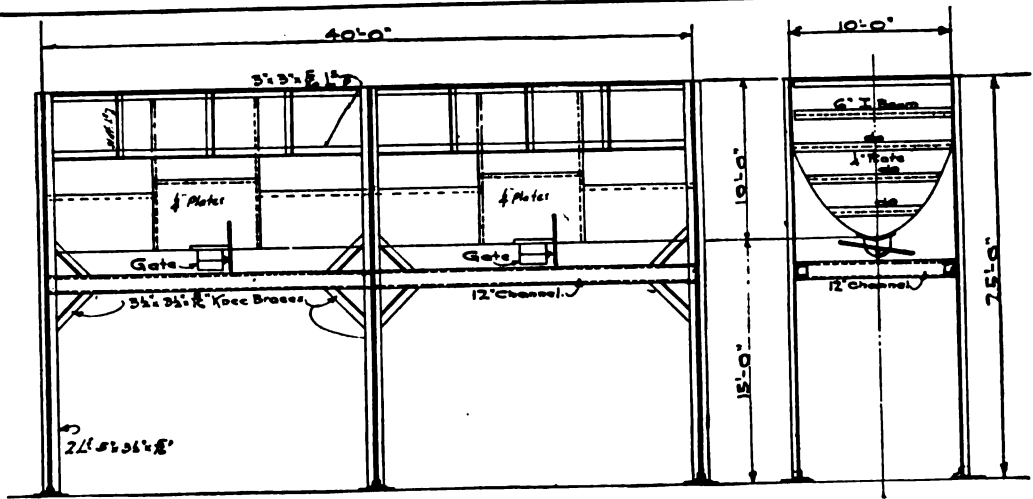
Every precaution is taken to give customers just what they expect to get.



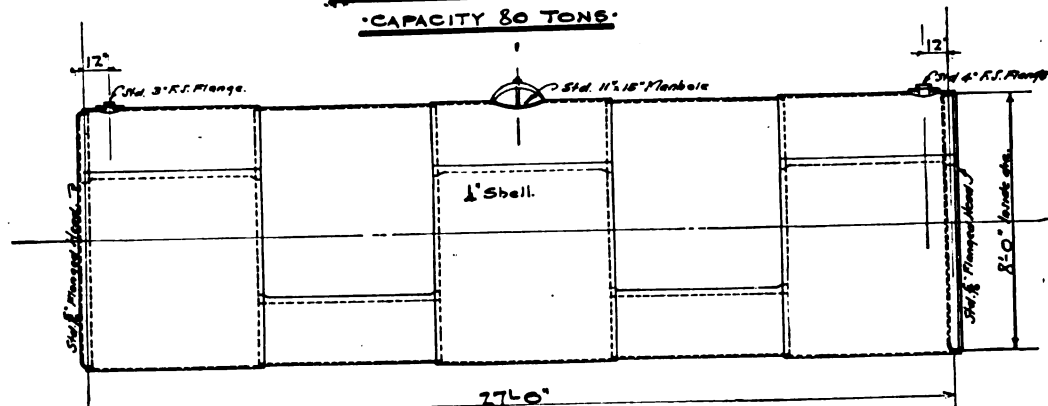
HORIZONTAL STILL, 10 FT. IN DIAM., 30 FT. LONG



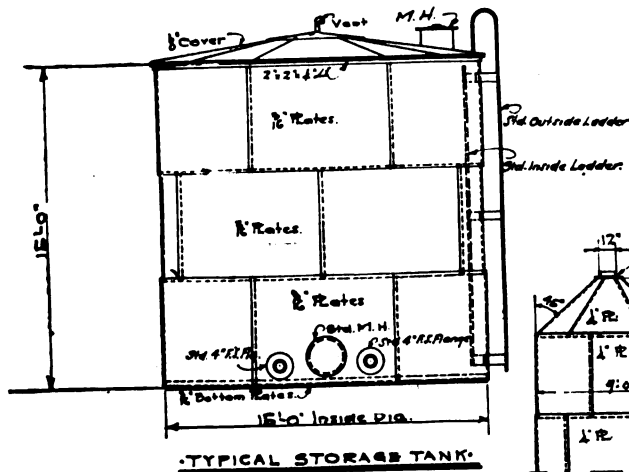
SELF-SUPPORTING STACK
250 BY 18 FT.



COAL STORAGE BIN
CAPACITY 80 TONS



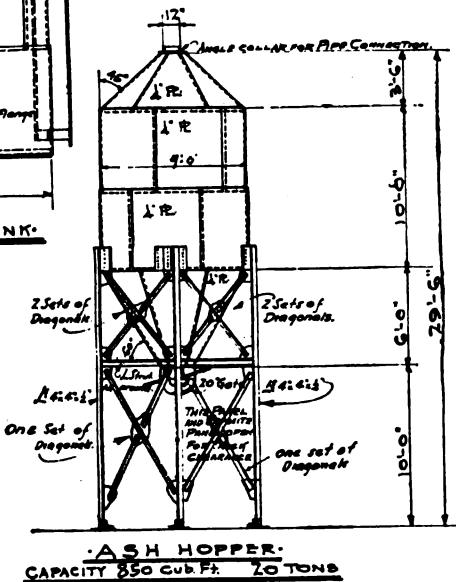
STANDARD HORIZONTAL STORAGE TANK



TYPICAL STORAGE TANK

SIZE	THICKNESS OF MATERIAL	CAPACITY IN GALLONS
8'-0" DIA. x 21'-0" LONG	Shell Heads 1/2"	8000
8'-0" DIA. x 27'-0" LONG	Shell Heads 1/2"	10000
8'-0" DIA. x 32'-0" LONG	Shell Heads 1/2"	12000
8'-0" DIA. x 40'-0" LONG	Shell Heads 1/2"	15000

SIZE	THICKNESS OF MAT.	CAPACITY IN GALLONS
15'-0" DIA. x 15'-0" DEEP	Shell Bottom 1/2"	10000
15'-0" DIA. x 15'-0" DEEP	Shell Bottom 1/2"	20000
15'-0" DIA. x 15'-0" DEEP	Shell Bottom 1/2"	30000
15'-0" DIA. x 20'-0" DEEP	Shell Bottom 1/2"	40000
15'-0" DIA. x 20'-0" DEEP	Shell Bottom 1/2"	50000



ASH HOPPER
CAPACITY 850 CUB. FT. 20 TONS

SUBJECT ASH HOPPER, COAL BIN AND STORAGE TANKS.	
SCALE 1" = 1' FOOT 1/2" = 1' FOOT 1/4" = 1' FOOT	CUSTOMER
DATE 5-23-15 DRAWN BY CHECKED BY	REVIEWER
DOVER BOILER WORKS ENGINEERS & CONTRACTORS 80 CHURCH ST., NEW YORK BRIDGE, N. Y.	

DIAGRAMS AND DIMENSIONS, STORAGE TANKS

McNAMARA BROTHERS COMPANY

Manufacturers of Steel Plates, Tanks, Boilers and Stacks

WESTPORT, BALTIMORE, MD.

Products.

RIVETED and WELDED IRON and STEEL PLATE CONSTRUCTION, including Pressure and Storage Tanks for Air, Liquids, and Chemicals; Hoppers, Bins, Ducts, and Breechings; Dryers, Cookers, Extractors, Filters and Diffusers; Boilers; Penstocks.

SPECIAL STEEL PLATE WORK of all descriptions built to specifications and requirements.



TRADE-MARK

Tanks.

Great stress is placed on tank work because of the importance attached to proper construction. Every product

is guaranteed to perform the service for which it is built. It is well to remember when purchasing tanks that an inferior tank is false economy.

Non-corrosive Metals.

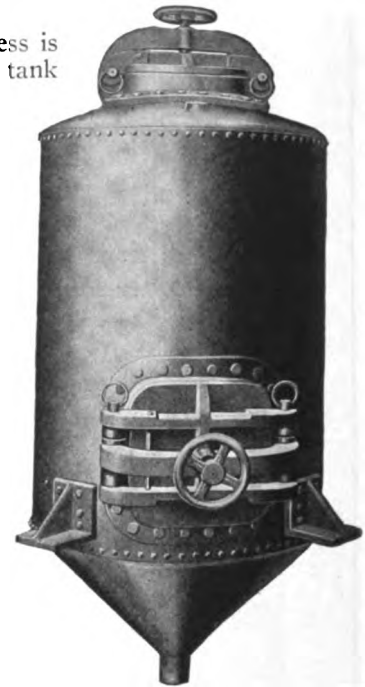
The use of "treated" or specially prepared iron for combatting rust or corrosion is a special feature of our work. Full particulars will be sent on request.

Knocked Down and Export Work.

Knocked down fabricated material for construction at its destination when the article is too large to be shipped intact, is fabricated at our plant, assembled to insure it as to its correct dimensions and to eliminate unnecessary work in the field, and knocked down and made ready for shipment to any point.

Engineering Service.

Realizing the grave responsibility that rests with



FOOD COOKER

Facilities.

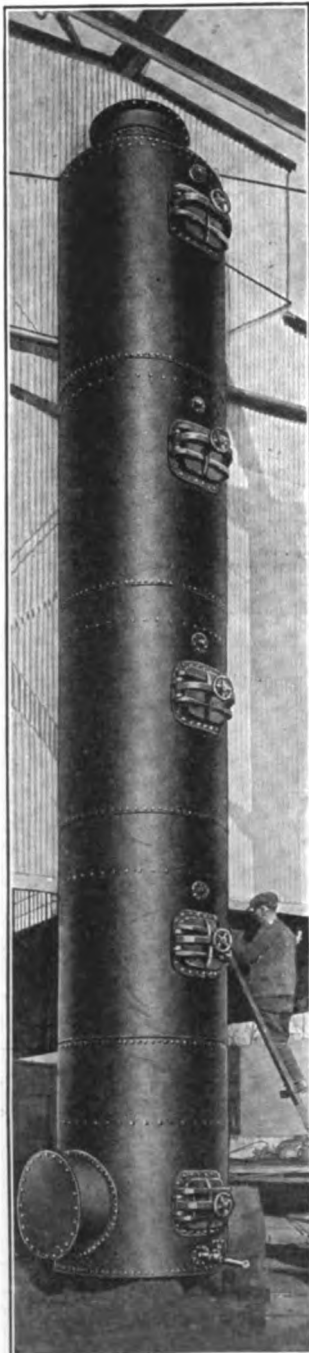
The natural geographical location of Baltimore, the proximity of our plant to two trunk line railroads, the new improved machinery and equipment, and the large stock of steel plate of all sizes and weights, enable us to expedite matters when either time or price is a prime factor.

Plant.

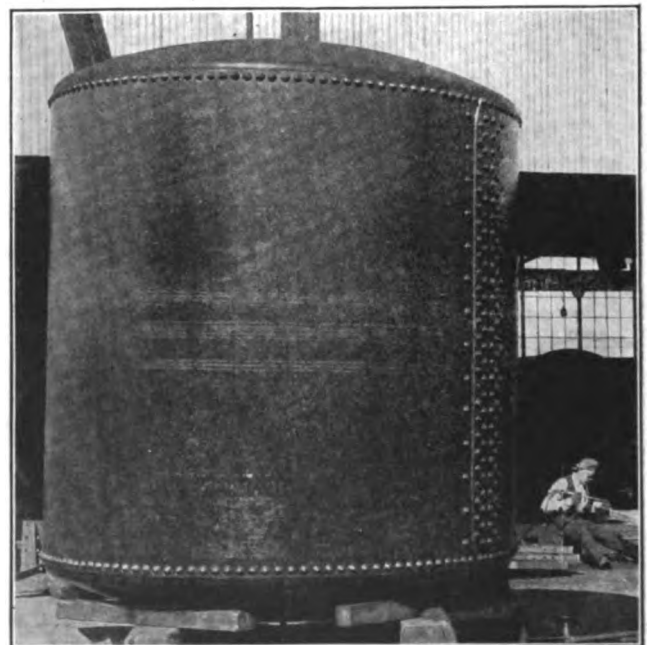
The new plant, with its latest additions, is located in Westport, Baltimore, facing on three city thoroughfares and on two railroads, with sidings under our electric traveling crane. The machine facilities are of the most modern and up-to-date equipment, warranting the best results. Recently the plate and welding shops have been improved by the extension of 12,000 sq. ft. of floor space, along with additional equipment. The welding shop now occupies a space in the plate shop, and is thoroughly equipped with an electric welding outfit, together with the auto-genous welding process.

Special Design.

Particular attention is paid to tank and steel plate work of special construction. This company invites inquiries and description of requirements, and prompt attention will be given them. Drawing will be submitted on our solution of the problems.



PURIFIER

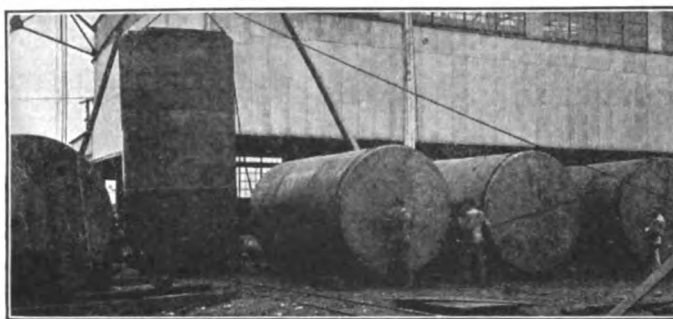


HIGH PRESSURE TANK

the product of our plant, the company has placed the responsibility in the hands of competent engineers, capable of coping with the most difficult problems in this line.

Test.

As additional assurance of the competency of the product, every item that is built in this plant is thoroughly tested to its



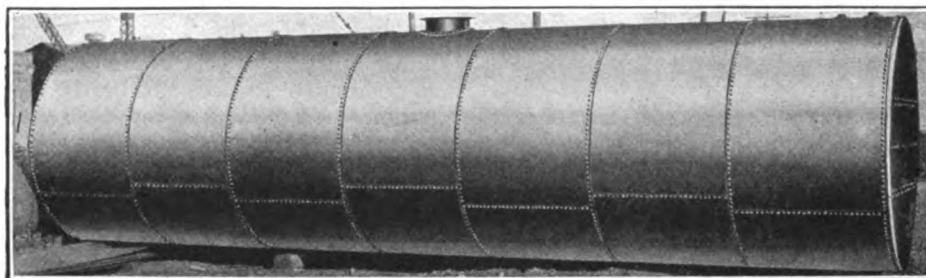
STEEL TANKS UNDER CONSTRUCTION

required purpose before shipment. It must be right.

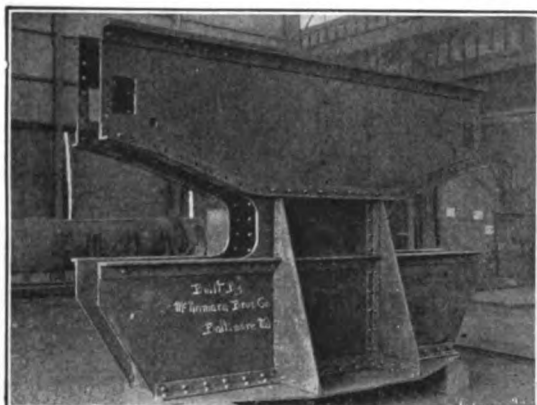
Estimates.

Estimates on inquiries are furnished with all possible dispatch.

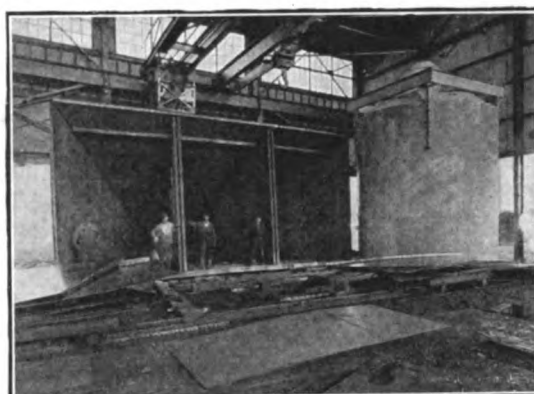
To avoid delays, principals are requested to furnish full data of requirements—location, proper dimensions, pressures, weight or gauge of materials, etc.



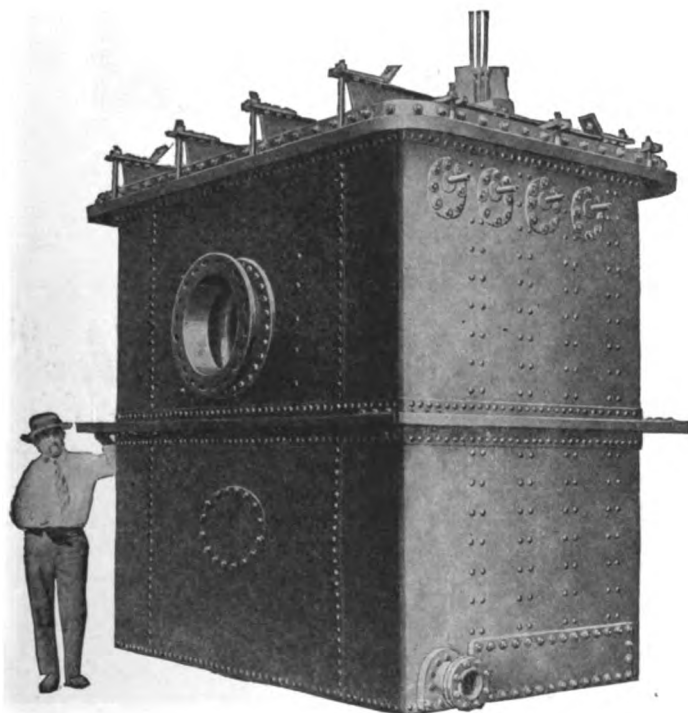
20,000-GAL. CAPACITY OIL STORAGE TANK



PUNCH FRAME



INTERIOR OF ASSEMBLING SHOP



FILTER
Special construction work



SPECIAL STEAM JACKETED KETTLE

THE KITTOE BOILER & TANK COMPANY

Manufacturers of Steel Plate Construction

1307 Bank Place, S. W.

CANTON, OHIO

CHICAGO OFFICE, 725 Monadnock Building

NEW YORK OFFICE, 95 Liberty Street

Products.

STEEL PLATE CONSTRUCTION which includes: Steel Tanks, Stacks, Riveted Steel Pipe, Gas Producers and Piping, Self-supporting Chimneys, Penstocks, Stand-pipes, Refrigerating Tanks of all Kinds, Steel Hoppers; FLANGING and BENDING STEEL PLATES.

Tanks.

Riveted complete or knocked down, as the size may require. We have a carefully trained and expert corps of erectors for field work.

Self-supporting Chimneys.

These are a specialty, and we have built them with

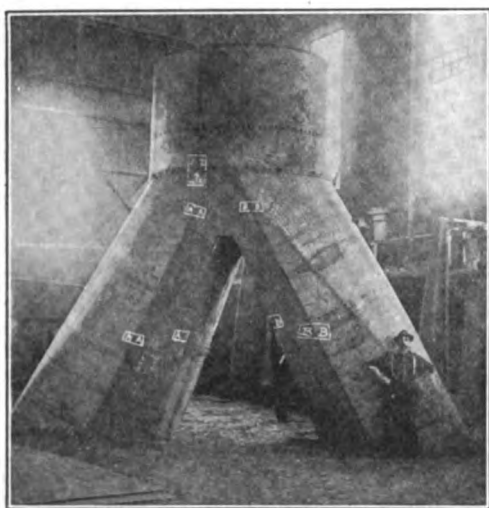
satisfaction to customers in all parts of the United States.

Flanging and Bending.

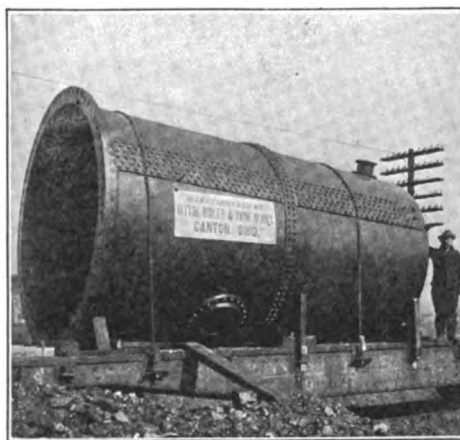
Complete hydraulic equipment for flanging, bending and dishing steel plates and heads, together with a large equipment of dies.

Material for Export.

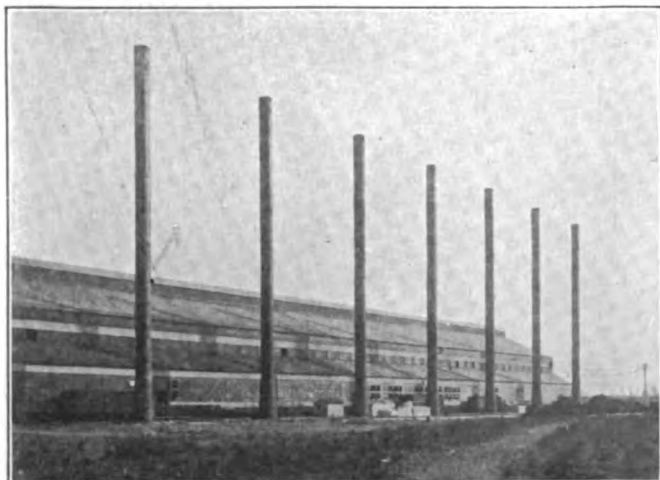
We are thoroughly prepared to fabricate and properly prepare and pack for export, all kinds of knocked down steel plate construction—tanks, stacks, steel pipe, etc. Material is carefully match-marked for facility in assembling at destination.



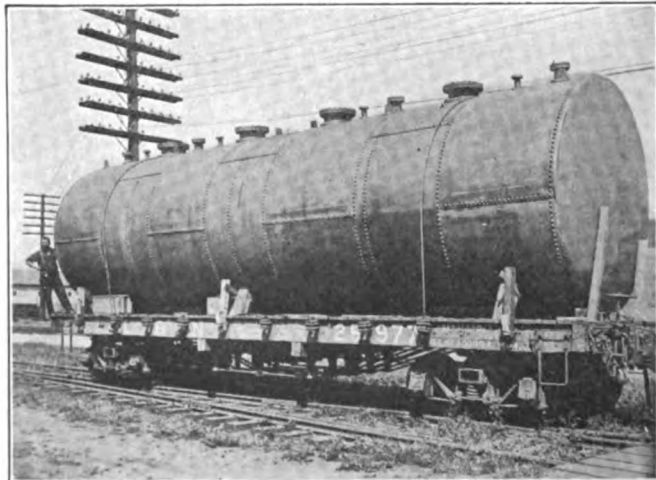
BREECHING FOR 12-FOOT STACK



PENSTOCK



OPEN HEARTH STACKS AT CENTRAL STEEL CO., MASSILLON, OHIO



BENZOL TANK

STEACY-SCHMIDT MFG. CO.

Manufacturers of Lime Kilns and Complete Hydrating Plants
Queen Street, Hay Street, Arch Street, Mill Road and Pennsylvania Railroad
YORK, PA.

CABLE ADDRESS: "BROOMELL"—Codes used: ABC 5th Edition and Western Union

Products.

KEYSTONE LIME KILNS, COMPLETE LIME and HYDRATING PLANTS, and EQUIPMENT for ELDRED PROCESS for Lime Burning.

Also manufacturers of Belgian and other type Kilns for the extraction of carbonic dioxide gas; Bag Filters, Stacks, Tanks, Castings, Turntables and Special Machinery from engineers' designs.

For Sugar Machinery, see page 1195.

Keystone Lime Kilns.

The Keystone kiln, the result of the best kiln practice, is an all-steel brick lined kiln built of very heavy steel boiler plate, beams, angles, etc., to give the strongest possible construction. Fitted to burn either coal, wood, gas or oil as fuel.

Repeated requests have been made to this company to design the Keystone kiln so as to use a mechanical

conveyor of lime from the bottom of the cooling cone to crusher or bins instead of trucking the lime away.

This result has been accomplished by setting the furnaces at right angles to drawing shears.

Keystone kilns will in the future be furnished in this way when *specially* ordered.

Gas Producer Kilns—We are prepared to furnish Keystone kiln installations, and Keystone kiln gas-fired lime kiln installations complete.

Forced or Induced Draft—If either forced or induced draft is desired for increased production over natural draft, such equipment will be furnished.

Capacity—The capacity of lime kilns and the cost of burning are dependent on a large number of variables—the nature and quality of the rock, the kind and quality of fuel used, together with the management and skill of the burners—so that it is impossible to predict the exact amount that can be obtained from a given kiln. However, under average conditions, with a standard kiln burning coal or wood, 9 to 14 tons may be produced per day; if forced or induced draft is used these figures are exceeded. With producer gas or oil for fuel this capacity is from 14 to 25 tons per day.

Specifications—Diameter of shell outside, 11 ft. Diameter of brick lining inside, 6 ft. 6 in. Total height of kiln, 47 ft. 10 in. Shipping weight, about 42,500 lbs.

Improved Keystone Kiln.

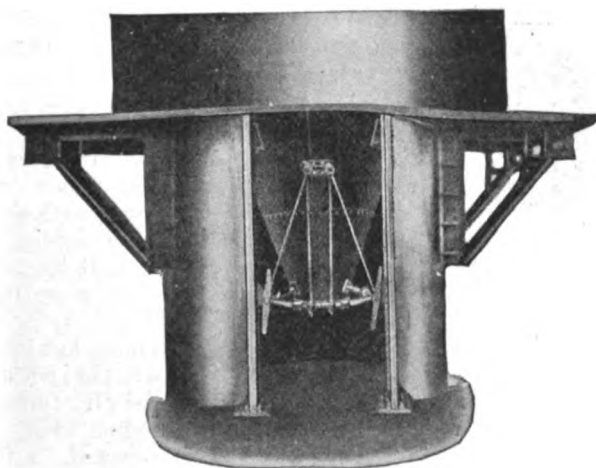
Test installations for our new type kiln, the Improved Keystone, have been concluded. Catalogues and claims can be had on application.

Eldred System.

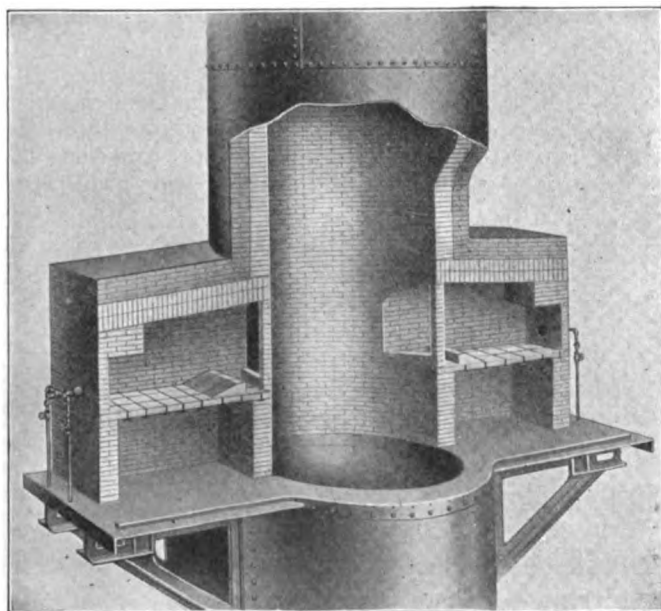
The company is prepared to install Keystone lime kilns using coal as a fuel with the Eldred process. This patented process insures a very substantial output on an economical installation.

Lime Hydrating Plants.

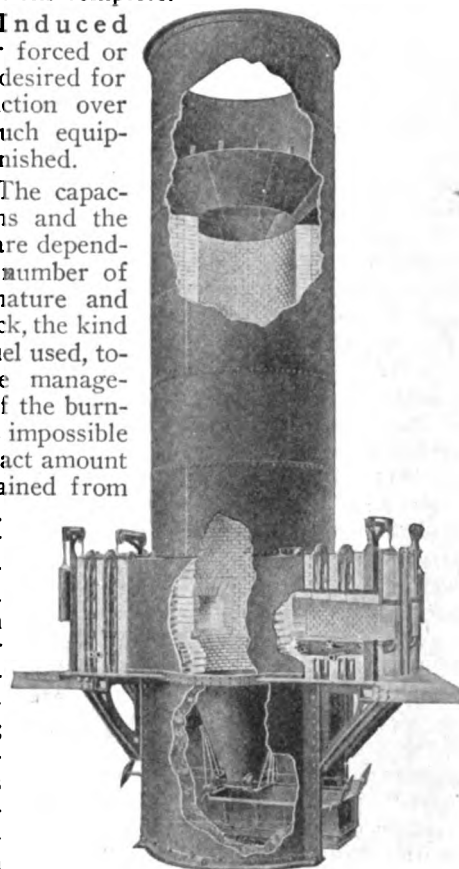
We are prepared to furnish complete lime and hydrating plants, either from specifications or from our own designs.



VIEW SHOWING KEYSTONE KILN SET AT RIGHT ANGLES TO DRAWING SHEARS



SECTIONAL VIEW SHOWING OIL BURNING TYPE



SECTIONAL VIEW KEYSTONE LIME KILN

THE PETROLEUM IRON WORKS COMPANY

THE PENNSYLVANIA TANK CAR COMPANY

Steel Plate Construction and Tank Cars

SHARON, PA.

DISTRICT SALES OFFICES

NEW YORK, N. Y., 25 West 43rd Street
HOUSTON, TEX., 1110 Carter Building

ST. LOUIS, MO., Liberty Central Trust Co. Building
SAN FRANCISCO, CAL., 503 Market Street

Products.

All classes of LIGHT and HEAVY STEEL PLATE CONSTRUCTION for the oil, gas, chemical, iron and steel, municipal water works, railway and allied engineering industries, including:

Tanks for every purpose: Oil Storage, large and small; Acid Storage; Water; Turpentine Storage; Molasses; Grain; Tar; Asphalt; Hydro-pneumatic; Pressure; Filter; Car; Bleaching; Distillate; Benzol; Drip; Gasoline; Naphtha, Benzine, Lubricating Oils and all classes of Petroleum Products; Malt; Alkali, Caustic Soda; Brine; Sand; Compressed Air Storage; Evaporating; Cooling; Settling; Mixing; Gaging, etc.

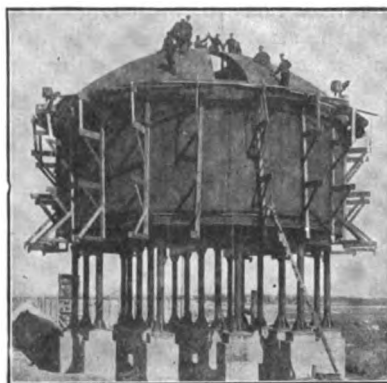
Oil Refinery Equipment: "Leman" Countercurrent Condensers; Condenser Boxes; Agitators; Stills of all descriptions.

"Gem" Bilged Steel Barrels; "Presteel" Drums; Standpipes; Smokestacks, Guyed and Self-supporting Penstocks; Flumes; Riveted Steel Pipe; Galvanizing Kettles; Hot Metal Ladders; Annealing Boxes; Condenser Boxes; Pulp Digesters; Creosoting Cylinders; Coal and Ash Storage Bins; Ore Storage Bins, etc.

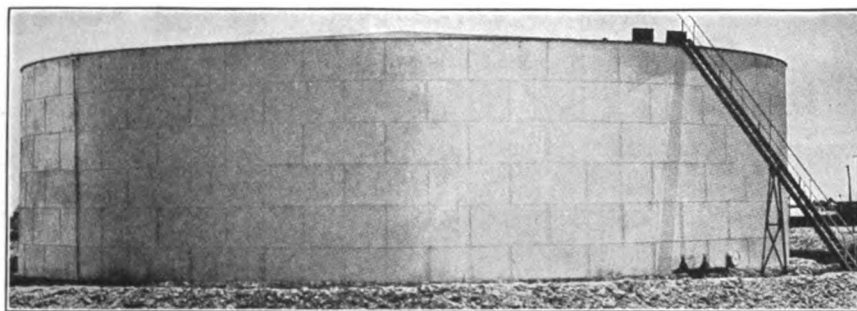
"PENNSYLVANIA" TANK CARS.



TRADE-MARK



2000-TON ACID TANK
45 ft. 5 1/4 in. diam.; 26 ft. 7 1/4 in. high
One of 6 erected for General Chemical Co., East St. Louis, Ill., Marcus Hook, Pa., Nichols, Cal., and Bayonne, N. J.



55,000-BARREL OIL STORAGE TANK
114 ft. 6 1/4 in. diam. by 30 ft. 4 1/4 in. high
This standard size carried in stock for immediate shipment. Tanks from 5- to 120-ft. diam. and 5- to 45-ft. height; capacities, 25 to 64,000 barrels

Also Breechings for boilers; Buckets, Scrap and Dredge; Lime Kilns; Coaling Towers.

Offices and Works.

The general offices and works are situated about 3 miles south of Sharon, Pa., on the Youngstown and Sharon Street Railway, and consist of modern, substantially built structural steel buildings, including fabricating shops, power plant, machinshops, warehouses, storage yards, etc., equipped with the most modern and most efficient machinery necessary for the fabrication of all classes of light and heavy steel plate work.

Inspection and Tests.

During the different processes of manufacture, rigid inspections and tests, varying in accordance with character of work in hand, are applied all the way through to, and including, finished product. These are more than

sufficiently rigid to meet local field conditions to which finished product will be subjected, and provide for a high factor of safety.

Engineering Service.

Technically trained engineers with many years of experience in steel plate erection, will design



THE TEXAS COMPANY'S REFINERY, PORT ARTHUR, TEX. (Continuous with view on opposite page)

Showing a wide range of steel plate products, many of which have been fabricated and erected by THE PETROLEUM IRON WORKS COMPANY. It has erected approximately 65 stills; 21 condenser boxes of various sizes and capacities; 18 agitators; 81 storage tanks of various sizes.

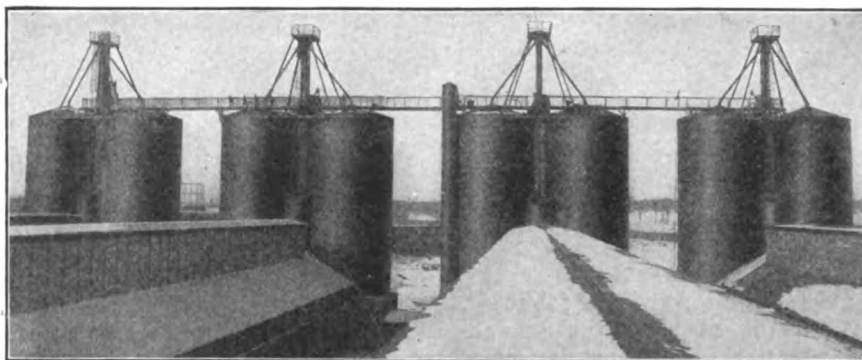
and fabricate all classes of light or heavy steel plate construction from rough sketches or from working drawings. Special working drawings and erection plans are furnished any steel construction engineer or contractor, however, which enable him to erect P.I.W. products readily and satisfactorily.

Field of Activity.

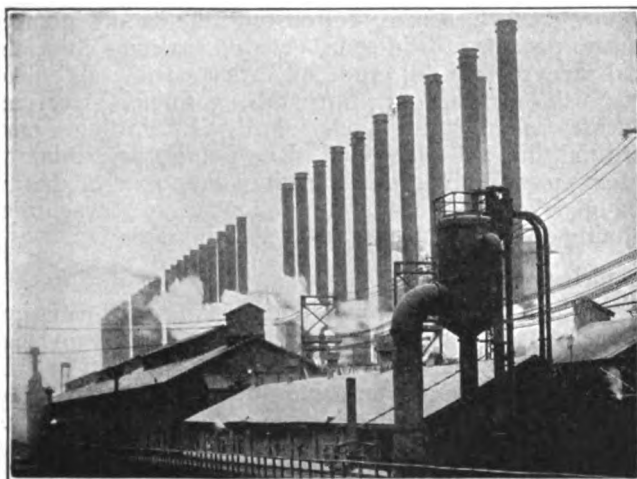
On these pages are illustrated examples of steel plate work fabricated and erected by this company. They partially show the wide range of activity in many fields. Sizes and capacities of these products are not indicative of manufacturing ability or capacity, being limited only by operating conditions of field in which products are to be used.

THE PETROLEUM IRON WORKS COMPANY has sold and erected its products in practically every oil field of importance in the world. It was one of the first manufacturers of oil storage tanks, and of other steel plate construction used in the petroleum industry, to enter foreign fields, and is therefore not only prepared to contract for steel plate work in the United States, but in any part of the world.

In addition to the wide scope of P.I.W. activity



EIGHT ALUMINUM ORE BINS, 34 FT. DIAMETER BY 70 FT. HIGH
Aluminum Company of America, Massena, N. Y.



GROUP OF SMOKESTACKS

Fabricated and erected for the Youngstown Sheet & Tube Co., Youngstown, Ohio

in oil fields, this company has designed, fabricated and erected hundreds of other steel plate products for use in various industrial fields as is evident from list of products. P.I.W. field of service covers many classes of engineering projects, such as water works, hydroelectric and other power plants, railway, iron and steel, and practically every industry where steel plate construction is necessary.

All kinds and classes of steel plate penstocks, standpipes, riveted steel pipe, smokestacks, and tanks and towers are made and erected by us and indicate the wide scope of P.I.W. activity in the general engineering field.

Shipping Facilities.

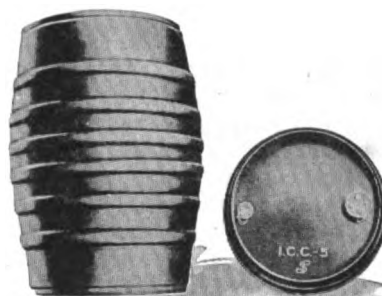
The company's plant has direct communication with the New York Central, Erie, and Penn. R. R. systems.

The present yard trackage for handling inbound and outbound freight is about 3 miles in

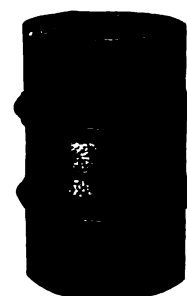
length and affords ample space for car storage, and ideal facilities for making shipments, thereby eliminating car shortage and delays occurring where there is but one railroad connection. It makes possible prompt delivery to points in practically every direction.

The closeness of the plant to the heart of the iron and steel district insures excellent service in obtaining raw materials and other commodities used in the fabrication of P.I.W. products.

P.I.W. service begins in the shop, continues through



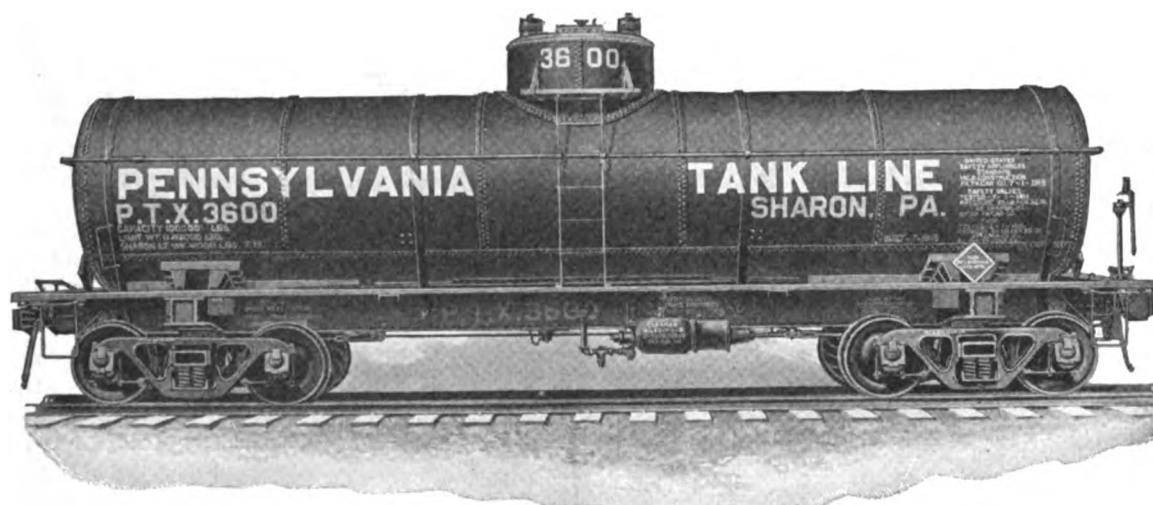
"GEM" BILGED STEEL BARREL
Showing the 6 outward hoop formations rolled into the frame of barrel.
Made only in 55-gal. capacity—black or galvanized



"PRESTEEL" DRUM
Conforming to all Interstate Commerce Commission's requirements for shipping containers. Capacities, 15, 30, 50, 55, 110 and 175 gals.



THE TEXAS COMPANY'S REFINERY, PORT ARTHUR, TEX. (Continuous with view on opposite page)
from a few hundred barrels to 55,000-barrel capacity; 30 filter tanks, 4 dump tanks; 2 receiving tanks; 26 filling tanks; 5 separator tanks, 22 exchanger tanks; 16 steam drums; 11 grease tanks, some steam jacketed; acid tanks, kettles, etc. This refinery is one of the largest in the world



ONE OF THE 5000 "PENNSYLVANIA" TANK CARS IN THE PENNSYLVANIA TANK LINE

These cars are leased to producers, refiners and marketers of petroleum products. They also carry products in the chemical, mineral and vegetable fields

shipping and delivery and follows through the job itself. The company is just as much interested in the satisfactory performance of its products years after the job is completed as it was on the day the contract was signed. Our installations are our best salesmen and are reckoned among our greatest assets.

Steel Barrels and Drums.

Unbreakable "Gem" Bilged Steel Barrels and "Presteel" Drums are designed to carry a great variety of liquids such as petroleum and its by-products, chemicals and other liquid commodities. They are specially constructed to resist impact and abrasion due to rough handling; can not leak or corrode, and are the safest means of transporting and handling inflammable liquids in small quantities.

Tank Cars.

All materials used in manufacturing "Pennsylvania" tank cars are of best quality and in accordance with all requirements of the Master Car Builders Association.

Standard capacities of tank cars are 6500, 8050 and 10,100 gals., though special cars to carry particular products in any size can be manufactured. For the 10,100-gal. car the length over striking plates is 35 ft. 6 in., and the width over running boards is 9 ft. 5 in. 70% of all tanks cars at present haul petroleum or its products. They may be insulated with wood or

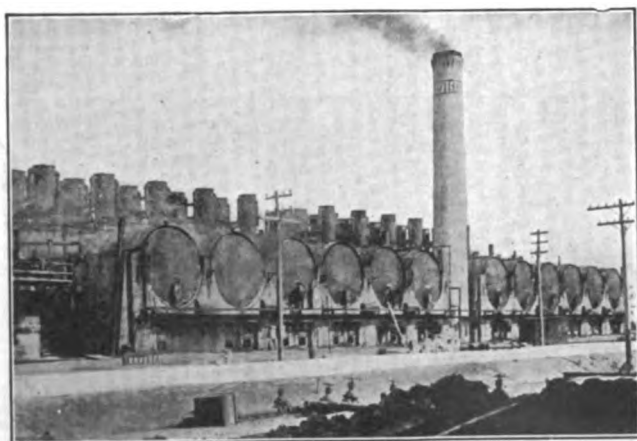
other material, if desired, to transport corrosive liquids. "Pennsylvania" tank cars operate in all parts of North America and in many foreign countries.

Description—Car tank is double riveted throughout, and all seams are well calked; tested with cold water at a pressure of 60 lbs. per sq. in., and made absolutely tight in conformity to M.C.B. requirements. All details and appliances also conform to M.C.B. specifications and comply with the Federal Safety Appliance and Interstate Commerce Commission Laws.

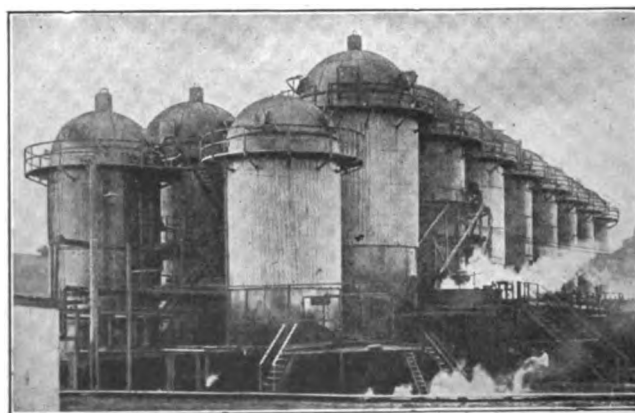
Uses—For carrying acids, animal oils, ammonia liquor, alcohol, benzol, cottonseed oil, candle grease, caustic potash, caustic soda, corn oil, calcium chloride, coal tar, creosote oil, crude oil, cider, castor oil, edible oils, fish oil, fuel oil, fatty oils, gasoline, glycerine, glucose, illuminating oils, lard, lubricating oils, lard oil, linseed oil, liquid driers, molasses, mineral waters, petroleum products, pitch, paints, road oil, rosin, red oil, silicate of soda, syrup, tallow, toluol, turpentine, tanning extracts, vinegar, wood alcohol, wine, etc.

Inquiries.

When writing for quotations, detailed information as well as drawings and information relative to local conditions, as haul from nearest railroad station or siding, topography and other general field conditions of district, accommodations for boarding erecting forces, etc., will assist in prompt and accurate preparation of estimates.



BATTERY OF PARAFFIN STILLS
Built for the Texas Company, Port Arthur, Tex.



BATTERY OF 18 AGITATORS
Built for the Texas Company, Port Arthur, Tex. This is one of the largest installations of its kind yet to be erected

TIPPETT & WOOD

Designers, Manufacturers and Erectors of Steel Plate Construction

166 Howard Street
PHILLIPSBURG, N. J.

BRANCH OFFICE, Royal Building, cor. William and Fulton Streets, NEW YORK, N. Y.

Products.

STANDPIPES, WATER TOWERS and STEEL TANKS of every description and for all purposes.

Tanks: Acid, Brine, Car, Coal Tar, Creosoting, Crude Oil, Cyanide, Elevated, Filter, Fuel Oil, Galvanizing, Gasoline, Jacketed, Molasses, Pressure, Refined Oil, Soap, Storage, etc.; Smokestacks, Breechings, Flues, Flumes, Penstocks, Riveted Pipe, Cylinders, Boilers, Condensers, Ladles, Hoppers, Troughs, Pans, Dryers, Receivers, Bins, Supports, Trestles, Accumulators, Agitators, Buckets, Cable Towers, Caissons, Clarifiers, Cylinders, Desiccators, Drums, Gas Holders, Hearth Jackets, Jacketed Kettles, Railway Water and Coaling Stations, Stills, Turntables, Water Jackets, Accessories for Water Towers and Standpipes and all kinds of Plate Steel Work and Structural Steel Construction requiring unusual fabrication.

Quick Shipments.

We carry a large stock of steel plates of several

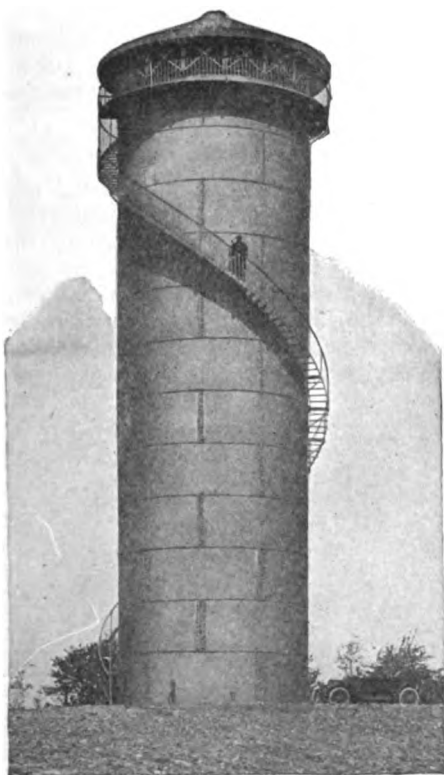
thicknesses from which we make tanks of a large range of diameters. For special requirements, permit us to make slight substitutions from our stock, and fabrication will proceed immediately. We are equipped and prepared for orders requiring concentration of effort resulting in unusually prompt completion of the work.

Facilities.

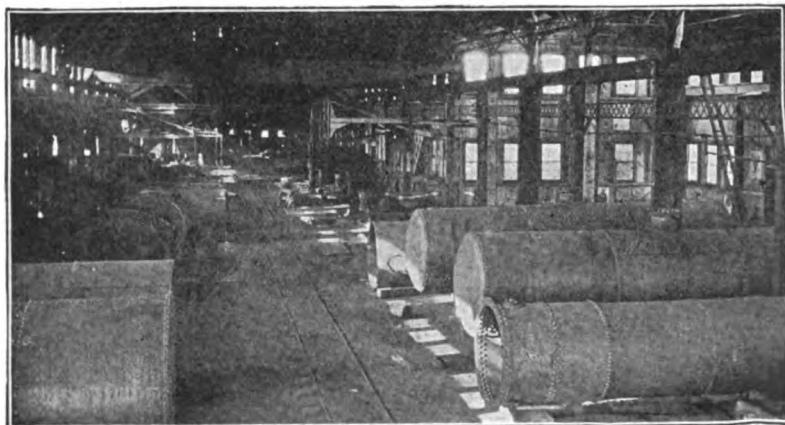
Our fifty years of experience are your benefit and assurance of proper attention and construction. Our shops, which are large and equipped with the most modern machinery, have expanded steadily during this time. We are constantly extending and installing new machinery and new methods. No work is too large for us. Send us inquiries stating when material is required. Our engineers are at all times at your service. A catalogue giving information on standpipes and water towers will be mailed on request.



STANDARD WATER TOWER



STANDPIPE FOR CONNECTICUT AGRICULTURAL COLLEGE
Diameter, 25 ft.; height, 80 ft.



ASSEMBLING SHOP

ESTABLISHED 1851

INCORPORATED 1902

STRUTHERS-WELLS COMPANY

Riveted and Welded Steel Plate Construction

WARREN, PA.

NEW YORK SALES OFFICE: 50 Church Street

Products.

RIVETED and WELDED STEEL and IRON PLATE CONSTRUCTION of every description, with various STRUCTURAL SHAPES, FINISHED CASTINGS and FORGINGS which include: Riveted and Welded Pipe; Steel Tanks (rectangular, circular or oval) for storage, pressure and vacuum; Coolers; Retorts; Dryers; Jacketed Kettles for cooking, boiling and evaporating; Evaporating Pans; Cylinders for brick hardening and creosoting purposes; Stills, Heaters.

Steam Regenerators; Incinerators; Extractors; Steam Headers; Stacks; Penstocks; Exhaust Piping; Standpipes; Flumes; Condensers; Steel Plate Equipment for refining sugar and oil; for the manufacture of paper, soap, chemicals, rubber, paints, acids, powder; for use in the distillation of wood in the production of turpentine, wood alcohol and their by-products; Horizontal Tubular Boilers.

A Complete Modern Plant.

The shops of this company cover seven acres and consist of an engineering department, a plate shop, riveting department, flange and forge shop, welding department, machine shop, foundry and pattern shop; a complete modern unit under one ownership and management, fully equipped with most modern tools and appliances.

Engineering Department—A corps of trained engineers and draftsmen thoroughly schooled in steel plate construction, prepared to work out specifications, outline plan of shop operations and make careful estimates of cost on intricate or simple work.

Plate Shop—Comprises seven sections or bays. Work starts where the steel plates are first unloaded, and moves steadily in one direction to completion of product. No back-tracking. Shears and punches, flange presses, bending rolls, riveters, calking and testing apparatus, etc., are so placed that each operation is performed in consecutive order. Entire floor space served by electric traveling cranes that move all work quickly.

Riveting Department—Riveting equipment includes five hydraulic bull riveters, each served with sep-

arate hydraulic hoist. The largest of these riveters has 16-ft. throat, will exert a pressure of 100 tons, and properly drive rivets of 1½-in. diameter. It is supplemented with four smaller machines of varying throat and pressure capacities adapted for all smaller and lighter work. This permits large and small work to be handled, obtaining the greatest number of bull-driven rivets, with least number of riveted seams.

Flange and Forge Shop—In the flanging department there is a 400-ton 4-post press capable of handling heads up to 10-ft. finished diameter, and a 200-ton sectional flange press with 72-in. throat. Both presses are fully equipped with dies of standard sizes and shapes, and a large assortment of specials. A natural gas heated furnace that will take plates up to 12 ft. square, serves both presses.

The forge department is equipped with steam and electric hammers, furnaces and small tools to meet every demand.

Welding Department—Covers a floor space of 15,000 sq. ft., fully equipped with apparatus for welding both by electricity and the oxy-acetylene flame. Joints and seams are made with 100% efficiency—equal in strength to the plate itself.

Machine Shop—Equipped with planers, boring mills, lathes, turret lathes, automatic machines, radial and multiple drills capable of machining the special castings and forgings that form a large part of the intricate and complicated plate work on which this company specializes. Electric cranes handling pieces up to 20 tons serve all machine tools.

Foundry and Pattern Shop—The foundry is a separate building, adjacent to both machine and plate shops, covering an area of 18,000 sq. ft. Cupola and crane capacities are ample for castings weighing up to 15 tons.

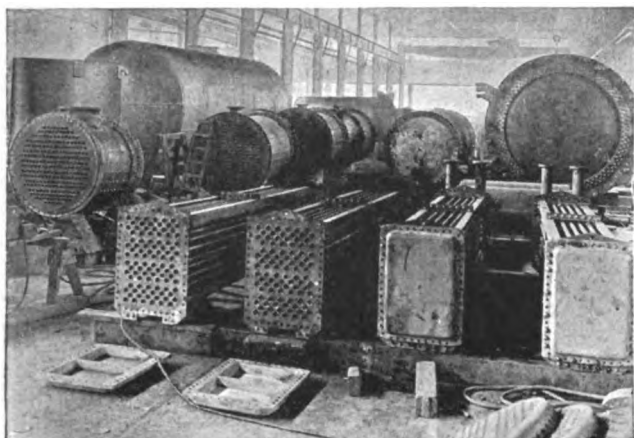
The pattern shop is fully equipped with modern electrically driven wood-working machinery, and a force of expert pattern makers, permitting the production of patterns on short notice.



MAIN OFFICE AND WORKS OF STRUTHERS-WELLS COMPANY

The Assembling Bay.

The illustrations on this page show a number of views of the assembling bay where products of the machine shop, plate shop, flanging department and foundry are brought together and assembled into the finished product. These views were taken at different times, and illustrate the wide variety of work which is continually passing through the Struthers-Wells shops.



TUBE NESTS FOR HEAT EXCHANGERS, VARIOUS TANKS AND A CREOSOTING CYLINDER

Knocked Down Work.

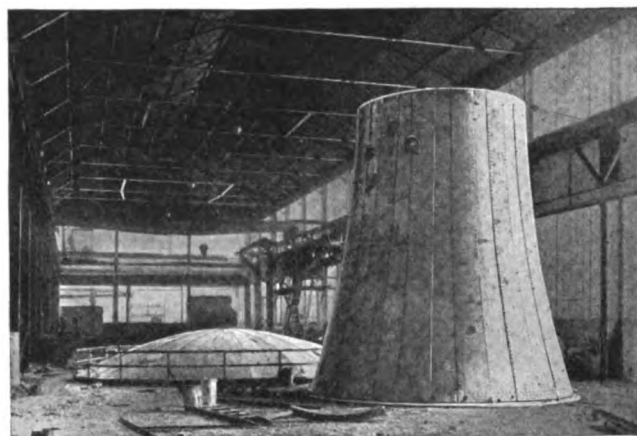
Knocked down fabricated material is furnished when construction is too large to be shipped intact. Working drawings supplied for guidance of erecting gangs. Such material is assembled in shop before shipment, to insure accurate dimensions and to minimize work in the field. Knocked down material for export will be properly prepared for ocean transportation, and nested to reduce space.



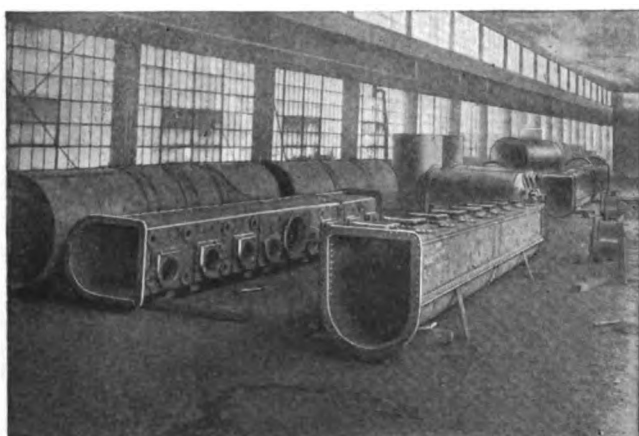
LARGE PENSTOCK HEADER, TANKS AND A RETORT FOR WOOD DISTILLATION



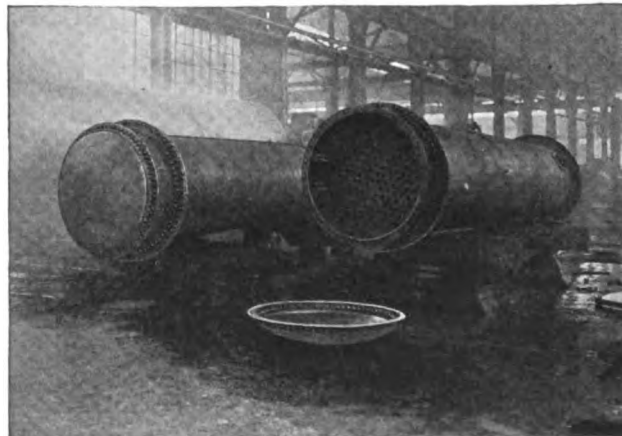
TUBULAR TRANSFORMER TANKS, BRICK HARDENING CYLINDER, PENSTOCKS AND TANKS



BASE SECTION OF SELF-SUPPORTING SMOKE STACK AND SPHERICAL TOP OF STORAGE TANK



ODD-SHAPED HEADERS FOR GAS PIPING AND SECTIONS OF CYLINDRICAL PIPING



TUBULAR HEAT EXCHANGERS

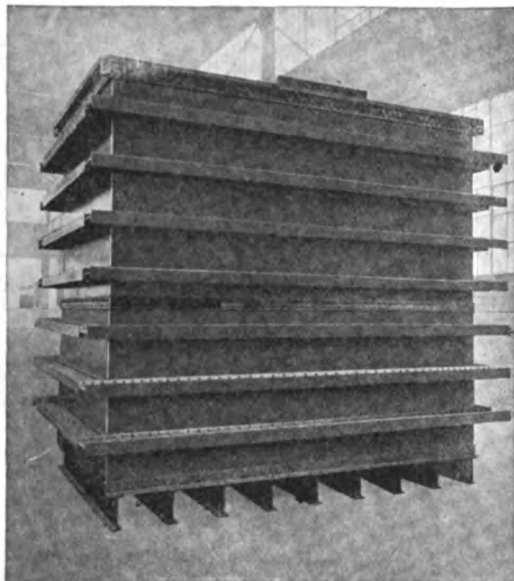
Oxy-acetylene and Electric Welding.

By use of these welding processes, a number of pieces can be welded into one homogeneous whole which expands and contracts equally throughout, giving an absolutely and permanently tight job—a perfect seamless joint.

Advantages—Welded seams are vastly superior to riveted seams in tanks holding air or gas under pressure, and in tanks for the storage of oil, gasoline, and other fluids of a volatile nature. They are a safeguard against

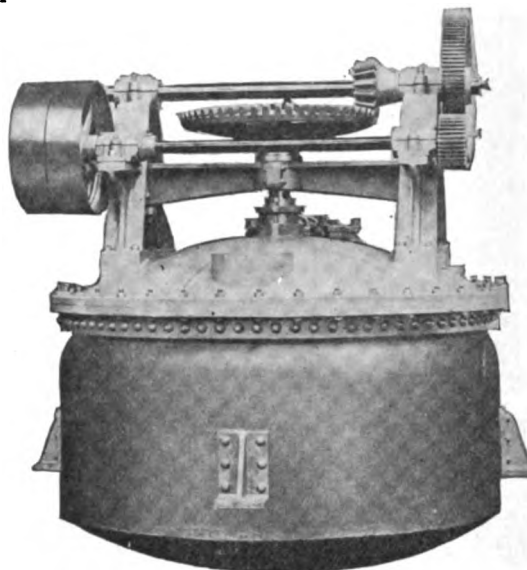
fire, and evaporation is reduced to a minimum. The welding process permits using steel plates exclusively in constructions which with riveted seams would necessitate forgings and castings with their additional cost.

The welded tank is rapidly supplanting the riveted tank in many requirements of plate construction, especially in those cases referred to in preceding paragraph. Plates for any kind of work can be successfully welded by means of the process followed in the welding department; and the experience of this company during a period of ten years is a sufficient warrant for efficient welding operations.



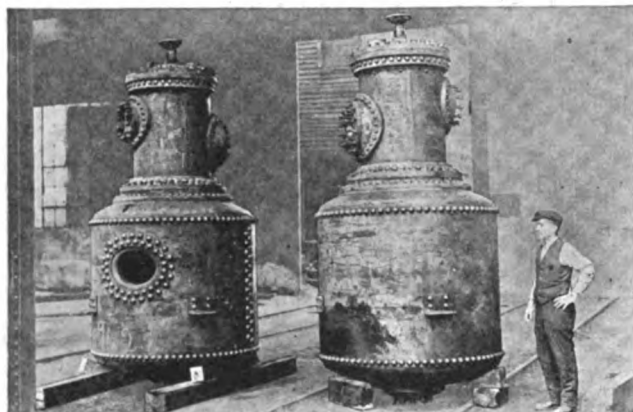
RECTANGULAR VACUUM TANK

Size, 17 x 9 x 16 ft. with welded seams braced to withstand 29-in. vacuum. Cover of cast iron



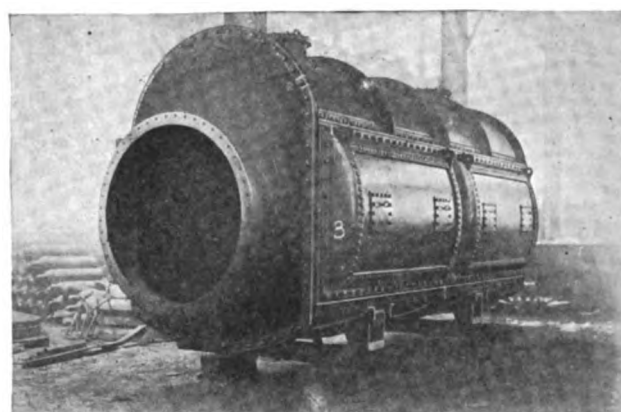
JACKETED MIXING TANK

With welded seams in both inside and outside shells. Cast iron cover bolted on



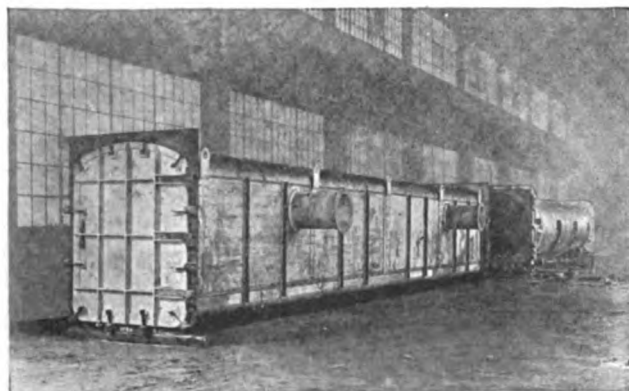
SPECIAL WATER HEATERS

Designed for high pressures. Made in various sizes and shapes in accordance with customers' designs and specifications



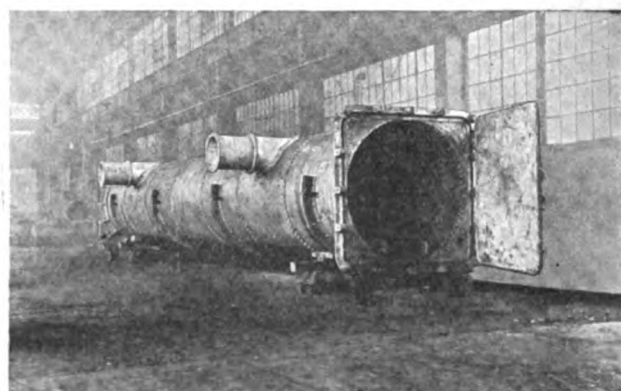
SPECIAL TYPE SURFACE CONDENSER

Size, 7 x 14 ft. Access is gained to the interior for cleaning through the removable side sections of the shell



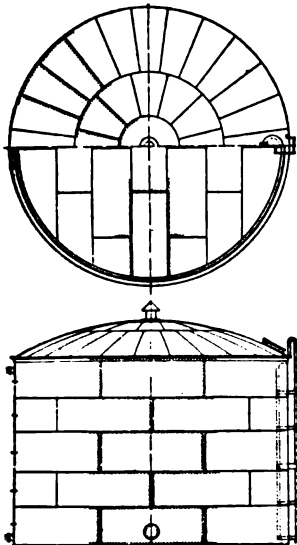
RECTANGULAR OVEN RETORT

Used in the distillation of hardwoods. These retorts may be had in any lengths from 32 to 56 ft.



CYLINDRICAL OVEN RETORT

Used in the distillation of resinous woods. These retorts may be had in practically any length desired



PLAN AND ELEVATION OF
STEEL STORAGE TANK
WITH GLOBE SHAPED
ROOF

Large Steel Storage Tanks.

Materials for large storage tanks of any thickness of steel plates are fabricated and furnished to meet all requirements. Designs are made in accordance with character and weight of contents, with proper weight of plates and type of riveting, to give sufficient factor of safety at all heights. All parts are assembled in shop to verify accuracy of holes and other preliminary work; each piece is then plainly marked for guidance of erecting gang; material is painted, small parts boxed, and entire tank is shipped knocked down. Blue prints are supplied to men in the field to facilitate erection.

Horizontal Tubular Boilers.

Boilers of the horizontal tubular type, in diameters of 78 to 108 in., rated from 175 to 375 h.p., are a standard product of the Struthers-Wells shops.

These boilers are equipped with double or single connected steam drums. If desired a dome will be furnished, or, in lieu of drum or dome, a dry pipe or steam separator. The longitudinal seams are designed for maximum efficiency, placed above the fire line and arranged to break joints in adjacent courses. Braces of weldless steel. Manhole furnished as required, both above and below tubes. Ends of tubes flared or beaded over. All steel plates of open hearth homogeneous flange quality, having a tensile strength of from 55,000 to 65,000 lbs. per sq. in.

Work of Special Design for Particular Purposes.

Estimates on intricate or simple work promptly furnished. Drawings and specifications of special design for any particular purpose should be forwarded to our

nearest office, in order to obtain an estimate or special report from the engineering department.

Responsibility Centralized.

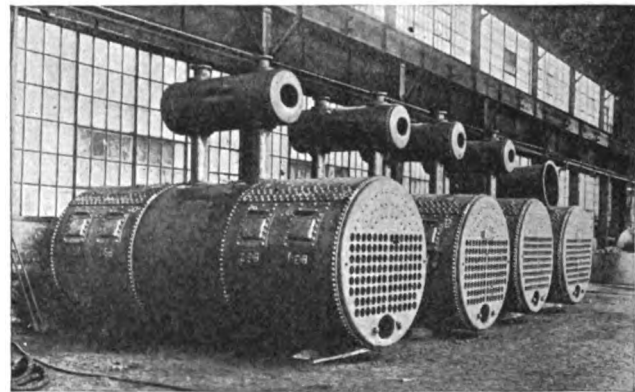
All operations connected with Struthers-Wells service are carried on under one roof and one responsibility, without outside assistance. Absolute confidence is assured, as the plant contains its own engineering department, drafting rooms and all necessary shops. Every operation in each job is executed by our own men under our guidance and control. Full responsibility for the complete work is accepted.

Engineering Service.

Those having jobs involving steel plate construction will find the co-operation of this efficient organization very valuable.

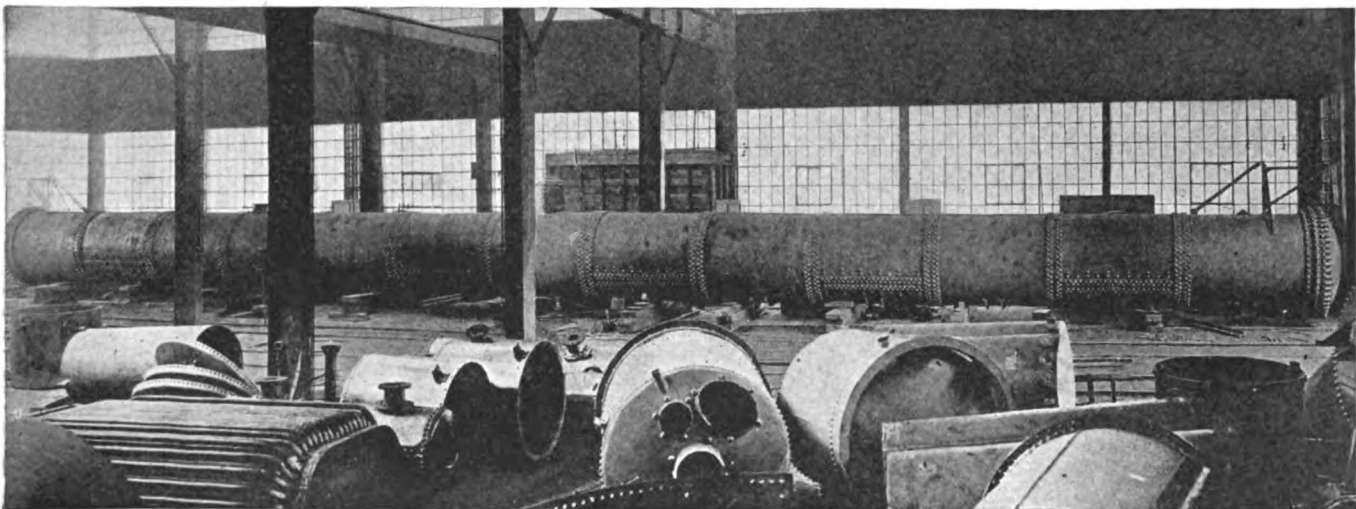
Difficult, intricate and apparently baffling problems in steel plate construction are solved here, and this accumulated experience is at the disposal of those having such problems.

If customers' ideas are fully developed, they can depend on our ability to interpret them intelligently, or, the engineering department will develop customers' ideas, putting them into practical shape, and the shop will fabricate the work. No job too large or difficult; none too small to receive best attention.



A BATTERY OF HORIZONTAL FIRE TUBE BOILERS

84-in. diameter x 20-ft. long, 225-h.p. each, working pressure 125 lbs. Boilers in diameter of 78 to 108 in., rated 175 to 375 h.p. are a standard product of Struthers-Wells shops



CREOSOTING CYLINDER

6 ft. 2 in. diameter; 106 ft. long, tested to 375 lbs. per sq. in. Also a miscellaneous assortment of steel plate work

WALSH'S HOLYOKE STEAM BOILER WORKS

Steel Plate Construction

Riverside
HOLYOKE, MASS.

BRANCH OFFICE AND WORKS, DRUMMONDVILLE, QUEBEC, CAN.

Products.

All classes of LIGHT and HEAVY STEEL PLATE CONSTRUCTION, including Riveted and Welded Tanks of every description for water storage, compressed air, acid, filters, rosin, size, heaters, blow-off, receiving, oil, caustic soda, brine, molasses, fuel oil and tar.

Diffusers, Digestors, Incinerators, Barking Drums. Penstocks, Riveted Steel Pipe, Surge Pipes, Wheel Cases and Draft Tubes; Smokestacks; Flues, Rotary Bleach Boilers, Standpipes, Kiers, Flumes, Expansion Joints for pipe lines, etc.

Light Gage Dipped Pipe for bolted or flanged joints or continuous riveting.

Fabricated Plates of every description.

Structural Steel for construction, bridges, etc.

Services.

The practical experience of this company in designing, constructing and erecting is at the service of prospective customers.

The engineering department of this organization will assist in the solution of all steel plate construction problems.

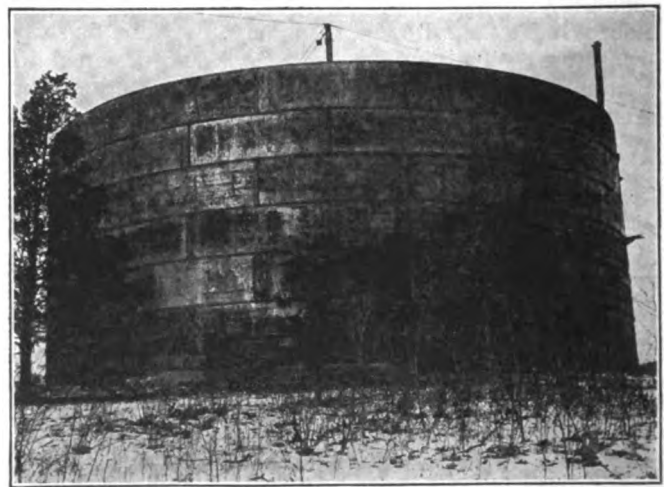
A satisfactory solution is assured, as has been accomplished for many others.

Facilities.

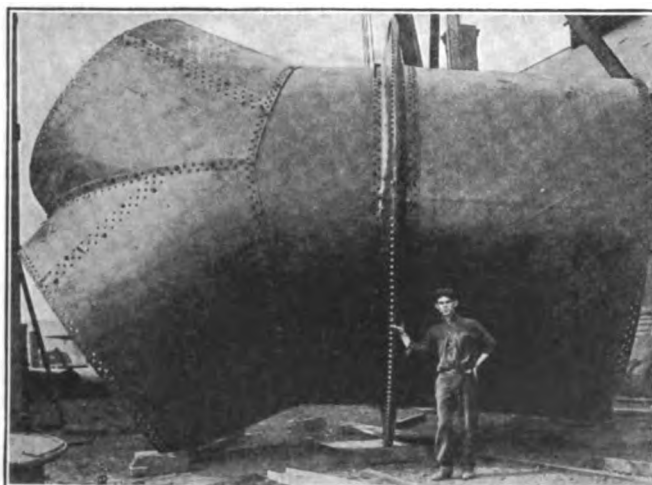
A corps of skilled and experienced mechanics, modern shop tools and portable field equipment insure prompt and satisfactory execution of all contracts.



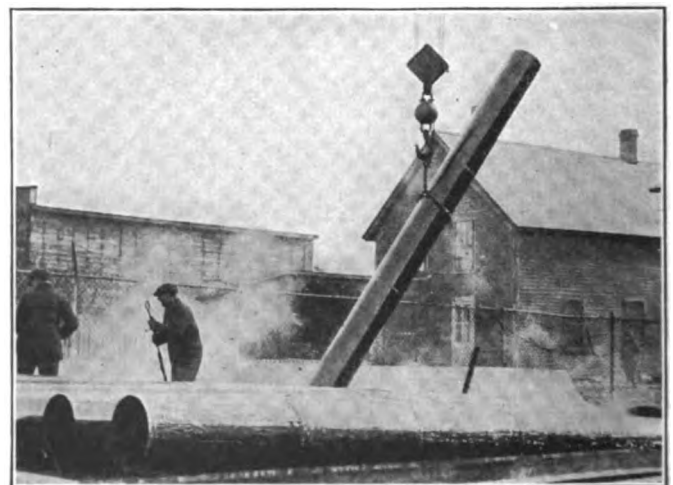
PENSTOCK, STEEL CRADLES AND EXPANSION JOINTS,
EAGLE FALLS, N. Y.



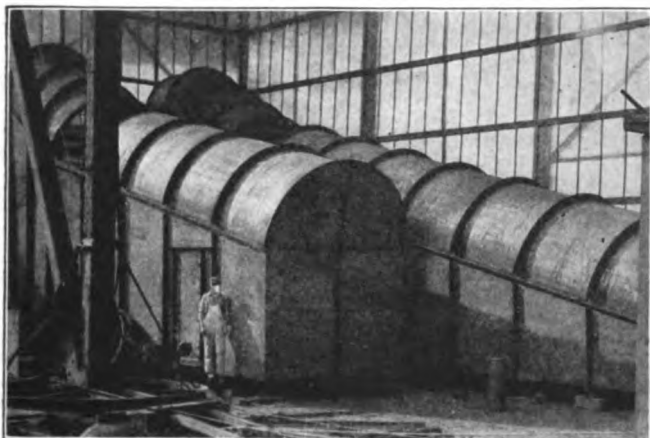
100-FOOT DIAMETER STANDPIPE FOR METROPOLITAN WATER
WORKS, BOSTON, MASS.



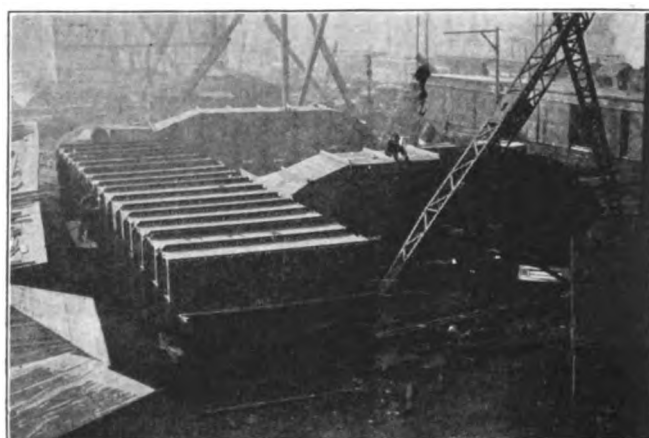
Y-CONNECTION SHOWING EXPANSION JOINT



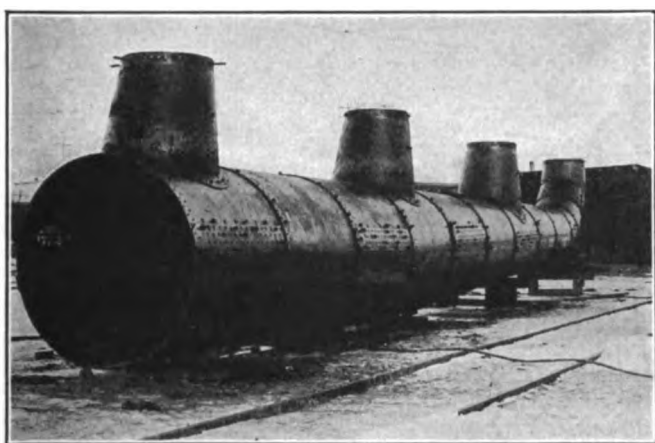
DIPPING LIGHT GAGE RIVETED STEEL PIPE



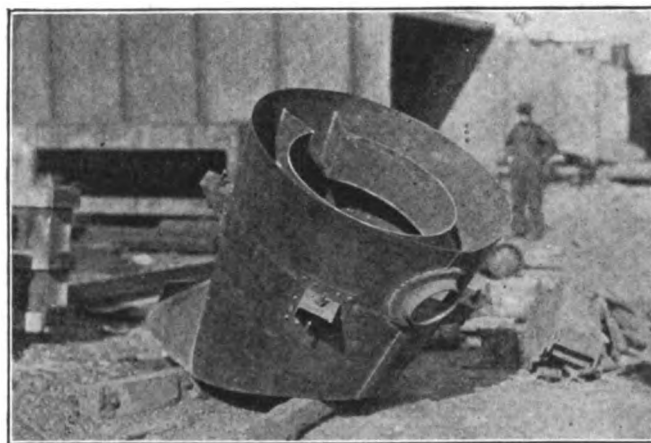
SMOKE FLUES FOR DWIGHT P. ROBINSON CO., PENNSYLVANIA PUBLIC SERVICE CORP., SEWARD, PA.



AIR DUCTS FOR DWIGHT P. ROBINSON CO., PENNSYLVANIA PUBLIC SERVICE CORP., SEWARD, PA.



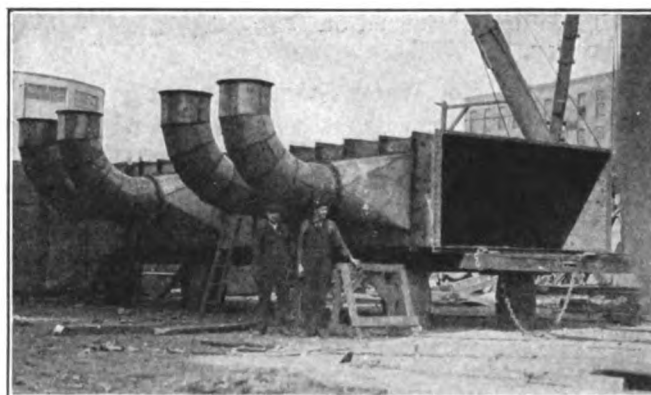
DISTRIBUTOR FOR STATACONA HYDRAULIC CO., ST. FERREOLE, QUEBEC



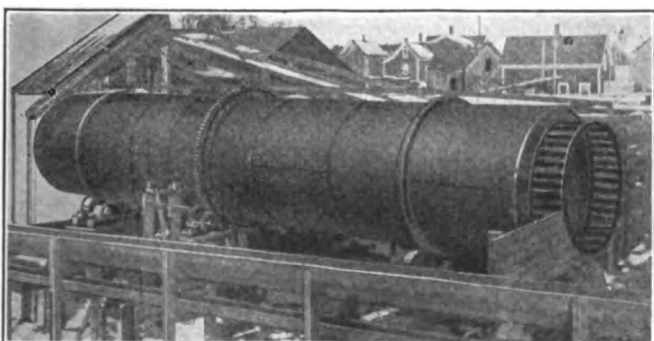
FILTER BUILT FOR CITY OF SPRINGFIELD, MASS.



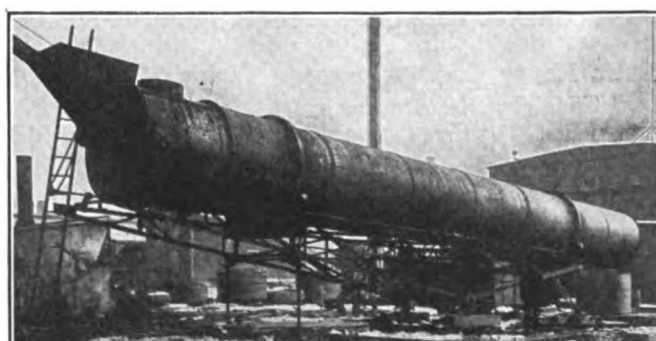
UPTAKES FOR STONE & WEBSTER CORP., LOWELL GAS LIGHT CO., LOWELL, MASS.



AIR DUCTS FOR STONE & WEBSTER CORP., LOWELL GAS LIGHT CO., LOWELL, MASS.



WALSH (PULP WOOD) BARKING DRUM OPERATING AT PASSADUMKEAG, ME.



MATCH SPLINT DRYER FOR DIAMOND MATCH CO.

THE BIGGS BOILER WORKS COMPANY

Steel Pressure and Storage Tanks

East Market Street and Case Avenue
AKRON, OHIO

Products.

STEEL TANKS for Pneumatic Water Supply, Hot Water Storage, Gasoline, Fuel Oil, Kerosene, Naphtha, etc.; AIR RECEIVERS.

Also manufacturers of Jacketed Tanks; Flumes; Heaters: Oil, Refinery and Rubber Mill; Jacketed Kettles; Steam Jacketed, and Steel Riveted Pipe; Retorts; Smokestacks; Stills.

For Vulcanizers and Devulcanizers, see page 1192.

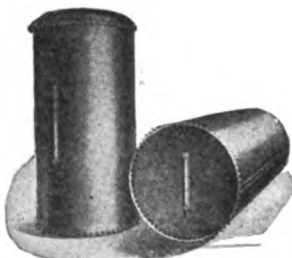
Pneumatic Water Supply Tanks.

Recommended and guaranteed for a safe daily working pressure of 75 lbs. Materials and workmanship are the best. Rivets are closely spaced and are hydraulically driven.

Heads are flanged and dished under hydraulic pressure of 300 tons in formers which are accurately machined. Water gauge openings are tapped automatically by a special machine. Openings for pipe connection are properly reinforced, using forged steel flanges on sizes $1\frac{1}{4}$ in. in diameter and larger.

Thoroughly inspected during construction, and upon completion are subjected to a hydrostatic test pressure of 50% in excess of the safe daily working pressure. Absolutely airtight.

Price lists furnished on application.

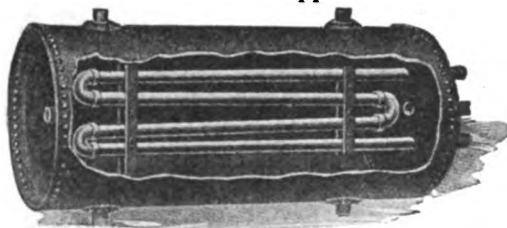


PNEUMATIC WATER SUPPLY TANKS

Extra Heavy Hot Water Storage Tanks.

Made with or without coils. Standard coils are made of four pipes connected with three return bends. They are securely fastened to the tank and properly braced. Can be equipped with special coils if desired.

Price lists furnished on application.



EXTRA HEAVY HOT WATER STORAGE TANK FOR 100 LBS. PRESSURE

Extra Heavy Gasoline Storage Tanks.

Constructed according to specifications of the National Board of Fire Underwriters, and, if desired, will be furnished with underwriters' label attached at no additional charge. Suitable for the storage of gas, fuel oil, kerosene, gasoline, naphtha, etc.

An absolutely tight joint is assured under all conditions, all rivets being closely spaced and driven hot under hydraulic pressure. All seams are lap jointed, single riveted, properly laid up and calked metal to metal without composition filler.

On tanks under 15,000-gal. capacity, heads are

dished to the true radius of the diameter of the tank, one head being riveted in convex and one concave, which materially reinforces the tank.

Material is the best open hearth steel, and workmanship is subject to the most critical inspection.

Standard sizes of oil and gasoline storage tanks are carried in stock. Price lists furnished on application.



EXTRA HEAVY GASOLINE STORAGE TANK
Capacity, 84 gals. to 25,000 gals.

High Pressure Tanks.

The tank in accompanying illustration is designed for 500 lbs. working pressure. Shell plates are $1\frac{1}{2}$ in. thick. Rivets are $1\frac{1}{8}$ in. in diameter, with longitudinal seams butt joint, quadruple staggered riveted with inside and outside covering strap.

We are specialists in high pressure tank construction, and our plant is hydraulically equipped throughout, enabling us to fabricate material $1\frac{1}{2}$ in. in thickness.



STEEL STORAGE AND PRESSURE TANK

Air Receivers.

The construction of these air receivers and the selection of materials both receive the utmost care. Tested to 50% in excess of guaranteed safe working pressure. Rivets are hydraulically driven. Heads are flanged and dished to true radius of diameter of shell. Openings are reinforced with forged steel flanges.

Horizontal receivers with manhead have both heads riveted in convex. Manhead is always placed in head near drain opening, unless otherwise specified.

Vertical receivers with manheads have bottom head concave and manhead is located in shell on line with outlet near bottom, unless otherwise specified.

Standard air receivers have longitudinal seams lap joint, double staggered riveted; circular seams, single riveted.

Price list furnished on application. Prices of special air receivers, for any working pressure desired, also quoted on application.



AIR RECEIVER

CHATTANOOGA BOILER & TANK CO.

CHATTANOOGA, TENN.

Products.

TANKS for all General and Special Purposes:

For the manufacture and storage of Sulphuric, Nitric and Mixed Acids.

For manufacture and storage of Benzol and Toluol.

Creosote Tanks.

Grain Tanks.

Ice Tanks.

Rendering Tanks.

Oil and Gasoline Tanks.

Cottonseed Storage Tanks.

Bleaching Tanks.

Kier Tanks.

Silicate Soda Tanks.

Alum Manufacturers' Tanks.

Soap Stock, Rosin and Brine Tanks.

Molasses Tanks.

Barium Process Tanks.

Tanks for manufacture and storage of Green Gum or Wood Turpentine.

Water Tanks, Towers and Standpipes; Gas Holders.

Co-operation and Service.

This company makes a specialty of tankage design and construction, and has spent and is spending much money and time on mechanical and chemical investigation.

Experience places it in a position to offer valuable advice on tanks required for all general purposes.

In the consulting department is one of the country's

most capable and successful chemical engineers, who can be consulted for special propositions.

With this service and an up-to-date shop, the company gives more value, from beginning to end, than is obtainable elsewhere.

With an immense stock of materials, quick shipments, together with other advantages, are guaranteed.

Acid Tanks.

The various steps in acid processes can not be handled with the same material. Any material from steel to lead lined tanks is furnished. Also, cooler frames of steel, or shipped complete with lead coils and lining.

Acid work is a very important subject, and the plant is specially equipped to render the latest and best practice.

Towers, Tanks and Standpipes.

The consulting department will advise whether towers and tanks, or standpipes, are the most economical for condition presented.

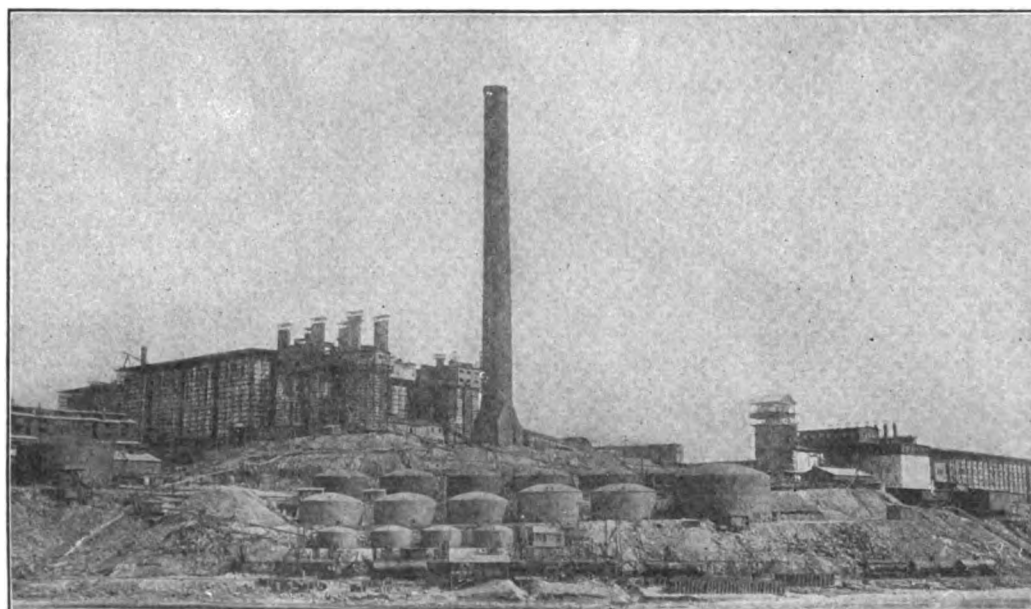
Gas Holders.

Will supply gas holders for any gas which can be handled by means of a holder.

For which purpose we have constructed tanks covering a wide range in capacities.

Estimates, etc.

Information and estimates will be furnished on request.



A NUMBER OF ACID TANKS ERECTED BY CHATTANOOGA BOILER & TANK COMPANY AT ONE OF THE LARGEST PLANTS IN THIS COUNTRY

CHICAGO BRIDGE & IRON WORKS

Designers, Manufacturers and Constructors of Elevated Steel Water Tanks, Storage Tanks, Self-supporting Steel Stacks; All Classes of Plate Metal Work

OFFICES

CHICAGO, ILL., 2022 Old Colony Building
NEW YORK, N. Y., 3135 Hudson Terminal Building
DALLAS, TEX., 1622 Pretorian Building
CHARLOTTE, N. C., 501 Realty Building

EASTERN PLANT
GREENVILLE, PA.

CENTRAL PLANT
CHICAGO, ILL.

LOS ANGELES, CAL., Wright & Callendar Building
SAN FRANCISCO, CAL., Call Building
SEATTLE, WASH., L. C. Smith Building
MONTREAL, QUE., 260 St. James Street

CANADIAN PLANT
BRIDGEBURG, ONT., CAN.

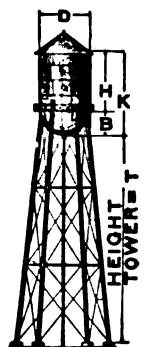
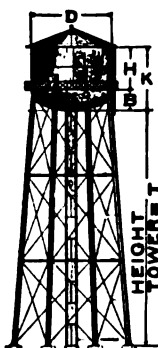
Products.

ELEVATED WATER TANKS, STORAGE TANKS, STAND-PIPES, RAILWAY TANKS, SELF-SUPPORTING STACKS, ACID TANKS.

Also manufacturers of Paper and Sugar Plantation Equipment, Coaling Stations and all classes of Heavy Plate Metal Work.

DATA, ELLIPTICAL AND HEMISPHERICAL TANKS

Capacity, gals.	Elliptical bottom			Hemispherical bottom		
	D	H	K	D	H	K
5,000	10' 0"	7' 0"	9' 6"	8' 0"	12' 0"	16' 0"
10,000	13' 0"	8' 0"	11' 3"	10' 0"	14' 0"	19' 0"
15,000	15' 0"	9' 0"	12' 9"	12' 0"	16' 0"	22' 0"
20,000	16' 0"	11' 0"	15' 0"	12' 0"	17' 3"	23' 7"
25,000	17' 6"	11' 0"	15' 4"	14' 1"	17' 3"	24' 3"
30,000	18' 6"	12' 0"	16' 7"	15' 3"	17' 3"	24' 10"
35,000	19' 0"	13' 4"	18' 1"	16' 4"	17' 3"	25' 5"
40,000	20' 0"	13' 9"	18' 9"	17' 4"	17' 3"	25' 11"
45,000	22' 0"	12' 4"	17' 10"	18' 3"	17' 3"	26' 4"
50,000	22' 0"	14' 0"	19' 6"	19' 0"	17' 6"	27' 0"
60,000	24' 0"	14' 0"	20' 0"	19' 0"	22' 3"	31' 9"
65,000	24' 0"	15' 6"	21' 6"	20' 0"	21' 3"	31' 3"
70,000	25' 0"	15' 0"	21' 3"	21' 0"	20' 3"	30' 9"
75,000	26' 0"	15' 0"	21' 6"	22' 0"	19' 4"	30' 4"
80,000	26' 0"	16' 0"	22' 6"	22' 0"	21' 1"	32' 1"
90,000	28' 8"	14' 0"	21' 2"	22' 0"	24' 6"	35' 6"
100,000	28' 8"	16' 0"	23' 2"	22' 0"	28' 0"	39' 0"
120,000	32' 0"	14' 8"	22' 8"	24' 0"	28' 0"	40' 0"
125,000	32' 0"	15' 6"	23' 6"	24' 0"	29' 0"	41' 0"
150,000	34' 0"	16' 6"	25' 0"	26' 0"	29' 3"	42' 3"
175,000	36' 0"	17' 6"	26' 6"	26' 0"	35' 0"	48' 0"
200,000	38' 0"	17' 6"	27' 0"	28' 0"	35' 0"	49' 0"
250,000	40' 0"	20' 0"	30' 0"	30' 0"	37' 0"	52' 0"
300,000	41' 0"	23' 9"	34' 0"	32' 0"	40' 0"	56' 0"
400,000	47' 0"	23' 0"	34' 9"	35' 0"	44' 0"	61' 6"
500,000	51' 0"	24' 3"	37' 0"	38' 0"	46' 6"	65' 6"



Dimensions of our Standard Tanks:

Elliptical. Depth of bottom $B = \frac{D}{4}$
Square of base $= .71D + .118(T + B)$

Hemispherical. Depth of bottom $B = \frac{D}{2}$
Square of base $= .71D + .162(T + B)$

Information Required in Making Quotations on Elevated Water Tanks.

- (1) Capacity of tank required in gallons.
- (2) Height of tower, which should be given to the lowest point of bottom of tank above top of foundations.
- (3) If tank is used for sprinkler service, state whether stock company or mutual.
- (4) Which, if any, of the following accessories manufacturer is to furnish: riser pipe, frost casing, overflow, indicator, pressure gage tank heater, heater house, foot elbow, gate valve, float valve. Not one of these accessories is included in quotations except when expressly so stated.

STANDARD SIZES CYLINDRICAL VERTICAL STORAGE TANKS

Capacity, gals.	Diam.	Height	Capacity, gals.	Diam.	Height	Capacity, gals.	Diam.	Height
10,000	12' 3"	11' 9"	75,000	23' 9"	23' 3"	225,000	36' 6"	29' 0"
15,000	15' 0"	11' 9"	90,000	26' 0"	23' 3"	250,000	38' 6"	29' 0"
20,000	17' 4"	11' 9"	100,000	27' 3"	23' 3"	300,000	42' 0"	29' 0"
25,000	16' 0"	17' 6"	120,000	30' 0"	23' 3"	400,000	49' 0"	29' 0"
30,000	17' 4"	17' 6"	125,000	27' 6"	29' 0"	500,000	54' 3"	29' 0"
40,000	20' 0"	17' 6"	150,000	30' 0"	29' 0"	600,000	60' 0"	29' 0"
50,000	22' 3"	17' 6"	175,000	32' 3"	29' 0"	750,000	66' 3"	29' 0"
60,000	21' 3"	23' 3"	200,000	34' 6"	29' 0"	1,000,000	77' 0"	29' 0"

Catalogue.

Catalogue No. 50 mailed on request.

SWEET'S CATALOGUE

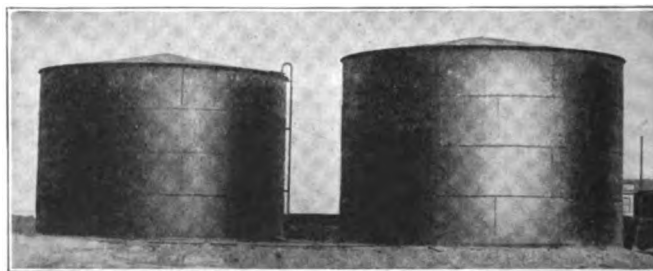


TANK OF PROC. TER & GAMBLE, HAMILTON, ONT.

Capacities, 50,000 and 100,000 gals.
Heights, 100 and 50 ft. to bottom

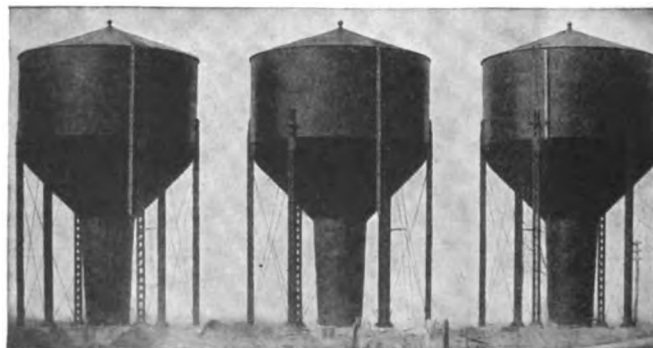


STEEL STACK, UNITED VERDE COPPER CO., JEROME, ARIZ.
Diameter, 31 ft.; height, 400 ft.



MOLASSES TANKS, GREAT WESTERN SUGAR CO., GERING, NEBR.

Diameter, 35 ft.; height, 23 ft.



150,000-GAL. CONICAL BOTTOM TANKS, CHICAGO & NORTH WESTERN RY., CHICAGO TERMINAL

GRAVER CORPORATION

Steel Tanks and General Steel Plate Construction

EAST CHICAGO, IND.

BRANCH OFFICES

NEW YORK, N. Y., 280 Broadway
TOLEDO, OHIO, Nicholas Building
CHICAGO, ILL., Steger Building

PITTSBURGH, PA., Conestoga Building
CINCINNATI, OHIO, Gwynne Building
KANSAS CITY, MO., Gloyd Building
SAN FRANCISCO, CAL., Balboa Building

Products.

The Graver line includes everything made of Steel Plate; all kinds of STEEL TANK and STEEL PLATE WORK, from a single shop built storage tank to largest field erected tanks or complete refinery, including Stills, Condenser Boxes, Agitators, Filters, Bleacher Tanks, Run-down Tanks and Storage Tanks.

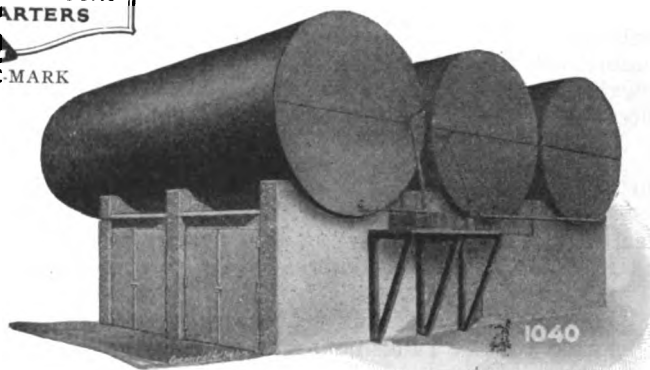
For Water Softening, Purifying, Sterilizing and Filtering Equipment, see page 434.

Range of Products and Facilities.

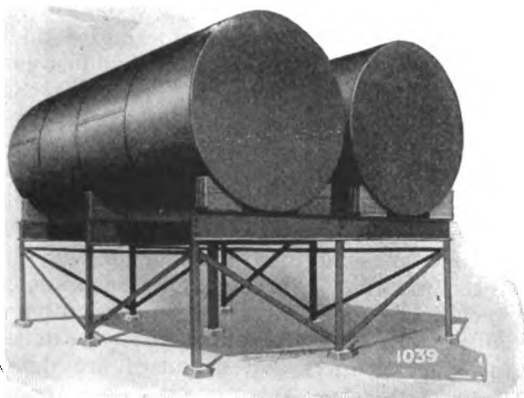
Our economical standard designs and sizes will fit most cases. But we are prepared to build and erect according to any special design or individual specification. Our plant is ideally located in a celebrated steel center; shop equipment includes the best for efficient production, and our facilities for quick shipment are unexcelled.



each pump is usually provided. In design, they meet the requirements of the National Board of Fire Underwriters and are provided with their label.



TANKS WITH ENCLOSED AND CONCRETE SUPPORT
STANDARD RIVETED HORIZONTAL CYLINDRICAL TANKS



TANKS WITH STRUCTURAL STEEL SUPPORT

Graver Standard Station Tanks.

A large supply of steel plate is carried in stock, completely fabricated and ready to assemble. As a result, tanks are produced that are inexpensive, and prompt deliveries made under normal conditions, or at least within a few weeks after receipt of order.

All Graver standard station tanks are made of open hearth steel, well riveted and calked throughout. Necessary flanges for openings are furnished for standard pipe connections.

They are made both in horizontal and vertical type. The choice between the two styles depends entirely upon the conditions under which the tanks are to be used, but the unusual range of stock sizes, shown in tables herewith, makes it possible to meet every capacity or installation requirement.

Graver Welded Tanks.

These tanks are mainly used at gasoline filling stations and are placed underground. One tank for

FLAT HEADS 1/4 IN., SHELL 1/4 IN.				FLAT HEADS 1/4 IN. SHELL 1/4 IN.			
Capacity, gals.	Size		Shipping weight, lbs.	Capacity, gals.	Size		Shipping weight, lbs.
	Diam.	Length			Diam.	Length	
4,000	8'	10' 9 1/2"	5,500	4,000	8'	10' 9 1/2"	3,800
5,000	8'	13' 6"	4,400	5,000	8'	13' 6"	4,400
6,000	8'	16' 3/4"	6,200	6,000	8'	16' 3/4"	5,000
7,000	8'	19'	7,000	7,000	8'	19'	5,700
8,000	8'	21' 4"	7,700	8,000	8'	21' 4"	6,200
9,000	8'	24'	8,500	9,000	8'	24'	6,800
10,000	8'	26' 7 1/4"	9,200	10,000	8'	26' 7 1/4"	7,300
11,000	8'	29' 4"	10,000	11,000	8'	29' 4"	7,900
12,000	8'	31' 10 1/2"	10,800	12,000	8'	31' 10 1/2"	8,500
13,000	8'	34' 8"	11,500	13,000	8'	34' 8"	9,100
14,000	8'	37' 1 3/4"	12,300	14,000	8'	37' 1 3/4"	9,700
15,000	8'	40'	13,300	15,000	8'	40'	10,400
16,000	8'	42' 6"	13,900	16,000	8'	42' 6"	10,900
7,700	10' 6"	11' 11"	6,900	6,200	9'	13' 1 1/2"	5,000
11,500	10' 6"	17' 9"	9,000	9,300	9'	19' 5 1/2"	6,500
15,200	10' 6"	23' 7"	11,300	12,300	9'	25' 10"	8,100
19,200	10' 6"	29' 5"	13,500	15,300	9'	32' 2 1/2"	9,700
24,600	10' 6"	38' 1"	16,900	18,200	9'	38' 7 1/2"	11,300
				7,700	10' 6"	11' 11"	5,800
				11,500	10' 6"	17' 9"	7,400
				15,200	10' 6"	23' 7"	9,100
				19,200	10' 6"	29' 5"	10,800
				24,600	10' 6"	38' 1"	13,400

STANDARD RIVETED VERTICAL CYLINDRICAL TANKS

Capacity, gals.	Diameter	Height	Weight, lbs.
7000	10' 6"	11' 2"	4300
8000	10' 6"	12' 8"	4600
10000	10' 6"	15' 8"	5300
11000	10' 6"	17' 0"	5500
13000	10' 6"	20' 2"	6200
14000	10' 6"	21' 6"	6500
16000	10' 6"	24' 10"	7700
18000	10' 6"	28' 0"	8600
20000	10' 6"	30' 9"	9300

STANDARD WELDED HORIZONTAL CYLINDRICAL TANKS

Capacity, gals.	Diameter	Length	Weight, lbs.
550	4'	6'	800
1000	5' 5"	6'	1200
1500	5' 5"	9'	1600
2000	5' 5"	12'	2100
2500	5' 5"	15'	2600
3000	5' 5"	18'	3000

W. W. POSEY, PRESIDENT AND GENERAL MANAGER

A. C. SCULLY, SECRETARY AND TREASURER

LANCASTER IRON WORKS, INC.**Steel Plate Construction**

MAIN OFFICES AND PLANT

552 South Prince Street

LANCASTER, PA.

NEW YORK OFFICE, 501 Fifth Avenue

BOSTON OFFICE, 88 Broad Street

Products and Services.

A complete line of TANKS for all purposes:

Acid	Fuel oil	Pneumatic
Barge	Galvanizing	Pressure
Brine	Grease	Rendering
Blow-off	Hot water storage	Settling
Car	Hydro-pneumatic	Soap
Coal car	Jacketed	Vacuum
Compressed air	Molasses	Varnish
Elevator	Mixing	Water storage
Filter	Oil storage	

BRICK MAKING MACHINES; COMPLETE OUTFITS for BRICK MAKING PLANTS.

Also manufacturers of Acid Eggs; Condensers; Steel Barges; Dredge Pipes; Filters; Standpipes; Gas and Hydraulic Mains; Industrial Cars; Rotary Dryers. All knocked down work assembled before shipment. Stackings and Breechings built and erected. Large Storage Tanks built and erected.

Tanks.

Tanks constitute the primary product of LANCASTER IRON WORKS, INC.; in fact the word "Lancaster" is synonymous with tanks and steel plate construction.

The standard line of tanks is from 2 to 10 ft. in diameter, and from 5 to 40 ft. long. Tanks are built for oil storage from 19 to 114 ft. in diameter, and from 10 to 30 ft. high.

Stock Tanks—The list at the bottom of the page is shown as stock tanks, because we order stock plates for these sizes, and have in stock at all times material to make these tanks at a moment's notice. More than 100 tanks of the various sizes most often specified are carried in stock ready for immediate shipment. We also carry in stock materials for storage tanks (with flat heads) where pressure is not to be used; capacities from 100 to 20,000 gals.

Tanks Built to Specifications—If there is nothing in stock that suits the requirements, LANCASTER IRON

WORKS, INC. will build a tank according to the specifications in the shortest possible time.

Lancaster Tank Bulletin sent on request.

Brick Making Machines.

Brick making machinery is another important branch of LANCASTER IRON WORKS, INC. This line is both a continuation and a development of the famous old Martin and Arnold-Creager brick machinery.

We have recently taken over the Arnold-Creager Company of New London, Ohio, and will continue to manufacture their various lines; particularly the automatic brick machine. Replacement parts will be provided and repairs made for both the Martin and Arnold-Creager machinery.

We equip the whole or any portion of large and small brick making plants, inside or out. Machinery includes dryers, transfer cars, kilns, disintegrators and crushers, sand dryers, cable conveyors (portable or permanent), etc. Likewise we design brick making plants.

Brick Making Machinery Catalogue sent on request.

Facilities.

Four Shops—LANCASTER IRON WORKS, INC. maintains four shops: tank shop, machinshop, foundry, and pattern shop. Lancaster, therefore, handles every job complete; none of it is done outside. Lancaster is in immediate touch with every stage of the work. Therefore you can unfailingly depend on a Lancaster promise.

Conscientious Workmen—The plant is located in the center of the district noted for its conscientious workmen. Many of the Lancaster men are home owners. Every Lancaster man, after being with the company three months, is protected by insurance. Lancaster men have every convenience and incentive without paternalism; they are honest and honestly treated. Hence all Lancaster products and promises are dependable.

Early Deliveries—We can take care of all needs, whether standard or special, on unusually short notice.

LANCASTER IRON WORKS, INC. requests the privilege of estimating on your requirements.

STOCK TANKS

Diam., ft.	Length, ft.	Shell, in.	Heads, in.	Capacity, gals.	Weight, lbs.	Diam., ft.	Length, ft.	Shell, in.	Heads, in.	Capacity, gals.	Weight, lbs.	Diam., ft.	Length, ft.	Shell, in.	Heads, in.	Capacity, gals.	Weight, lbs.
2	5	1/2	1/4	115	407	4	16	1/2	3/8	1,500	2,949	7	28	1/2	3/8	8,060	10,358
2	6	1/2	1/4	140	453	4	18	1/2	3/8	1,690	3,226	7	30	1/2	3/8	8,637	11,000
2	8	1/2	1/4	190	563	4	20	1/2	3/8	1,880	3,550	7	36	1/2	3/8	10,360	12,530
2 1/2	5	1/2	1/4	185	521	4	22	1/2	3/8	2,050	3,797	8	16	1/2	3/8	6,015	7,522
2 1/2	6	1/2	1/4	220	588	4	24	1/2	3/8	2,260	4,132	8	18	1/2	3/8	6,765	8,065
2 1/2	8	1/2	1/4	295	696	5	7	1/2	3/8	1,025	2,380	8	24	1/2	3/8	9,020	10,378
2 1/2	10	1/2	1/4	365	839	5	14	1/2	3/8	2,050	3,790	8	30	1/2	3/8	11,280	12,255
3	6	1/2	1/4	315	799	5	16	1/2	3/8	2,350	4,427	8	32	1/2	3/8	12,030	12,950
3	8	1/2	1/4	420	1,042	5	20	1/2	3/8	2,940	5,189	8	36	1/2	3/8	13,530	14,320
3	10	1/2	1/4	525	1,151	5	22	1/2	3/8	3,230	5,663	8	40	1/2	3/8	15,040	15,655
3	12	1/2	1/4	630	1,311	5	24	1/2	3/8	3,525	6,037	8	16	1/2	3/8	6,015	7,522
3 1/2	6	1/2	1/4	435	977	5	28	1/2	3/8	4,100	6,962	8	18	1/2	3/8	6,765	8,065
3 1/2	8	1/2	1/4	575	1,160	5	30	1/2	3/8	4,410	7,370	8	24	1/2	3/8	9,020	10,378
3 1/2	10	1/2	1/4	720	1,353	6	8	1/2	3/8	1,690	3,326	8	30	1/2	3/8	11,280	12,255
3 1/2	12	1/2	1/4	865	1,547	6	12	1/2	3/8	2,540	4,340	8	32	1/2	3/8	12,030	12,950
3 1/2	14	1/2	1/4	1,000	1,730	6	16	1/2	3/8	3,385	5,350	8	36	1/2	3/8	13,530	14,320
3 1/2	16	1/2	1/4	1,150	2,070	6	18	1/2	3/8	3,805	5,856	8	40	1/2	3/8	15,040	15,655
4	6	1/2	3/8	550	1,468	6	24	1/2	3/8	5,080	7,366	9	40	1/2	3/8	19,030	17,720
4	8	1/2	3/8	750	1,769	6	30	1/2	3/8	6,345	9,054	9	40	1/2	3/8	19,030	22,355
4	10	1/2	3/8	950	2,068	7	18	1/2	3/8	5,182	6,995	10	20	1/2	3/8	11,750	14,990
4	12	1/2	3/8	1,100	2,346	7	24	1/2	3/8	6,910	8,710	10	30	1/2	3/8	17,625	20,480
4	14	1/2	3/8	1,300	2,636							10	40	1/2	3/8	23,500	25,860

PITTSBURGH-DES MOINES STEEL COMPANY

Elevated Steel Tanks, Storage Tanks and Structural Steel

750 Curry Building
PITTSBURGH, PA.

BRANCH OFFICES

NEW YORK, N. Y., 46 Church Street

SAN FRANCISCO, CAL., 380 Rialto Building

DES MOINES, IOWA, 950 Tuttle Street

CHICAGO, ILL., 70 West Monroe Street

DALLAS, TEX., 1239 Praetorian Building

WASHINGTON, D. C., 969 Munsey Building

SHOPS: PITTSBURGH, PA., DES MOINES, IOWA

CHATHAM, ONTARIO, CAN., CANADIAN DES MOINES STEEL CO., LTD., 292 Inshes Avenue

Products and Services.

Engineers, manufacturers and erectors of ELEVATED STEEL TANKS and STORAGE TANKS of all types for industrial, municipal and railway service; REFINERY CONDENSERS; OIL STILL.

Also, Standpipes, Smokestacks, Steel Pipe Lines, Coal Bins, Barges, Dredges, Coaling Stations, Wireless Towers, Steel Structures and General Plate Work.

Elevated Steel Tanks.

This company has made a specialty for many years of the manufacture of elevated steel tanks. It is the most satisfactory means of supplying water to a sprinkler system, and in connection with private or municipal water works, it furnishes a reliable, long lived, watertight structure of simple lines and pleasing appearance.



ELEVATED STEEL TANK, EAST YORK, PA. AMERICAN CHAIN CO. Capacity, 100,000 gals., height, 100 ft.



ERECTED AT THREE RIVERS, QUE. Capacity 50,000 gals., height, 149 ft. Capacity 120,000 gals., height, 100 ft.

Railway Locomotive Service.

Engineers who build for the future have adopted as their standard this permanent all-steel, fire-proof construction.

The peculiar requirements of the railway water tank are met by the large diameter mud drum and antifreeze design.

This company has special designs which are most satisfactory and economical.



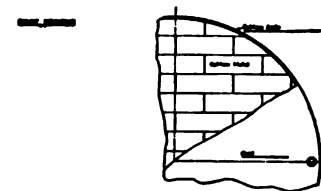
LIGONIER VALLEY RAILROAD COMPANY, LIGONIER, PA. 30,000 gals., 15 ft. to bottom

DIMENSIONS, STANDARD ELEVATED STEEL TANKS

Rated cap. U. S. gals.	Diam.	Dist.	Cylinder	Rated cap. U. S. gals.	Diam.	Dist.	Cylinder
10,000	11'	4'-0"	10'-11"	70,000	21'	7'-7"	21'-10"
15,000	13'	6'-0"	10'-11"	75,000	21'	8'-0"	22'-6"
20,000	15'	5'-5"	10'-9"	80,000	21'	8'-11"	24'-2"
25,000	15'	5'-4"	14'-7"	90,000	21'	8'-0"	28'-4"
30,000	15'	5'-3"	18'-5"	100,000	24'	8'-6"	22'-6"
35,000	17'	6'-4"	15'-7"	125,000	24'	8'-4"	30'-0"
40,000	17'	6'-8"	18'-5"	150,000	28'	10'-5"	24'-2"
45,000	19'	6'-5"	15'-11"	200,000	28'	10'-5"	35'-0"
50,000	19'	8'-0"	17'-7"	250,000	32'	13'-11"	33'-0"
60,000	19'	7'-3"	22'-6"	300,000	32'	15'-0"	40'-3"

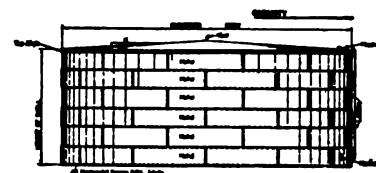
Refinery Equipment.

The company fabricates complete refinery equipment including stills, agitators and condensers.



Storage Tanks.

Steel storage tanks of any description are manufactured by this company. They may be used for storage of oil, acid, gasoline, water, molasses, grain, etc.



DETAIL OF STORAGE TANK

DIMENSIONS AND CAPACITIES, STANDARD STORAGE TANKS

No.	Capacity, bbls.	Capacity, gals.	Height	Diam.
12	10,000	428,000	25'	54'
13	10,000	423,000	30'	49'
14	15,000	640,000	25'	66'
15	15,000	635,000	30'	60'
16	20,000	848,000	25'	76'
17	20,000	841,000	30'	69'
18	25,000	1,050,000	30'	77'
19	30,000	1,273,000	30'	85'
20	35,000	1,492,000	30'	92'
21	37,500	1,590,000	30'	95'
22	40,000	1,692,000	30'	98'
23	45,000	1,906,000	30'	104'
24	50,000	2,132,000	30'	110'
25	55,000	2,330,000	30'	115'

Co-operative Service.

This company maintains an expert engineering and contracting staff. If the problems of design are complicated a wire or letter to the nearest office will bring a competent man before you without expense or obligation.

Upon receipt of inquiry, the engineering department will gladly prepare plans and prepare estimates and submit quotations with no obligation on the part of the prospective purchaser.

It is recommended that specifications of tanks be given in accordance with standard dimensions.

Write the nearest sales office for catalogue.

RIVERSIDE BOILER WORKS, INC.

Manufacturers of Steel Tanks

CAMBRIDGE, MASS.

PACIFIC COAST OFFICE, 461 Market Street, SAN FRANCISCO, CAL.

NEW YORK OFFICE, 48 East 41st Street

Products.

BLACK and GALVANIZED STEEL TANKS.

RECTANGULAR TANKS of different sizes for water, oil and other storage.

Also manufacturers of Air and Gasoline Tanks; Ship, Expansion and Pressure Tanks; Range Boilers; Welded Headers.

Special Riveted and Brazed Construction.

The strongest, tightest and safest tank construction today is the "Riverside" riveted and brazed construction. The riveted and brazed seam is a specialty with this company and is used on all possible work.

Tanks.

The tanks listed can be made up from sheets regularly carried in stock. Tappings placed in any location desired.

Manholes and handholes are extra and furnished on request. Net prices f. o. b. Boston will be quoted promptly.

Sizes range from 5 to 2260 gals. capacity, with diameters ranging from 6 to 48 in., inclusive, suitable for all purposes where working pressures do not exceed 300 lbs. per sq. in.

Rectangular or odd shaped tanks, riveted or welded, black or galvanized, from $\frac{1}{8}$ to $\frac{1}{4}$ in. thickness, inclusive, are made to order.

Galvanizing.

Tanks are galvanized inside and out by the hot-dip process.

Heads.

Regularly furnished with one convex and one concave. Welded tanks can be made up with both heads convex or concave, if desired.

Estimates.

Over 32 years' experience of the company is of value. State the problem and the tank will be designed and quotations submitted promptly.

On receipt of inquiry, quotations on square and rectangular storage tanks, or any tanks of special dimensions, will be furnished.

Table.

The table is to be used in specifying "Riverside" steel tanks, and represents the best tank practice for purposes stated.

First figures shown are inside diameters; second figures show lengths on shell.

Facilities.

A well equipped and up-to-date plant guarantees the prompt construction of steel tank work of riveted, riveted and brazed, and welded construction, the oxy-acetylene method being employed.

STORAGE TANKS FOR HOT WATER, FUEL OIL, GASOLINE, ETC.

AIR TANKS

GALVANIZED ONLY, WITH RIVETED AND BRAZED SEAMS				BLACK OR GALVANIZED, WITH ALL WELDED SEAMS		
Capacity, gals.	Dimensions, in.	Gauge shell		Gauge shell		List price
		75 lbs. working pressure	100 lbs. working pressure	125 lbs. or less working pressure	126 lbs. up to 200 lbs. working pressure	
5	9x16	14	12	11	11	\$6.00
6	10x16	14	12	11	11	6.50
7	10x20	14	12	11	11	7.00
8	12x16	14	12	11	11	7.50
9	12x18	14	12	11	11	8.00
10	12x20	14	12	11	11	8.25
11	12x22	14	12	11	11	8.50
12	12x24	14	12	11	11	8.75
15	12x30	14	12	11	11	9.00
18	12x36	14	12	11	11	9.50
20	14x30	14	12	11	11	12.50
21	12x42	14	12	11	11	15.50
24	12x48	14	12	11	11	15.75
27	12x54	14	12	11	11	18.50
28	14x42	14	12	11	11	20.25
30	12x60	14	11	11	7	19.00
32	14x48	14	12	11	11	21.00
36	14x54	14	12	11	11	21.50
40	14x60	14	11	11	7	24.00
42	16x48	13	12	11	11	26.00
47	16x54	13	12	11	11	30.00
52	16x60	12	11	7	7	31.00
53	18x48	12	11	7	7	31.50
66	18x60	12	11	7	7	38.00
82	20x60	12	11	7	7	45.50
100	22x60	12	11	7	7	63.50
120	24x60	12	11	7	7	72.50
144	24x72	11	10	7	7	103.00
168	24x84	11	10	7	7	120.00
192	24x96	11	10	7	7	132.00
235	24x120	7	7	7	7	152.00

BLACK OR GALVANIZED				BLACK OR GALVANIZED		
Capacity, gals.	Dimensions, in.	Gauge shell	Approximate weight, lbs.	Gauge shell	Approximate weight, lbs., 100 lbs. working pressure, only	List price
86	30x30	7	300	7	300	\$58.00
105	30x36	7	365	7	365	64.00
139	30x48	7	430	7	430	76.00
175	30x60	7	495	7	495	85.00
209	30x72	7	558	7	558	94.00
245	30x84	7	640	7	640	102.00
281	30x96	7	690	7	690	104.00
314	30x108	7	770	7	770	108.00
347	30x120	7	819	7	819	116.00
383	30x132	7	910	7	910	127.00
418	30x144	7	933	7	933	130.00

BLACK ONLY, ALL SEAMS RIVETED*				BLACK ONLY, ALL SEAMS WELDED		
Capacity, gals.	Dimensions, in.	Gauge shell	Approximate weight, lbs.	Gauge shell	Approximate weight, lbs., 100 lbs. working pressure, only	List price
300	36x 72	7	699	7	699	\$112.00
399	36x 96	7	872	7	872	126.00
499	36x120	7	1018	7	1018	142.00
599	36x144	3	1264	3	1264	156.00
699	36x168	3	1330	3	1330	175.00
547	42x 96	3	1375	3	1375	170.00
684	42x120	3	1818	3	1818	178.00
822	42x144	3	1960	3	1960	196.00
950	42x168	3	2200	3	2200	218.00
1093	42x192	3	2480	3	2480	236.00
950	48x120	3	2060	3	2060	240.00
1074	48x144	3	2320	3	2320	250.00
1235	48x168	3	2610	3	2610	274.00
1425	48x192	3	2900	3	2900	304.00
1615	48x216	3	3600	3	3600	352.00
1786	48x288	3	3950	3	3950	393.00
2147	48x288	3	4650	3	4650	438.00

*Double riveted longitudinal seams and single riveted girth seams.

ESTABLISHED 1867

INCORPORATED 1908

JOHN WOOD MANUFACTURING COMPANY

Manufacturers of Range Boilers and Welded Specialties

CONSHOHOCKEN, PA.

BRANCH OFFICES

NEW YORK, N. Y., Bush Terminal Building, No. 5
BOSTON, MASS., 78 West Second Street
CLEVELAND, OHIO, 1841 Carter RoadPHILADELPHIA, PA., 1223 Hamilton Street
CHICAGO, ILL., 320 East North Water Street
LOS ANGELES, CAL., 304-306 Crocker Street

SAN FRANCISCO, CAL., 268 Market Street

FOREIGN REPRESENTATIVES

CANADIAN JOHN WOOD MANUFACTURING COMPANY, LIMITED
TORONTO, ONT., CANADA**Products.**RANGE BOILERS.
PNEUMATIC TANKS.
AIR COMPRESSOR TANKS.
RAILWAY FORGE TANKS.
CONTAINERS FOR LIQUIDS.
ICE CREAM CANS.Also manufacturers of Water Tanks
and Tanks of all kinds for all purposes.*Electric Weld*TRADE-MARK
(Registered)

boilers are stenciled with working pressures. Each boiler is tested to double its working capacity.

Tanks—Pneumatic, etc.

Air pressure tanks for air compressors, hydropneumatic systems and similar service are specialties with this company. They are built from 50 lbs. working pressure to 500 lbs. working pressure.

Advantages of "Electric Weld" Construction.

All products of this company have electric welded longitudinal joints, recognized as the best possible insurance against leaks. Electric welding of the longitudinal joint is the only means by which air tanks can be constructed and guaranteed to be absolutely tight without galvanizing or soldering. A riveted joint must be soldered or galvanized, if it is to be tight even under moderate pressure.

The head and bottom joints are made by expanding the shells by heating, and then shrinking the heads into position. The head and bottom seams are then securely brazed with first quality brazing solder. This is the only construction that makes possible an absolute metal-to-metal joint in the end seams. All tanks made by this firm are tested before shipment and must prove absolutely airtight under pressure that would be impossible for riveted construction to resist.

Range Boilers.

Range boilers can be furnished from stock, without delay, in all sizes up to and including 192-U.S. gal. capacity. Double extra heavy range boilers are made of special analysis steel. All

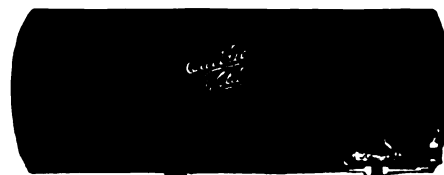


RANGE BOILER



RAILWAY FORGE TANK

Size and location of pipe connections according to requirements. Finished plain, galvanized or painted black.



AIR TANK

Containers.

Steel shipping containers are constructed for domestic and international service in shipping any kind of liquids. They are made with or without removable lids, and have given entire satisfaction where other containers have proved unreliable or too expensive.

The demand for welded containers is increasing daily. This firm is particularly well equipped to meet any requirements in this line.



CONTAINERS

Ice Cream Cans.

Electric Weld rivetless-solderless ice cream cans in 6-, 8-, 20- (high or low), 30-, and 40-qt. capacities in lots of 1 to 20,000. Cans protected by patents pending. Built for long usage at low maintenance cost, owing to adaptability to retinning.

Capacity.

The plant of the JOHN WOOD MANUFACTURING COMPANY produces, daily, 2000 range boilers in addition to large quantities of storage tanks, gasoline tanks and similar products.

Service.

The Service Department will gladly co-operate with prospective purchasers' drawings, and offer suggestions on any welded project or device.

DAHLQUIST MFG. COMPANY

Manufacturers of Copper Tanks and Boilers, Expansion Joints
Coppersmiths and Metal Workers

TELEPHONE:
SOUTH BOSTON 2160

30-40 West Third Street
SOUTH BOSTON, MASS.

FACTORY, 11-19 Bolton Street

Products.

COPPER TANKS for hot water or pressure; EXPANSION JOINTS; STEAM JACKET KETTLES.

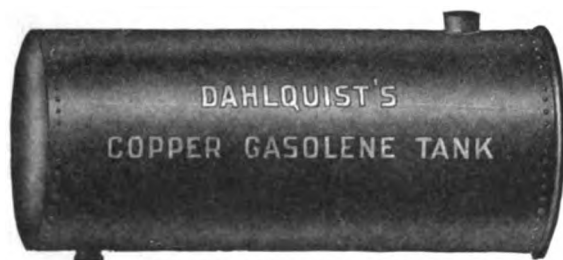
Also manufacturers of Iron Boiler Stands, Candy Kettles, Dyers' Kettles, Extractors' Tanks, Steam Coils, Steam Pipes, Steamboat Work, Vacuum Pans, Barbers' Boilers, Copper Floats and Hammered Copper Products.

Plant and Equipment.

The company's plant at South Boston is equipped with modern machinery and appliances enabling them to produce the finest copper tank and boiler workmanship at greatly reduced cost of manufacture. The plant is so situated as to make quick steamboat and railroad deliveries.

Copper Industrial Tanks.

Built for hot water or pressure service. They give long and reliable use in many industries. The corrosive action of hot water is minimized so thoroughly by the use of copper tanks or boilers that many manufacturers using hot water in the various processes of making their products are adopting copper for this kind of work exclusively. They realize that in view of the frequent replacements necessary in the case of iron, that the copper is cheaper in the long run.



HEAVY PRESSURE TANK

The heavy pressure Dahlquist tanks are designed in capacities up to 3000 gals., and tested up to 400 lbs. pressure. Furnished with or without coils.

The direct pressure tanks are made in varying capacities from 5 to 500 gals. and for from 150 to 300 lbs. pressure. All tanks are furnished with common size couplings free of charge. Handholes in tanks above 80 gals. capacity.

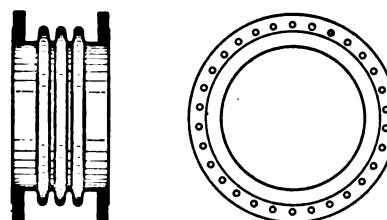
The material and workmanship in the company's pressure tanks are rigidly inspected and the best possible results are guaranteed. In ordering, state whether coil is needed or not.

Corrugated Copper Expansion Joints.

The Dahlquist expansion joints are made of finest quality lake copper. The deep corrugations afford the

elasticity and strength necessary to withstand constant changes due to fluctuating pressures.

The joints are made in 1, 2 and 3 corrugations. They are simple in construction, built for durability, and are safe, compact and efficient.



CORRUGATED COPPER EXPANSION JOINT

Dahlquist corrugated copper expansion joints can be made in any size required, or to meet engineer's specifications.

When ordering, state size of pipe, working pressure, amount of expansion required, and whether pipe conveys air, steam, water or gas.

Copper Steam Jacket Kettles.

Dahlquist copper kettles are made with extra heavy copper bottoms. They are not loaded with unnecessary rims or handles. They range in capacities from 3 to 200 gals.; in diameter from 13 to 45 in.; and in depth from 8 to 39 in.

They are banded and set on four sturdy wrought iron legs.

They are strong, easily cleaned and durable, and serve an innumerable amount of applications in the industrial field.

Prices on application.



COPPER STEAM JACKET KETTLE

Co-operative Service.

Consult our engineering experts about coppersmith problems. Send for the Dahlquist catalogue.

W. E. CALDWELL CO., INC.

Manufacturers of Tanks and Tank Towers

2240 Brook Street
LOUISVILLE, KY.

Products.

WOOD, STEEL and GALVANIZED IRON TANKS; TANK FOUNDATIONS; TUBULAR, ANGLE or CHANNEL COLUMN and WOOD TOWERS; FRICTION CLUTCHES and PULLEYS.

Also manufacturers of Steel Stacks, Standpipes, Tank Agitators; Water Supply Systems; Gearing and General Power Transmission Machinery.

Industrial Tanks.

Tanks for industrial and special purposes, in wood or steel—round, rectangular, elliptical, or any shape.

Wood—This company specializes in cypress, as it is the best wood for tanks for most purposes. It has great durability, minimum shrinking and swelling and does not give taste or color to drinking water.

Fir, yellow pine, white pine, white cedar and poplar are also used.

SPECIFICATIONS—Lumber is thoroughly dried, without loose or unsound knots, splits, shake, peck or wormholes or other defects. All heart on inside, sound sap on outside only, not to exceed one-half the thickness.

Thickness: 2 in. for 10,000 gals. and smaller; 2½ in. up to 20,000 gals.; 3 in. for larger sizes. Finished thicknesses are 1¾, 2¼ and 2¾ in., respectively.

Standard Inside Diameter: Every 6 in. from 3 ft. to 9 ft., every foot to 16 ft., and every 2 ft. above 16 ft.

Standard Inside Depth: 1 ft. 5 in.; 2 ft.; 2 ft. 5 in.; 3 ft.; 3 ft. 5 in.; 4 ft.; 4 ft. 5 in.; 5 ft.; 5 ft. 5 in.; 6 ft.; 6 ft. 5 in.; 7 ft. 5 in.; 9 ft. 5 in.; 11 ft. 5 in.; 13 ft. 5 in.; 15 ft. 4 in.; 17 ft. 4 in.; 19 ft. 4 in.; 21 ft. 4 in.; 23 ft. 4 in.

Workmanship: Staves dressed both sides. Edges machine jointed to proper bevel. Bottom dressed on top side only. Machine jointed straight and square and well doweled.

DIMENSIONS AND CAPACITIES OF STANDARD TOWER TANKS

Class towers*	Capacity, gals.	STANDARD WOOD TANKS		STANDARD STEEL OR GALVANIZED TANKS	
		Diameter ft.	Depth in.	Diameter ft.	Depth in.
O tubular.....	1,000	6	6	6	5
or CC angle.....	1,500	6	6	6	6
A tubular.....	2,800	8	0	7	5
or FF angle.....	3,000	8	0	8	0
B tubular.....	5,000	10	0	9	5
or HH angle.....	6,000	10	0	11	5
C tubular.....	10,000	12	6	11	5
or JJ angle.....	12,000	12	6	13	5
D tubular.....	15,000	14	0	13	5
or KK angle or LD latticed.	17,000	14	0	15	5
E tubular.....	20,000	16	0	13	5
or LL angle or LD latticed.	22,000	16	0	15	5
ES tubular or LES latticed.	25,000	16	0	17	4
F tubular.....	30,000	18	0	15	4
or LF latticed.....	33,000	18	0	17	4
FS tubular or LFS latticed.	35,000	18	0	19	4
G tubular.....	36,000	19	6	17	4
or LG latticed.....	40,000	19	6	20	0
LH latticed.....	50,000	22	0	17	4
	55,000	22	0	22	0

*Hemispherical bottom steel tanks and towers are regularly made in capacities from 10,000 gals. up. Any of the above towers can be made to suit special conditions.

SWEET'S CATALOGUE

THE TANK WITH
A REPUTATION
Caldwell
TANKS
AND
TOWERS
TRADE-MARK



WOOD TANKS

Hoops: Round hoops of wrought iron (not steel) with malleable iron draw lugs; sizes and spacing to give a safety factor of 4 to 1.

Steel—Thin galvanized tanks are recommended only in small sizes and for intermittent or temporary use.

Heavy steel tanks made in any shape or size.

SPECIFICATIONS—The standard diameters and depths are in even feet. The standard thicknesses are ¼ in. up to and including 10 ft.; ⅝ in. up to 16 ft.; ¾ in. up to 24 ft., and ⅞ in. above 24 ft.

These can be furnished set up, in the smaller sizes, or knocked down, all punched, fitted and bent to shape with the necessary rivets.

Tank Foundations.

Plans for foundations on the ground will be furnished. Designs of, and prices on, foundations for special conditions will be submitted on receipt of a sketch with the necessary rivets.

Tank Towers.

Tubular Column—Classes O to G built with tubular steel columns and struts, in heights of 15 ft. and every 12-ft. interval above to 100 ft.

Angle Column—Classes CC to LL built with steel angles for columns and struts, in heights of 12 ft. and every 10-ft. interval above to 102 ft.

Latticed Column—Classes LD to LH built with latticed steel channel columns and struts (bridge construction), in heights of 20 ft. and every 5 ft. above to any height.

Note: Above types of towers are for flat bottom tanks (see table) and are furnished with either a steel or wood foundation for the tank at the top.

Hemispherical All-steel Tanks and Towers—Made with latticed columns and struts in all capacities and heights.

Caldwell Friction Clutch.

The basic principle of this clutch is identical with that of the standard automobile service brake; a flexible band lined with Rabestos and tightened with a single lever. There are only eleven parts. One screw adjusts it, shortening or lengthening the band which gives equal pressure everywhere around the friction ring.



TANK AND TOWER,
STUDEBAKER BROS.
MFG. CO.,
SOUTH BEND, IND.
150,000 gals., 206 ft. high



CALDWELL
FRICTION CLUTCH
PULLEY

ESTABLISHED 1870

CHALLENGE COMPANY176 River Street
BATAVIA, ILL.

BRANCHES

KANSAS CITY, MO.

OMAHA, NEBR.

MINNEAPOLIS, MINN.

DALLAS, TEX.

Products.

WOOD TANKS: Round, Half Round, Rectangular and Oval of any capacity.

SPECIAL TANKS and VATS for any purpose supplied on specifications.

STEEL TANK TOWERS for elevating tanks any height.

Also manufacturers of Gasoline and Kerosene Engines; Windmills of all sizes for pumping purposes; Pumps. Hand and Power.

Wood Tanks.

Challenge tanks have been manufactured by us for the past 50 years and we have learned by actual experience how to serve the trade with the best that can be produced in the line of tanks, vats, etc. They are made of thoroughly seasoned clear Oregon fir, Louisiana red gulf cypress or redwood by men especially trained in tank building with modern tank-making machinery.



WOOD TANK

round, half oval or flat iron hoops, provided with lugs for tightening.

Specifications solicited, and we will be pleased to submit prices, etc.



RAILROAD WATER STATION

Railroad Water Stations.

We are in a position to furnish complete outfits consisting of tank of any size, tower and fixtures, f. o. b. cars at our factory or erected complete at any point in the United States or Canada. Send the specifications.

Sprinkler Tanks and Towers.

Sprinkler tanks and towers are used in connection with automatic sprinkler systems for fire protection. The increasing demand for these outfits has made it necessary for the factory mutual insurance companies, fire underwriters and stock companies to demand a tank built to suit the requirements, especially for safety.

Any size manufactured, according to insurance requirements, of cypress, fir or redwood, and provided with round iron hoops and lugs of proper sizes.

Towers can be furnished any height upon which these tanks can be placed and prices will be quoted on complete outfit delivered and erected.



SPRINKLER TANK AND TOWER

Wood Vats.

The accompanying illustration shows a plain rectangular tank such as we build hundreds of every year. Any size or style manufactured to specifications. All details of their construction, selection of material, etc., are in the hands of expert tank makers that have had years of experience. The ends are crozed into the sides and thoroughly rodded in every direction to prevent warping, splitting or leaking.



WOOD VAT

ESTABLISHED 1865

A. J. CORCORAN, INC.

Manufacturers of Tanks, Towers, Pumps and Windmills

OFFICE

766 Jersey Avenue

JERSEY CITY, N. J.

WORKS: JERSEY CITY, N. J., Jersey Avenue and 13th Street—Telephone, Montgomery 238

Products.

Manufacturers of "CORCORAN" TANKS which include: Ink and Blacking Tanks; Tanks for Acids and Chemicals; Rectangular and Oval Tanks; Frostproof Tanks; Sprinkler Tanks; Developing Tanks; Dye Tubs; Vats; Tumbling Barrels; Drums; Tanks for Special Purposes.

Also, machinery made and fitted in tanks, including Manhole and Handhole Frames and Covers to order.

Agitators for Wooden Tanks; Windmills; Towers; Pumps.

Experience and Prestige.

Over fifty years of practical experience in the manufacture and erection of tanks and windmills have made this house an authority on the essentials that tanks and windmills should possess for general utility.

Acid Tanks.

A. J. CORCORAN, INC., were pioneers in constructing acid tanks and are among the leaders in this important industry. Tanks of this kind are made of extra heavy

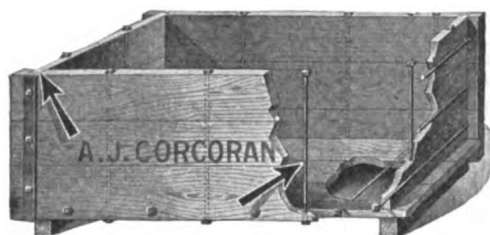
6-, 8- and 10-in. yellow pine, dressed so as to resist the corrosive influences of acids and other chemicals. They have replaced lead lined tanks, because they last longer and cost less.

The Corcoran factory is equipped for making all types of acid tanks, and special tools and fittings have been installed for making rectangular acid tanks in the best manner and by the most improved methods.

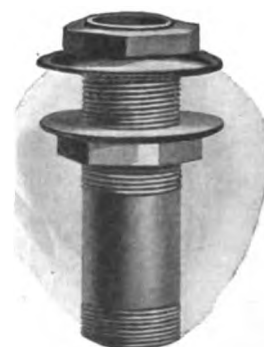
Advantages.

All Corcoran tanks are warranted to be absolutely watertight; and while the initial cost may be slightly higher than numerous unknown tanks, they are always cheaper in the end.

Corcoran tanks are indorsed by the New York Building and Fire Departments, Fire Insurance Exchange and the Associated Factory Mutual Fire Insurance Companies.

GRAVITY OR SPRINKLER
TANK FOR FACTORIES

ACID OR CHEMICAL TANK

CORCORAN
STANDARD
TANK
GAUGETANK FOR VIL-
LAGE WATER
WORKSCORCORAN FROST-
PROOF TANKCORCORAN WATER TOWER
FOR COUNTRY ESTATEFOR CONNECTING
PIPES TO TANK

HAUSER-STANDER TANK CO.

CINCINNATI, OHIO

Products.

HAUSER-STANDER WOOD TANKS, VATS, TUBS and DRUMS.

Quality of Products.

For 50 years, the HAUSER-STANDER TANK CO. has been building wooden tanks for all purposes, its products being used in all parts of the world. During this period we have developed and improved our construction and offer wooden tanks perfect in every detail. All lumber is thoroughly air seasoned, and each tank is made mechanically correct.

Slogan.

We Win With Quality.

Liberal Guarantee.

Hauser-Stander products are guaranteed as specified. If products do not meet with every claim made, they can be returned at our expense and we will promptly replace or refund money, together with freight charges that may have been paid by the purchaser.



40,000-GAL. LOUISIANA RED CYPRESS TANK

Water Supply and Sprinkler Tanks.

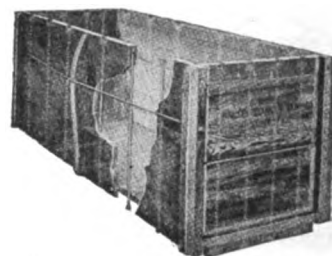
Made of best grades of Louisiana red cypress (the wood eternal) or Oregon fir, in accordance with the specifications of the National Board of Fire Underwriters. Also water tanks for private systems. Furnished with frostproof conical or flat roofs and with outside iron or inside wood ladders, hatch covers, etc.



PLANT OF HAUSER-STANDER TANK CO.

Rectangular Tanks.

Rectangular tanks of any size, plain or lead lined for chemical, acid and film manufacturers, dye and color works, photographers, electrotypers, galvanizers, textile mills, etchers, foundries, etc. Built of genuine Louisiana red cypress, long leaf yellow pine, or Oregon fir. They will not bulge or warp.



RECTANGULAR TANK

Round Tanks.

Made in any size from 100 to 100,000 gals. capacity, of genuine Louisiana red gulf cypress, yellow poplar, Southern long leaf yellow pine, quartered or plain white oak, Northern white pine, and Oregon fir.



ROUND TANK

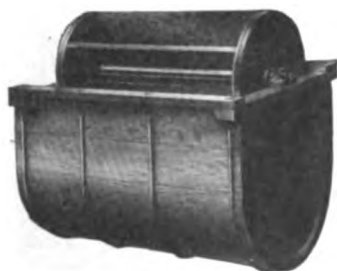
Double Headed Tanks.

Double headed tanks, with or without taper, with or without bilge, will be built according to purchaser's specifications.

Special Tanks Built to Purchaser's Specification.

We make all tanks for customer's special requirements. No stock goods carried.

If in doubt, submit tank problems to our tank experts for satisfactory solution.



TANNERS VAT WITH PADDLE WHEEL



SINGLE HEADED AGITATOR TANK



PRESSURE TANK

ORGANIZED 1867

INCORPORATED 1889

KALAMAZOO TANK & SILO CO.

KALAMAZOO, MICH.

Products.

WOOD TANKS for all purposes, including Storage Tanks, Railroad Tanks, Manufacturing Tanks, Paper and Pulp Mill Tanks, Blow Pits, etc.; STEEL TOWERS; TANNERS' DRUMS, VAT TRUCKS.

Also manufacturers of Special Tanks, Wood Vats, Agitators, Vinegar Generators, Frostproofing for Pipes.

Services.

This company maintains a staff of engineers whose experiences in the manufacture of tanks and tank structures cover a period of many years. They have acquired valuable information for the solution of all tank problems, which they will gladly furnish to prospective buyers.

Kalamazoo Wood Tanks.

For 50 years the KALAMAZOO TANK & SILO CO. have manufactured wood tanks of the best grade of lumber and workmanship. Their plant is equipped with the latest machinery for the manufacture of wood tanks.

Round Wood Tanks—Tank staves accurately sawed and jointed on true and radial lines, with proper regard for diameter of tank. The crozing at bottom of stave is cut circular with proper regard to stave when set in position and assures same to be completely filled by tank bottom when staves are driven up. Outside surfaces of staves finished convex, giving full bearing to hoop over entire face of stave. Tanks furnished with correct number of round steel hoops and malleable iron lugs for tightening.

Size of tank determines hoopage, and factor of safety allowed to make ample allowance for pressure of water, and swelling of staves.

Rectangular Wood Tanks—Carefully machined and jointed in workmanlike manner. Built in any size required, with or without partitions, false bottoms, etc. The vertical rodding runs through the lumber and tops of rods are countersunk and covered with rounded piece of maple wood, giving smooth and finished top. Shipped knocked down, all pieces match marked for easy assembly, or shipped set up if convenient or required.

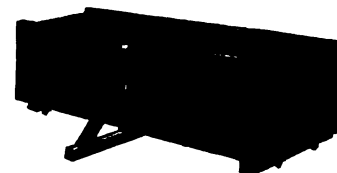
Gravity Wood Tanks—Furnished with or without steel towers and are suitable for supply or sprinkler systems. They can be furnished complete with pitched or flat roof, ladders, indicator and float. Built to requirements of National Board of Fire Underwriters and local authorities.



ROUND WOOD TANK

ELEVATED STORAGE
RAILROAD TANKGRAVITY TANK
Finial ornament omitted

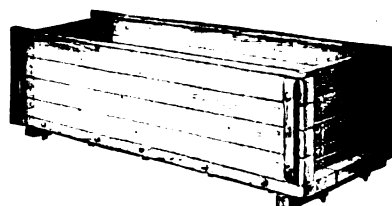
VAT TRUCK



TANK WITH OUTSIDE BRACE



TANKS AND TOWER

HALF ROUND TANK
Open top with brace

RECTANGULAR TANK

TANNERS' DRUM
DRIVEN WITH CHAIN
AND SPROCKETELLIPTICAL
TANK
All sizes

NEW ENGLAND TANK & TOWER CO.

EVERETT, MASS.

(Boston Postal District)

Products.

WOOD TANKS; STEEL TOWERS; AGITATOR DRIVES, with or without stirrers.

Also, Wood Vats, Dye Tubs, special Tanks for any purpose, and special Mixing Machines.



TRADE-MARK

Pressure Tanks.

Wood pressure tanks are designed and tested for 50 lbs. pressure per sq. in.



PRESSURE TANKS

Round Tanks.

Round tanks up to 100,000 gals. capacity, built of 1½-, 2-, 3- or 4-in. stock.

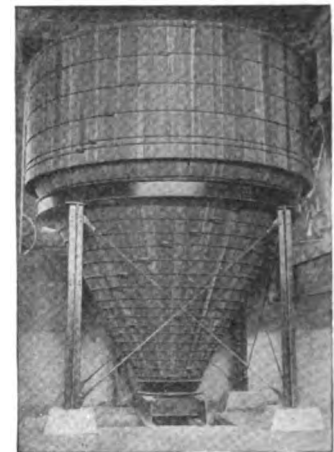
Cypress, redwood, Douglas fir, white pine, yellow pine or oak can be furnished.



ROUND TANK

Settling Tanks.

Cone bottom settling tanks, used by paper and board mills, can be furnished in capacities from 1000 to 35,000 gals., with either wood or steel supports.

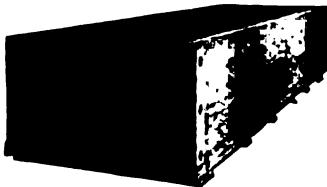


SETTLING TANK

Rectangular Tanks.

Rectangular tanks are built in desired sizes of 1½- to 4-in. stock.

Rectangular compartment tanks are furnished with dovetailed grooving on inside to provide anchorage for lining with cement.



RECTANGULAR TANK



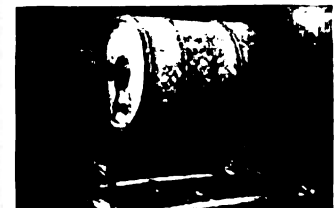
COMPARTMENT TANK

Pickling Tanks.

Pickling tanks are designed especially for handling wire in coils.



PICKLING TANKS



SPECIAL MIXING TANK WITH STEEL SPIRAL STIRRERS

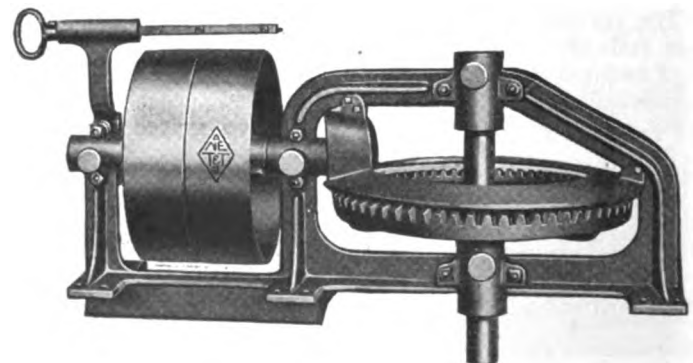
Tanks and Towers.

Sprinkler tanks and steel towers are furnished and installed to meet insurance requirements.

Tanks can be furnished of cypress, redwood, yellow pine or Douglas fir.



SPRINKLER TANKS AND STEEL TOWERS



BALL THRUST AGITATOR DRIVE
DIMENSIONS

Size no.	Pinion shaft, in.	Gear shaft, in.	Gear, in.		Pinion, in.		Tight and loose pulleys, in.	Length over all, ft.
			P. diam.	Face	P. diam.	Face		
0	1 1/4	1 1/4	8	1 1/4	2	1 1/4	8x3	1 11
1	1 1/2	1 1/2	13.37	2	3.34	2	12x4	2 9
1 1/2	1 3/4	1 3/4	16	2 1/2	4	2 1/2	12x4	3 2
2	2	2	23.87	3	5.97	3	18x5	4 2

THE A. T. STEARNS LUMBER COMPANY

Manufacturers of Wood Tanks

NEPONSET
BOSTON, MASS.

BRANCH OFFICE, 77 Summer Street, BOSTON, MASS.

SALES OFFICE, 1 Sudbury Street, BOSTON, MASS.

Products.

WOOD TANKS of all types and sizes for all purposes, including Sprinkler, Box, Vacuum, Mixing, Settling, Plating, Pickling and Pressure Tanks; Tumbling Barrels; Dye Tubs; Acid Towers and Tank Agitators.

Experience and Facilities.

THE A. T. STEARNS LUMBER COMPANY has been engaged in the manufacture of wood tanks for many years and has gained a reputation for careful design, high grade material and skilled workmanship.

Cypress is this company's specialty for tanks, because its natural element makes it especially adaptable for this purpose. Southern pine is used for special conditions.

This company controls cypress swamps and sawmills where lumber for tanks is cut into proper thicknesses and sizes, and as many millions of feet of season-



TRADE-MARK

ing cypress is carried in stock, shipments can be promptly made.

Co-operative Service.

The engineers of this company will give prospective purchasers the benefit of their knowledge and experience in connection with the design and construction of tanks, and will assist them in planning the best type of tank for any particular condition.

When making inquiries or requests for quotations, the following information should be given:

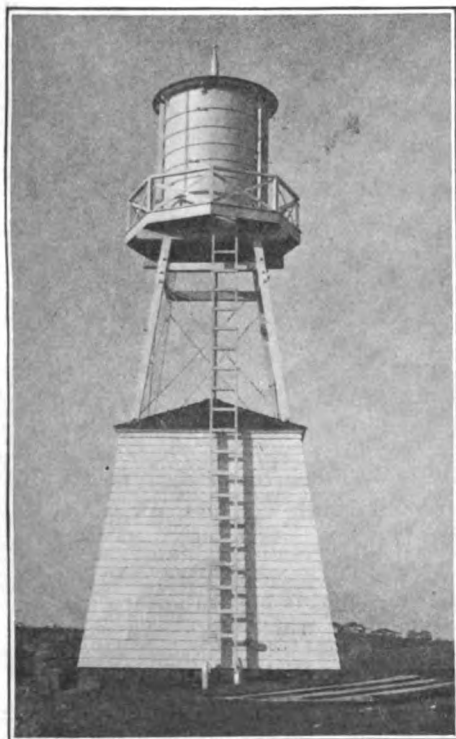
Give capacity of tank in gallons. State the service for which tank is intended; whether tank is to be open or closed. Height of tower from foundation to lowest point of bottom of tank. Whether tank is to be built in accordance with underwriters' or other official specifications. Whether tank is to be erected on ground, concrete foundation, tower, etc. What fittings this company is to furnish. Number and size of openings. Specify geographical location where tank is to be built.



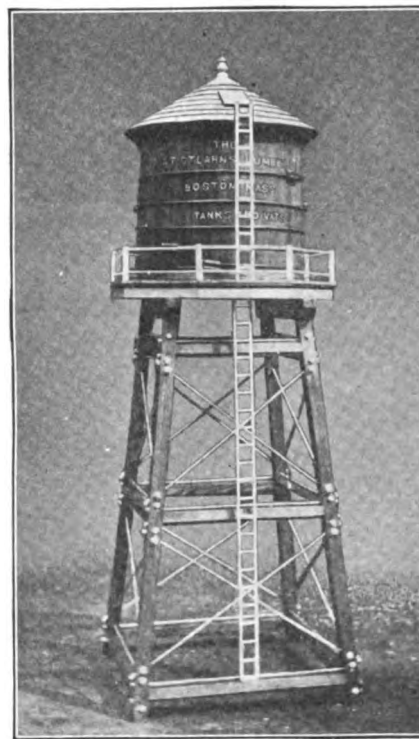
SMALL ROUND TANK



TUMBLING BARREL



TANK AND TOWER



CYPRESS TANK

U. S. WIND ENGINE & PUMP CO.

Engineers, Contractors, Manufacturers

23 Water Street
BATAVIA, ILL.

Products.

A complete line of WOOD TANKS for all purposes; STEEL TANK STRUCTURES for Wood and Steel Tanks; SWITCH STANDS and SEMAPHORES; WINDMILLS.

COMPLETE LOCOMOTIVE WATERING PLANTS, including TELESCOPIC WATER COLUMNS and all other necessary devices, are furnished and will also be installed.

Also Hand Pumps, Well Cylinders, Check Valves, Strainers and other Well Accessories.

Water Works and Other Products.

Water works installed complete, for all purposes.

Water works are adapted for efficient service that will meet all requirements of towns, factories, railroads, public and private institutions, residences, etc. The following are several productions, built for various lines of duty:

Wood Tanks—For any purpose. Quotations given on any kind of material, size or shape, according to specifications.

Steel Tank Structures—For elevating tanks. Made and shipped in any combination either f. o. b. cars or erected complete.

Tank Hoops—Round, flat, half round.

Windmills—Steel and wood, for pumping water. All sizes for different duties.

Hand Pumps—50 different kinds, for all requirements.

Curtis Pumps—Double acting, brass lined, for shallow wells.

Railroad Water Stations—These include outlet fixtures, water columns and pumping machinery, all made and shipped f. o. b. cars, or erected complete.

The railroad water columns are made adjustable, or with rigid spout. The outlet fixtures and valves are made in all styles, for wood or steel tanks.

The pumping machinery consists of a full line of well supplies and equipment for every condition.

Switch Stands and Semaphores—Built for hard service. The strongest on the market.

Three-inch Storage Tank.

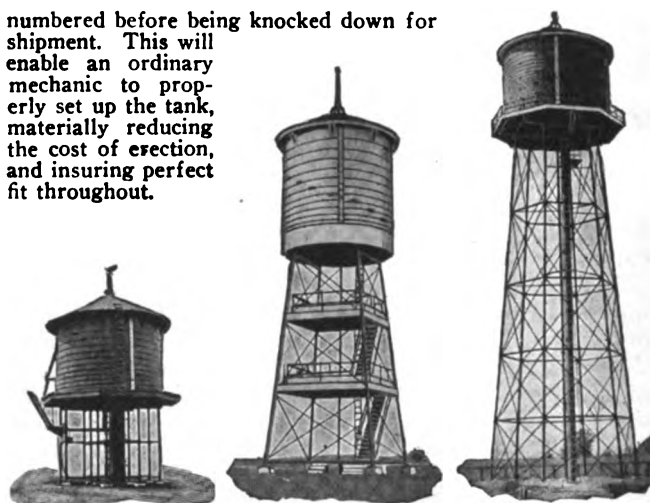
Specifications—All staves to be full length without splicing. Every joint to be machinemade and perfect, and stave joints to be sawed on true radial lines with due regard to top and bottom diameter of tank.

The crozing at bottom of staves to be cut with proper regard to pitch of stave when in position, and circular in shape, so as to be completely filled by tank bottom when staves are well driven up.

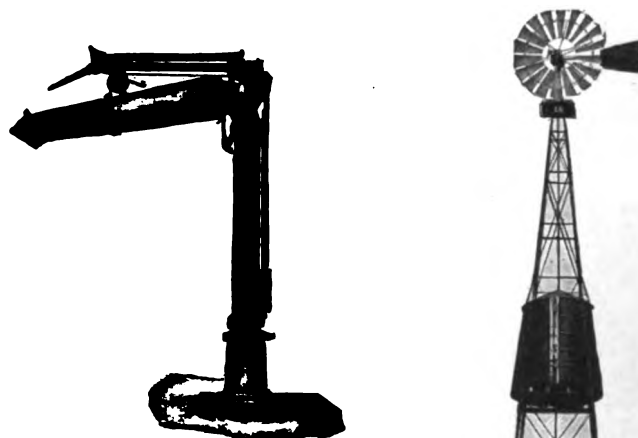
Outside of staves to be surfaced convex, so as to give full bearing to hoop throughout the width of each stave. The tank to be provided with proper number of hoops with draw lugs for tightening.

Installation Data—If desired the tank will be set up at factory, and the bottom and corresponding stave marked and

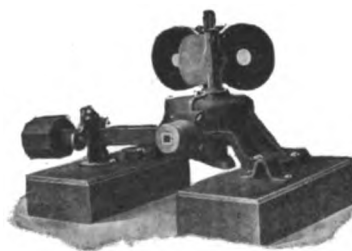
numbered before being knocked down for shipment. This will enable an ordinary mechanic to properly set up the tank, materially reducing the cost of erection, and insuring perfect fit throughout.



TYPICAL TANKS AND STRUCTURES



TELESCOPIC WATER COLUMN



SWITCH STAND



WINDMILL
AND TANK
COMBINATION

Special Designs.

Special designs of apparatus are manufactured to meet all demands of water works service.

Estimates and Co-operative Service.

Upon receipt of full information as to needs and conditions of water service to be installed, free advice and estimates will be furnished.

THE AMERICAN PULLEY COMPANY

MAIN OFFICE AND WORKS
4200 Wissahickon Avenue
PHILADELPHIA, PA.

BRANCH OFFICES

NEW YORK, N. Y., 33-35 Greene Street
SEATTLE, WASH., 536 First Avenue, S.
BOSTON, MASS., 165 Pearl Street

CHICAGO, ILL., 114-116 South Clinton Street
SAN FRANCISCO, CAL., 14 Natoma Street
LOS ANGELES, CAL., Sunset Terminal Warehouse

National distribution through supply houses from parent stocks in larger cities

Products.

Manufacturers of AMERICAN STEEL SPLIT PULLEY; AMERICAN STEEL SPLIT PULLEY with CORK INSERTS.

Also manufacturers of American Pressed Metal Sash Pulleys; Reels, Spools, Beams, Stampings, and Pressed Metal Shapes.

Special Features of Belt Pulleys.

- (1) Simplicity of design and construction.
- (2) Ease of installation on shafting.
- (3) No key seating or setscrews.
- (4) Well balanced and run true.
- (5) Stand greater strains than pulleys having much more weight.
- (6) Transmit maximum power with minimum belt slip.
- (7) Minimum air resistance effects enormous saving in power.
- (8) Recommended for rim speeds up to 6000 ft. per minute.



TRADE-MARK

(9) They are 40% to 60% lighter than cast iron pulley designed for equal service.

(10) Guaranteed for double belt duty under any conditions not demanding a special pulley.

Construction.

Rim made from two or more channel sections. Mounted side by side forming in-turned rim flanges which stiffen rim at center where it is subjected to greatest strain from belt pull. This construction forms groove, running centrally around face of pulley (an exclusive feature) which prevents air cushioning by acting as an air escape. Rim has safety beaded edges.

Ends of arms milled to exact length and riveted to internal rim flange; *not* riveted through face of pulley. These flat "A" braced arms (edge on) cut, instead of fan, the air, thereby effecting power economy.

Furnished with crown or straight face.

Information.

Over 275 dealers carry American Steel Split Pulleys in stock.

Prices on application.



SIX-ARM PULLEY
7- to 42-in. diameter, inclusive



SMALL DIAMETER
PULLEY
3-, 4-, 5- and 6-in.
diameter



EIGHT-ARM PULLEY
44- to 72-in. diameter, inclusive, with faces narrower than 16 in.



SPECIAL HEAVY DUTY
PULLEY

For any especially severe service where nothing but a special will stand up



DOUBLE- AND TRIPLE-ARM PULLEY
12- to 120-in. diameter, inclusive, when width of face is too great for safety with single arms



PULLEY WITH CORK
INSERTS

For use where an almost positive drive is required, insuring an absolute minimum of belt slip

CHARLES BOND COMPANY

Manufacturers of Power Transmission Equipment

617-619 Arch Street
PHILADELPHIA, PA.

Product.

FLEXIBLE INSULATED COUPLINGS.

Construction of Grundy Patent Flexible Insulated Coupling.

This coupling is constructed of three pieces only, the two outer flanges being of cast iron and the center disk of non-conducting material, with lugs on each side for transmitting the power to the outside flanges.

The central disk is made of specially selected leather or hard fiber, with lugs securely cemented and riveted to each side of the disk.

The larger sizes, Nos. 12 to 30 inclusive, have lugs cemented and bolted on and reinforced with steel plate as shown in illustration.

The disks supply the insulation while the lugs on each side transmit the power to outside flanges. The leather lugs are *cut on a bias*, tapering towards the disk; the cast iron driving flanges being machined with a corresponding taper, have a tendency to draw the flanges close to the disk, and to cause the leather lugs to receive and transmit the power at their strongest points.

The close connection made possible by this style of coupling reduces to a minimum the leverage, which is so objectionable on the old style pin couplings.

Scope of Use.

The Grundy coupling is specially adapted for connecting motors to pumps, machine tools, sewing machines, woodworking machinery, printing machinery, fans, blowers, shafting to angle drives, etc.

In the matter of neatness and utility, it is an ideal connection for use between dynamo and gas engines or similar machinery.

It is a simple device for connecting the two ends of shafting where it is difficult to get the bearings in perfect alignment, or where they are liable to get out of adjustment.

Distinctive Features.

The Grundy coupling will transmit more horsepower than any other flexible coupling of equal diameter.

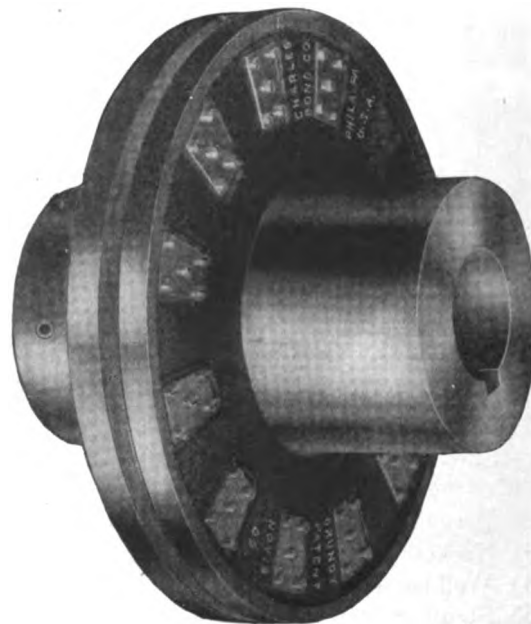
While maintaining a positive and silent drive, it is free from objectionable hammer action features.

It is perfectly balanced and adapted for revolving at high speeds. Can be run in either direction: is close connected; easy of access and practically free from repairs. Has been tested out under severe conditions. There are no loose cylinders, rings, threaded pins or bolts to give trouble.

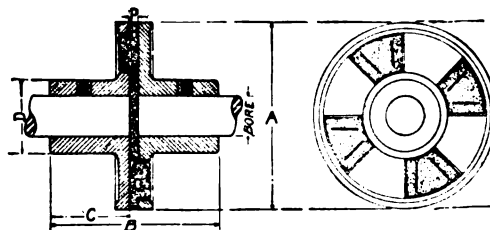
The driving disk, being of non-conducting material, acts as a thorough insulator. As there are only three pieces to the entire coupling, there are no complicated parts to get out of order. It can be either set screwed or key seated, or both. It is a safety coupling, there being no projections to cause danger.

Guaranteed to give less trouble and to outwear anything else of its character on the market.

Where it is not possible to get perfect alignment of shafts, this coupling will adjust itself to circumstances, and can be used whether insulation is required or not.



GRUNDY PATENT FLEXIBLE INSULATED COUPLING



DETAILS OF THE GRUNDY PATENT FLEXIBLE INSULATED COUPLING

DATA

No.	3	4	5	6	7	8	9	10	12	14	16	18	21	24	30
A, in.	3	4	5	6	7	8	9	10	12	14	16	18	21	24	30
B, in.	3	4	5	6	7	8	9	10	12	14	16	18	21	24	30
C, in.	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7	8	9	10	12	15
D, in.	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7	8	9	10	12	15
P, in.	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7	8	9	10	12	15
**Max. Bore, in.	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7	8	9	10	12	15
H. p. at 100 r. p. m.	3 1/2	4	5	6	8	10	12	15	20	25	30	35	45	55	70
No. of lugs	3	4	4	4	4	4	4	4	6	7	8	9	10	12	16
Approx. wgt., lbs.	1 1/2	2	3	4	5	6	8	10	15	20	25	30	35	45	60

*For standard sizes, the dimensions of "B" are twice "C" plus "P," but the length of hubs can be changed to suit conditions.

**Maximum capacity under steady load.

When small horsepower and large bores are required, couplings from No. 4 to No. 12 inclusive can be made with larger hubs, but are furnished only when details are given.

Horsepower shown above is for steady load and not for intermittent or hump loads. When Grundy couplings are to be used with gas engines, air compressors, A. C. electric motors, etc., it is advisable to get this company's recommendations.

Information Required When Making Inquiries.

Give the following information when making inquiries regarding the Grundy coupling:

Horsepower required; revolutions per minute; diameter of driving shaft and size of keyway; diameter of receiving shaft and size of keyway; whether couplings are to be set screwed; conditions under which the coupling is to operate are dry or subject to moisture; if the load is constant (if not, write fully regarding intermittent character of same); description of connection for which coupling is to be used.

BOND FOUNDRY AND MACHINE COMPANY

Manufacturers of Power Transmission Machinery

MANHEIM, PA.

AFFILIATED COMPANIES

BOND ENGINEERING WORKS, LIMITED, Toronto, Can.
CHARLES BOND CO., 617-19 Arch Street, Philadelphia, Pa.

CHRISTIANA MACHINE CO., Christiana, Pa.
J. & G. RICH CO., Sixth and Arch Streets, Philadelphia, Pa.

Products.

POWER TRANSMISSION EQUIPMENT:

Drop Shaft Hangers.
Ball and Socket Ring Oiling Hanger Bearings.
Post Hangers.
Pillow Blocks.
Bracket Shaft Hangers.
Flat Boxes.
Clamp Boxes.
Post Boxes.
Post Bearings.
Post Journals.



Floor Stands.
Girder Clamps.
Clutch Couplings.
Compression Couplings "Spiro."
Plate Couplings.
Clamp Couplings.
Safety Set Collars.
Friction Clutches.
Truck Casters, Stationary and Swivel.

Catalogue.

Catalogue 38 S sent on request.



FIG. 1. BOND PATENT UNIVERSAL DROP HANGER

A good, rigid hanger, with provisions for free movement in bearing for shaft to revolve. Metal is equally distributed in order that there will be sufficient amount where the greatest strain takes place.

Hanger has all the typical Bond features—Universal adjustment, babbitted and reamed bearings, case hardened steel, set screws, hanger yoke cast separate and interchangeable with any drop or type of hanger for the same size shaft, etc.

Bolts supporting yoke are integral with the frame proper, thus strengthening the hanger at one of the most important points that carry the load of the line shaft

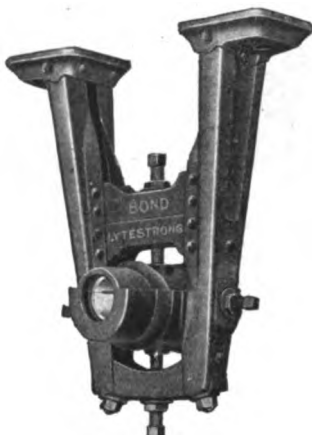


FIG. 17. BOND SCIENTIFIC "LYESTRONG" STEEL SHAFT HANGER

Folded into shape from sheet metal, without breaking the fiber, insuring greatest strength and rigidity.

One-half the weight of cast iron hangers.

Every possible strain that a hanger may be subjected to is well provided for. Can be converted into floor stand by simply inverting the bearing.

Bearings used identical with those used in Bond cast iron hanger.

Belt shifter arm is malleable iron and can be attached very quickly to hanger, and makes a very simple and neat countershaft hanger



FIG. 7. BOND UNIVERSAL BRACKET HANGER

Bearings babbitted and reamed. Fitted with ring oiling bearings, ball and socket adjustment

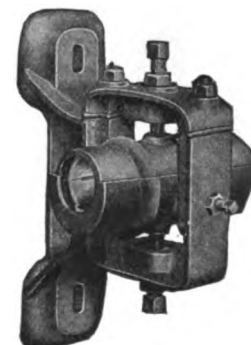


FIG. 4. BOND UNIVERSAL POST HANGER

Bearings babbitted and reamed. Fitted with ring oiling bearings, ball and socket adjustment

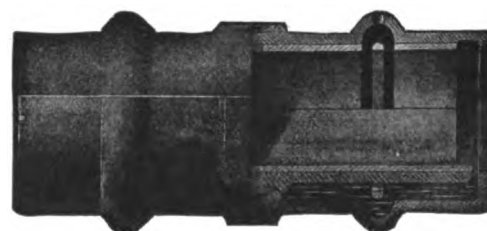


FIG. 2. BOND BALL AND SOCKET RING OILING HANGER BEARING

Three component parts: top, bottom and oil reservoir. Top and bottom carefully babbitted and correctly reamed, making a true bearing surface throughout. Oil reservoir and bottom designed with ball and socket feature insure perfect alignment of shaft. Oil reservoir constructed to prevent leakage of oil. Tempered spring steel rings used for lubricating shaft, diameters of which are sufficiently larger than the shaft to allow them to revolve freely and constantly in oil so that shaft is kept well and evenly lubricated at all times. Each end of bearing provided with carefully designed scrapers or wipers to remove surplus oil and return it to reservoir, preventing leakage or dripping. Reservoir, when properly filled, will amply lubricate shaft from 4 to 6 months without refilling



FIG. 5. BOND UNIVERSAL PILLOW BLOCK

Bearings babbitted and reamed. Fitted with ring oiling bearings, ball and socket adjustment



FIG. 6. BOND PEDESTAL PILLOW BLOCK

Bearings babbitted and reamed. Fitted with ring oiling bearings, ball and socket adjustment



FIG. 24. BOND CLAMP BOX
Suits ordinary requirements and majority of conditions

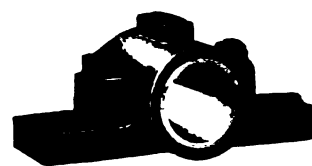


FIG. 25. BOND FLAT BOX
Babbitted and reamed. Substantial, inexpensive bearing



FIG. 30. BOND VERTICAL CLAMP BOX

Babbitted and reamed.
Provided with grease or oil reservoir at top and arranged with parting cover to prevent accumulation of dirt or grit



FIG. 29. BOND SPLIT POST JOURNAL BEARING (ANGLE BOX)

Bearings babbitted and reamed.
An exceptionally good bearing for light work. Adapted for conveyor work on account of angle of the split in bearing and position of oil cup



FIG. 31. BOND SOLID JOURNAL OR POST BEARING (DOLLY BOX)

Babbitted and reamed
Oil receptacle is placed at an angle so that it can be used as a pillow block or as a post bearing on upright posts or posts placed at any angle

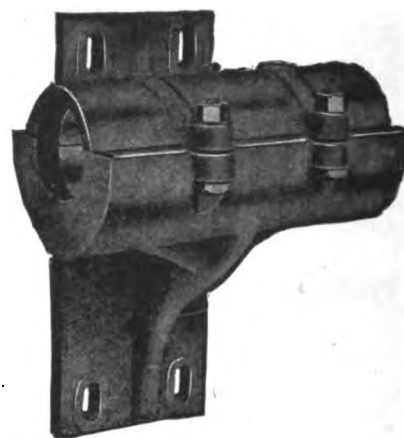


FIG. 26. BOND RIGID RING OILING POST BOX

Designed on same principle as rigid ring oiling pillow block, and used as substitute for universal post hanger, where it is essential to bring shafting close to post



FIG. 19. BOND RIGID RING OILING PILLOW BLOCK

Designed on same principle as ring oiling ball and socket bearing used in Bond Universal hangers, with oil reservoir constructed as a rigid base for bearing

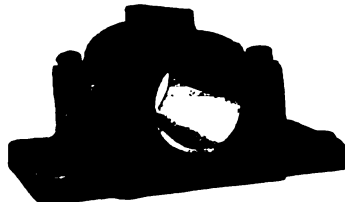


FIG. 22. BOND EXTRA HEAVY RIGID PILLOW BLOCK

For exceptionally heavy work, such as engine shafts, heavy elevator shafts in mines, etc.

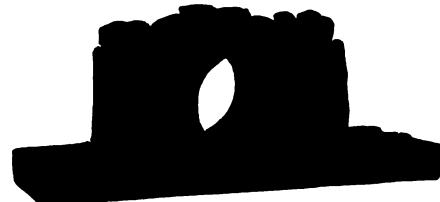


FIG. 23. BOND HEAVY RIGID PILLOW BLOCK (PACIFIC TYPE)

Meets the requirements of sawmill trade. A special feature of this type is that it interlocks the length and width of bearing.
Drilled and tapped for grease cups



FIG. 42. BOND PATENT "SPIRO" SINGLE FLANGE COMPRESSION COUPLING

Has enormous gripping power. Sleeve "A" is tapered from center towards each end. Outer shell "B" and inner shell "C" are bored tapered to correspond with taper on sleeve. There is also a spiral slot cut the entire length of sleeve.

When sleeve is placed in position to connect two shafts, shells are placed on sleeve and bolts are used to draw up the two shells over sleeve.

By this method of one taper drawing over the other, and the special method of cutting a spiral slot in the sleeve, the coupling exerts an enormous gripping power on shaft, for the reason that every square inch of bearing surface of inner diameter of sleeve comes in direct contact with the shaft

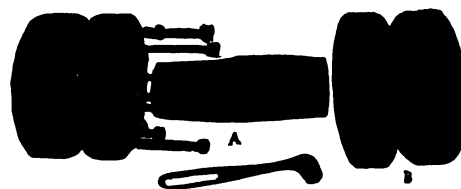


FIG. 43. BOND PATENT "SPIRO" DOUBLE FLANGE COMPRESSION COUPLING

For large shafts (sizes 2½ in. and above). Sleeve is of identical construction as in Fig. 42, with the exception that it is heavier and of larger proportions to suit larger shaft diameters.

Each of the two shells is constructed with two flanges cast on one hub with tapered bores similar to shells on single flange coupling.

Method of using bolts is different. A short and then a long bolt is used alternately. Short bolt extends from inside flange of one shell to inside flange of other shell, or, the flanges nearest to center of coupling.

Long bolt extends from outer flange of one shell to outer flange of the other. By this method, every bolt does the duty for which it is intended, making coupling very powerful for large shafts.

This type of coupling eliminates the expense of key seating the shaft, also the cost of keys

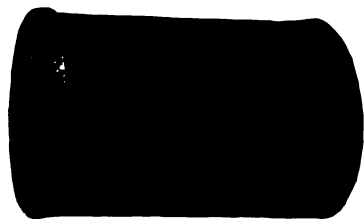


FIG. 45. BOND CLAMP COUPLING

A key seated coupling and requires key seating of the shaft.
Main feature is the clamping device, making coupling in halves, thus it can very readily be bolted to the ends of the shafts when in place

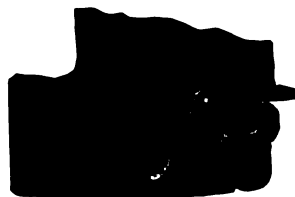


Fig. 39. Type A

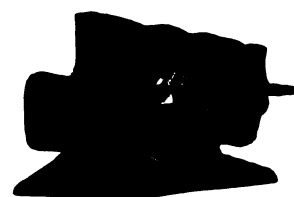


Fig. 56. Type B

BOND GIRDER CLAMPS

Hangers can not be attached to iron girders without the use of a girder clamp of a similar construction to those illustrated above. A full line of patterns takes care of these conditions



FIG. 44. BOND PLATE COUPLING

Used where key seated couplings are required, with shaft key seated to suit

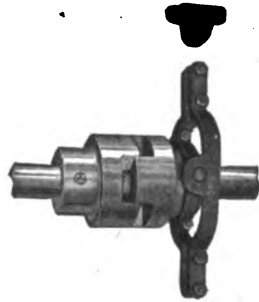


FIG. 40. BOND SQUARE JAW CLUTCH COUPLING

Used for connecting and disconnecting shafts. One-half of coupling is fastened to shaft with a key and other half slides on a feather key.

Finished all over. Jaws accurately planed to prevent backlash and to insure equal bearing pressure on each



FIG. 51. BOND DOUBLE FLANGE SOLID SET COLLAR

A collar of good mechanical construction at a moderate price. Both faces machined and edges carefully rounded. Countersunk to provide for low head set screw to assure safety

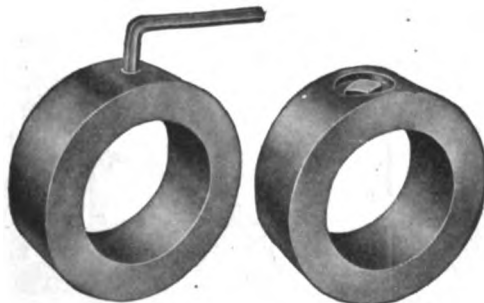


Fig. 47. Holscrew Type Fig. 48. Standard Type
BOND SOLID SAFETY SET COLLARS

Two types, one with low head set screw and countersunk, the other with hollow set screws, both insuring safety. Collars are machined all over

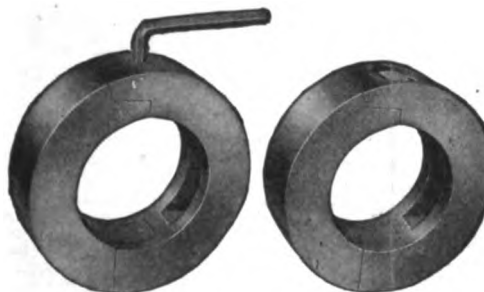


Fig. 49. Holscrew Type Fig. 50. Standard Type
BOND SPLIT SAFETY COLLARS

Have interlocking devices which bring parting line beyond center line of shaft, forming 3-point contact on shaft, making each half a collar in itself



BOND FRICTION CLUTCH

(Patented July 15, 1919)

Economical and practical in operation. Has the distinctive feature of a single adjustment on a multiple of friction shoes.

Friction shoes are brought in contact with friction drum by sturdy steel levers, giving a powerful grip. When clutch is disengaged, arrangement of levers makes a positive release.

No springs or other delicate mechanism are employed in the construction. Built with a minimum of working parts. Simple in construction, and powerful and easy in operation



BOND STATIONARY TRUCK CASTER

All casters are well proportioned; wheels turn freely on cold rolled steel axles



BOND STATIONARY TRUCK CASTER

Rough uneven floors or heavy loads have no effect on these casters, as they are built to stand the wear



BOND ANTIFRICTION SWIVEL TRUCK CASTER

Designed to meet the universal demand for a swivel wheel of good mechanical construction at a moderate price.

The plate swivels on hardened steel balls, swiveling easily under heavy loads.

The ball race is protected with a deep flange, making it dustproof

ESTABLISHED 1854

THE A. & F. BROWN CO.

Manufacturers of Power Transmission Equipment
Engineers, Founders, Machinists and Millwrights

79 Barclay Street
NEW YORK, N. Y.

WORKS:
ELIZABETHPORT, N. J.

Products.

A complete line of POWER TRANSMISSION EQUIPMENT including the following products: Shaft Hangers; Friction Clutch Pulleys; Gears; Belt Tighteners and Rope Sheaves; Steam and Air Driven Sirens; Foot Valves; Friction Clutch Couplings.

Also Grinding Mills; Color Mixers.

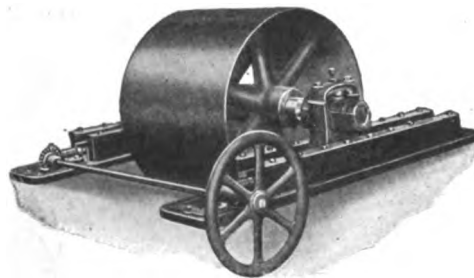
Brown Power Transmission Equipment—A Quality Line.

Designed and constructed according to sound engineering principles, combining simplicity

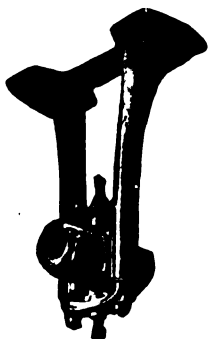
and practicability with sturdy and rugged construction.

Manufactured to meet the trying requirements of experienced buyers who understand and appreciate that the combination of high grade material and manufacturing efficiency constitutes true economy. Long life and absolute dependability are most essential where continuous operation requires something better than the ordinary commercial equipment—made to sell where price is the only consideration.

Consult this company's engineers for a solution of problems in power transmission.

**BELT TIGHTENER**

Does not stretch belt or put undue strain on shaft or bearings. Simply takes up slack in belt and gives more contact surface to the pulley. Made in many types to suit different conditions

**ADJUSTABLE HANGER**

With F. Brown's patent metallic wick self-oilers. Will not clog or glaze, and freedom of feed maintains a film of oil between shaft and bearing.

Many hangers have been in constant use 30 to 40 years without rebabbiting or signs of wear

**BROWN FRICTION CLUTCH PULLEY**

(Our own patent)

Simple, compact, having few small parts. Engages gradually and when thrown in gear has a stronger grip than any other.

Contact between friction surfaces being nearly equal to circumference of clutch permits use of smaller size than in other designs, thus reducing weight on shafting

**GEAR**

Cast gears can be furnished from 1-in. pitch up and up to 16 ft. in diameter

Gears of all description made—machine moulded or cut, cast iron, steel, semisteel, bakelite micarta, etc.

**SIREN**

Fog signal and fire alarm siren as furnished the U. S. Navy. Also built for compressed air

**NEWMAN PATENT CONTINUOUS SERVICE FOOT VALVE**

No stoppage for cleaning. Outer screen is raised above surface to clean, and lowered again. Circular scraper cleans inner screen of any deposit accumulated when outer screen was raised

THE BROWN CLUTCH CO.

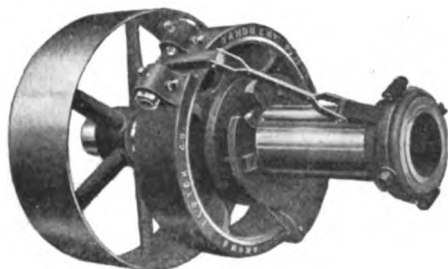
1500 Camp Street
SANDUSKY, OHIO

Products.

BROWN FRICTION CLUTCHES; FRICTION SHAFT COUPLINGS; HOISTS; PULLEYS.

Friction Clutch Pulleys.

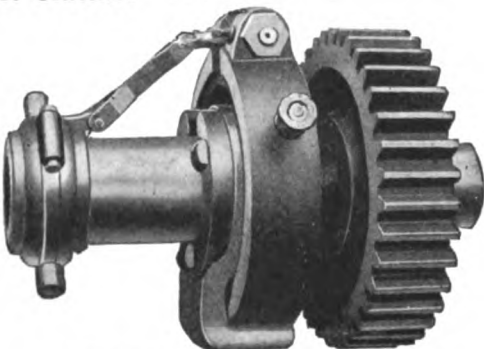
Friction clutch pulleys are manufactured up to 150 h.p. The company designs special styles of clutch pulleys, and is able to furnish one for every case where a pulley is necessitated.



LINE SHAFT CLUTCH

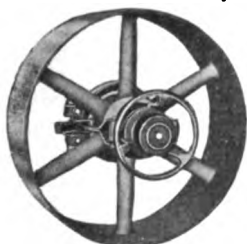
Brown Friction Clutches.

Line Shaft Clutches—These clutches are so constructed that they are easily secured to the shaft with keys, and are controlled by one lever. They are furnished complete with either oil or grease cups and a shifting lever.

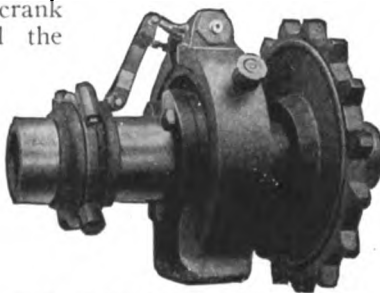


LINE SHAFT CLUTCH WITH GEAR

Short Shaft Clutches—Designed expressly for gas engines, where the crank shaft extends beyond the



SHORT SHAFT CLUTCH

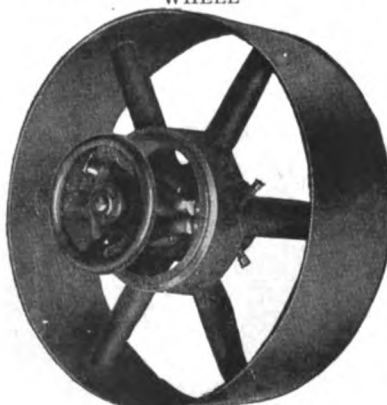


LINE SHAFT CLUTCH SPROCKET WHEEL

flywheel a sufficient length to carry the belt pulley.

Finished Cast Iron Pulleys.

A vast variety of finished cast iron pulleys, bored, turned, and balanced with set screws or key seats, are manufactured so as to fill requirements of all kinds from stock.



NO. O CLUTCH PULLEY
For 10 h. p. and under

Specifications of Conveyor Hoists.

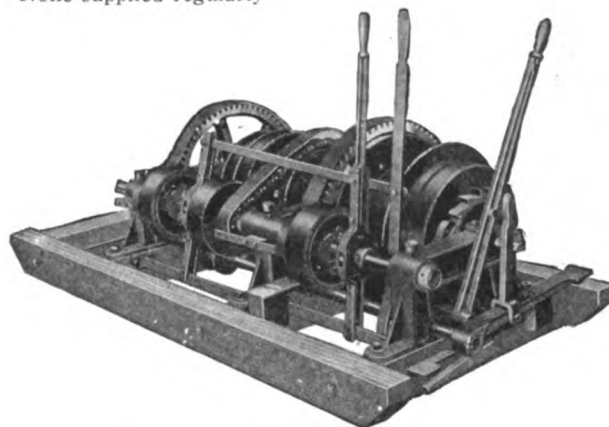
Capacity—1500 lbs. at 100 ft. per minute on single rope. Shipping weight, 1300 lbs.

Drums—Conveyor drum back geared 4 to 1; 14-in. diameter with 16-in. flanges 3 in. apart. Equipped with hand friction band brake. Is controlled by two 10 h.p. clutches on jack shaft operated by one lever making it a reversible drum. Conveyor drum operates about one-third faster than hoisting drum, requiring 5 h.p. engine. Should be driven about 400 r.p.m.

Hoisting drum back geared 6 to 1, controlled by 10 h.p. clutch or jack shaft. Drum is 12-in. diameter with 21-in. flanges 8 in. apart. Capacity 375 ft. of ½-in. cable. Equipped with friction band and ratchet brake.

Shafting—Main shaft 2-in. diameter, jack shaft 1¾-in. diameter. All bearings on main and jack shaft babbit.

Drive—Sprocket and chain, belt, or cut gears. None supplied regularly

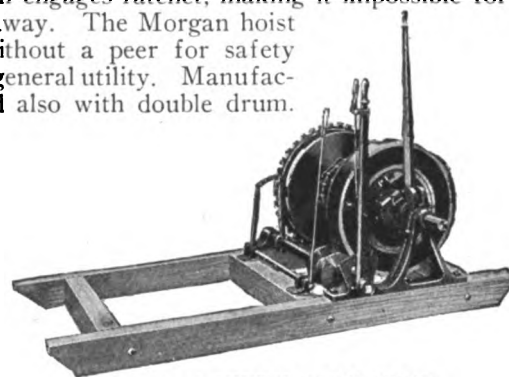


CONVEYOR HOIST

For use on coal docks, in quarries and other places

Morgan Hoists.

Designed to meet the great demand for a hoist to carry heavy loads at high speed. Simple and easy to operate. Load can be stopped at will by releasing dog which engages ratchet, making it impossible for load to get away. The Morgan hoist is without a peer for safety and general utility. Manufactured also with double drum.



MORGAN SINGLE DRUM HOIST

Made in seven types, operated by either motor or gasoline engine drive

Friction Shaft Couplings.

Standard Friction Clutch Couplings—Built upon simple principles of operation and easily manipulated by unskilled mechanics. With this clutch there is absolutely no contact of frictional surface when not engaged.

Information.

When inquiring please furnish particulars regarding horsepower desired with a certain size of clutch. Catalogue "C" will be mailed on request. Information gladly given regarding hoists and clutch pulleys.

CHICAGO PULLEY & SHAFTING CO.

Power Transmitting Machinery

TELEPHONE:
MAIN 1876

40 South Clinton Street
CHICAGO, ILL.

FACTORY, MENOMONEE FALLS, WIS.

Products.

Manufacturers of the "CHICAGO LINE" of POWER TRANSMITTING MACHINERY which includes:

Hangers: Ball Bearing, Roller Bearing and Babbitted; Bracket Hangers, Post Hangers and Pillow Blocks (adjustable and rigid).

Bearings: Ball, Roller or Babbitted; Thrust (ball or roller).

Couplings: Flange Plate, Compression, Flexible, Ribbed Compression, Friction Clutch, Spiral and Square Jaw Clutch.

Pulleys: Wood Split, Steel Split and Cast Iron; Daggett Loose Pulleys (ball bearing) and Daggett Friction Clutch Pulleys (ball bearing).

Countershafts: Ball, Roller and Babbitted Bearing.

Collars: Safety Set, Solid and Split.

Clutches: Friction Sleeve.

Shafting.

"All Loose" Drives (ball bearing).

BENCH LEGS.

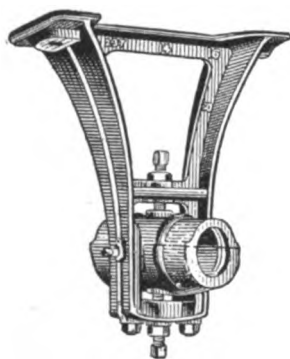
MARVEL GRINDERS (ball bearing).

Also manufacturers of Wall Brackets; Wall Frames; Base and Sole Plates; Takeup and Clamp Boxes; Beam Clamps; Mule Pulley Stands (ball bearing); Pedestals; Sprockets and Gears; Sheaves and Flanged Pulleys; Belt Tighteners.

Hangers.

The "Chicago Line" hangers are of great strength, generously babbitted and of pleasing design; have a duplex system of oiling, wick and ring combined.

Ball or roller bearings furnished when desired.



"CHICAGO LINE" HANGER

Pillow Blocks.

The "Chicago Line" pillow blocks are furnished in rigid or adjustable types with plain bores or the duplex system of oiling.

Adjustable pillow blocks can be fitted with ball or roller bearings when desired.



"CHICAGO LINE" PILLOW BLOCK

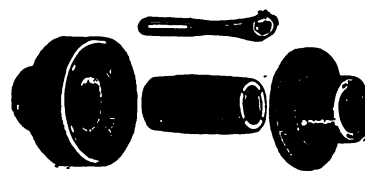
Couplings.

The "Chicago Line" couplings are the flange plate, compression, ribbed compression, flexible, square and spiral jaw, as well as other types.

The compression type is of the taper sleeve construction that requires no keys.



TRADE-MARK



"CHICAGO LINE" COMPRESSION COUPLING

Collars.

Complete line of safety set Collars—solid and split.

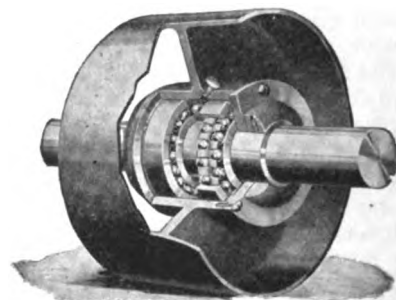
Daggett Ball Bearing Loose Pulleys.

The "Chicago Line" ball bearing loose pulleys are especially designed for high speed. They are simple in construction, accurately machined and will carry a belt at any working load or speed without heating or sticking.

They are dustproof, clean, noiseless and require but a small amount of lubricant a few times a year.

This loose pulley eliminates the loose pulley trouble prevalent in practically every plant where loose pulleys are used.

S. K. F. ball bearing equipped.



DAGGETT BALL BEARING LOOSE PULLEY

Daggett Ball Bearing Friction Clutch Pulley.

A friction clutch pulley designed and guaranteed to carry any belt load at any speed without bearing trouble.

Drive buffing lathes, emery and disk grinders, fans, punch presses, etc., direct from lineshaft with a ball bearing friction clutch pulley and save power, belts, lubricant, time and trouble.

The ball bearing friction clutch pulley illustrated below will not wear the shaft, is simple in construction, easy to install and requires less space on the shaft than ordinary clutches.



DAGGETT BALL BEARING FRICTION CLUTCH PULLEY

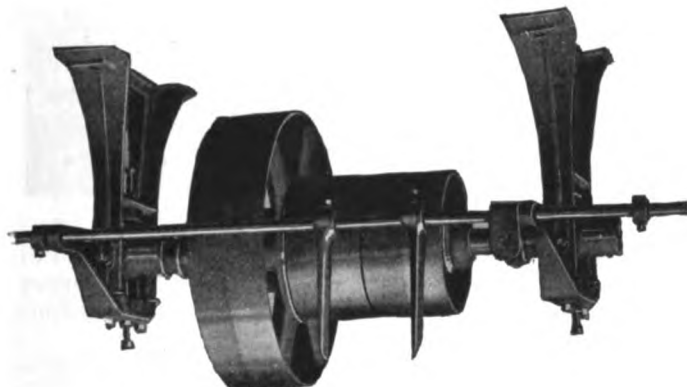
The ball bearings are dustproof, and the lubricant chamber needs refilling but from two to four times a year, according to conditions.

S. K. F. ball bearing equipped.

"All Loose" Drive Countershafts, Ball Bearing.

A countershaft with stationary shaft, another way to eliminate countershaft trouble and worries. The shaft is stationary—it does not revolve. The small driven pulley and the large driving pulley are cast as one. The additional loose pulley is the idler.

The "all loose" countershaft drive can be made in any combination of pulley sizes that may be required; any speed can be obtained by changing the pulley on the main line.

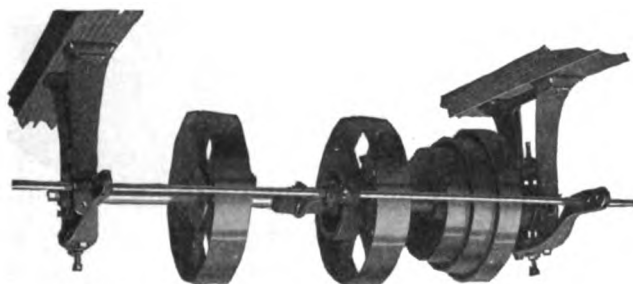


"ALL LOOSE" DRIVE COUNTERSHAFT

Ball Bearing Countershafts, Ordinary.

The "Chicago Line" are headquarters for all types of countershafts, but recommend at all times ball bearing equipment.

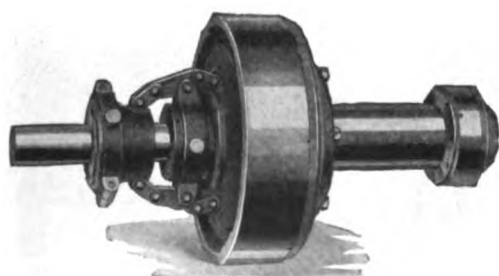
A countershaft with ball bearing friction clutch pulleys and ball bearing hangers will pay for itself in trouble saved in a short time, for wherever plain bab-bitted bearings are used in countershafts, there is a constant liability of trouble.



BALL BEARING COUNTERSHAFT

Friction Sleeve Clutch, Ball Bearing.

An exceptionally good friction clutch, well designed

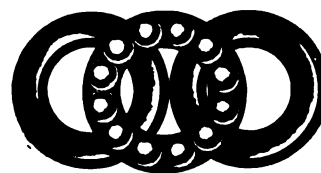


BALL BEARING FRICTION CLUTCH, SLEEVE TYPE

and constructed. Compact, strong and easily applied. Is made with an extended sleeve to accommodate pulleys, sheaves, gears, sprockets, etc.

Thrust Bearings.

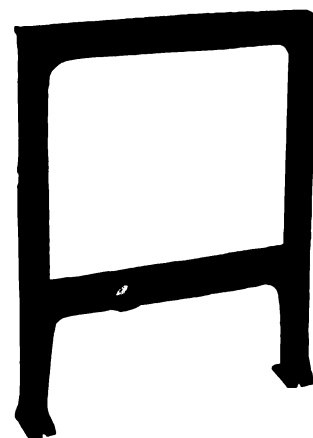
The "Chicago Line" thrust bearing for real satisfactory and enduring service, designed for loads in one direction along the axis of the shaft. Made in all sizes.



"CHICAGO LINE" THRUST BEARINGS

Bench Legs, Cast Iron.

Strong, durable, adaptable. Cross brace slotted for foot rest.



"CHICAGO LINE" BENCH LEGS

Marvel Grinder.

The marvel grinder, ball bearing equipped, permits high spindle speeds, with an assurance of long life, low upkeep and continuous service.



MARVEL GRINDER

THE CONWAY CLUTCH CO.

Manufacturers of Friction Clutches

P. O. Station F
CINCINNATI, OHIO

Products.

FRICITION CLUTCHES, including Compression, Expansion, High Speed, C. M. T., and Split Types.



Conway Friction Clutches.

Conway clutches are noted for their compact, rigid construction, their enormous leverage, their large factor of power in limited spaces, their five interchangeable parts, their handy, simple, and foolproof adjustment, and the complete peripheral contact of their friction surfaces.

Conway clutches are made in three types—this extension of their constructive design making them adaptable in every field of mechanical service.

They are standard equipment on lumber pilers, soap presses, sugar mills, wagon loaders, gas engines, sack fillers, foundry tumbler mills, textile machinery, geared lathe heads, line shafts, printing machinery, button machinery, dough mixers, etc. Wherever service is important Conway clutches are requisite.

Materials—Conway clutches are made of the metal most adaptable to conditions.

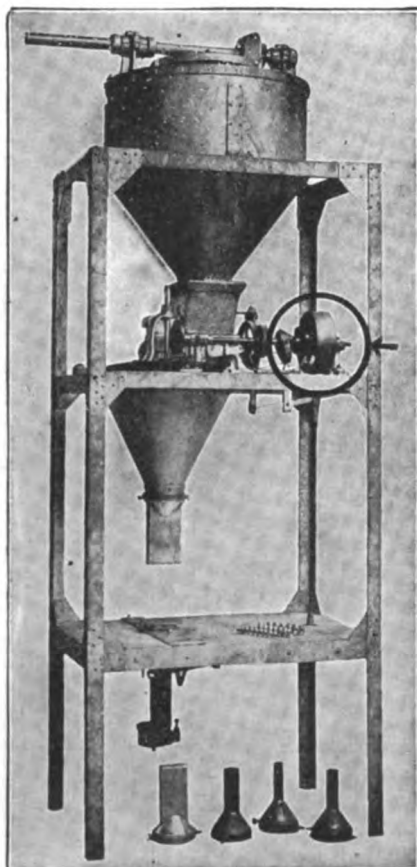
For excavating machinery, etc., exposed to all weather conditions, clutches are made of bronze friction band mounted on cast steel drive plate. For interior uses and light work they are made of cast iron.

The actuating members (latch and lever) of all clutches are made from Hyten B 3 analysis alloy steel.

Some Achievements of the Conway Clutch.

It will not be possible to tell the whole story of Conway clutches here, but their capabilities as shown by the following few performances, should impress the reader.

Can Filling Machines—The Conway clutch at work on this machine is thrown in and out of engagement 2000 times an hour. The clutch must respond on the dot, or the baking powder will overflow the can. It has not overflowed with any Conway clutch in thirteen years.



CAN FILLING MACHINE



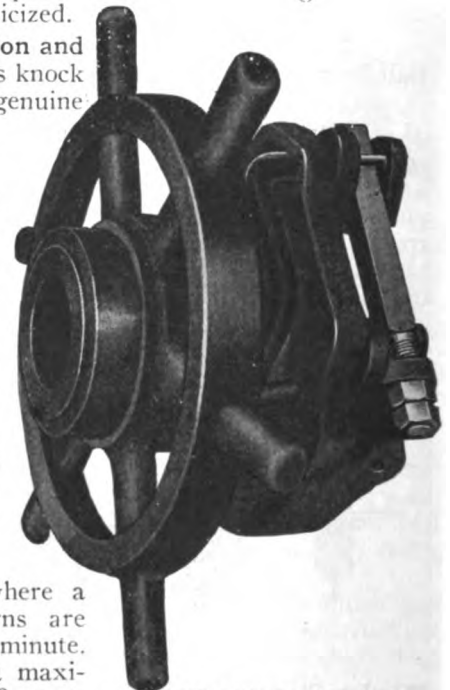
WAGON LOADER

Wagon Loaders—At the other side of the field of mechanical service—the wagon loader. (Conway clutches are adaptable to any service from rock crushing machinery to jeweler's tools.)

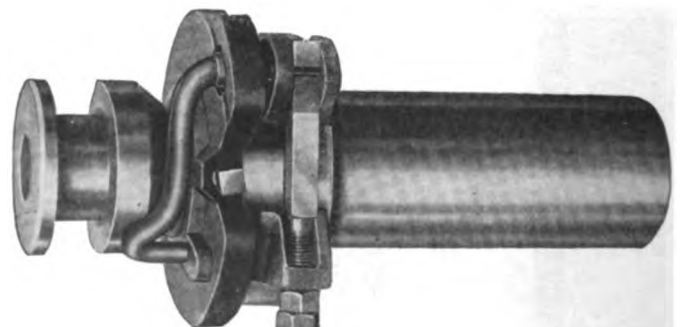
The wagon loader is a typical gas engine clutch service. Conway clutch performance on these engines of the road can not be criticized.

One Revolution and Stop Clutch—This knock out clutch gives genuine Conway service on sugar mills, hog shaving machines, presses and like machinery.

High Speed Clutch—Far removed from the slow pig scalper, is the high speed clutch used in textile machinery, lumber planing mills, on centrifugal pumps, grinders and polishing machines and any place where a multitude of turns are crowded into one minute. This clutch has a maximum speed of 1700 r.p.m.



ONE REVOLUTION CLUTCH



COMPRESSION SLEEVE CLUTCH

THE CORK INSERT COMPANY

166 Federal Street
BOSTON, MASS.

Products.

CORK INSERT PULLEYS: Cast Iron, Paper, Steel, Wood Rim Iron Center, to meet all requirements.

BRAKE FACINGS; DISKS for Clutches, Brakes and Slipping Tensions.

Also manufacturers of Friction Wheels; Cone Clutches; Cork Insert Transmission Belt; Clutch Facings, Disks and Blocks; Friction Washers and other guaranteed Frictional Devices equipped with Cork Inserts for use where great efficiency or uniform tension is necessary.

Cork Insert Pulleys.

Advantages—Cork Insert pulleys are made to any specifications to transmit any power a belt can carry, and *they are guaranteed* to give satisfaction in the places for which they are designed.

They transmit more power than plain pulleys, stop belt slip, maintain efficiency under unfavorable conditions, and are not affected by dampness.

They prevent loss from oily belts or dust, and maintain speeds in spite of water, deliver power with slack belts, cut down friction loads, and lessen wear on bearings.

They lengthen the life of belts, and eliminate use of belt dressing, thus reducing cost of upkeep.

They give uniform speeds, improve quality and quantity of products, and save fuel and electric current.

Applications—Main drives, motors, fans, blowers, air compressors, wood working machinery and all drives

where speeds are high and loads heavy; machine tools, textile and other machinery where output and uniform operation are especially important; pumps, paper mill machinery, dyeing machines, tanning machinery, sugar grinders, stone crushers, cement mill machinery, milling machinery, polishing machinery and all places where conditions are necessarily bad. These are a few typical cases where Cork Inserts are giving the most satisfactory results.

In one form or another, Cork Inserts are adapted to practically every place where it is necessary to *obtain the greatest possible frictional efficiency or a uniform tension.*

Directions for Ordering—When ordering Cork Insert pulleys or requesting quotations, give the following information:

Quantity; type of pulley (specify iron, paper, wood rim or steel); solid or split; crown or flat face; diameter; actual width of face; width of belt; bore; length of hub (standard is two-thirds width of face); projection of rim beyond end of hub; width and depth of keyway; number and location of setscrews.

If pulley must fit over parts of machine, send sketch or give outside diameter of hub and inside diameter of rim.

Describe drive, stating whether it is from motor, engine or shaft to machine (giving name and size) or shaft; distance between pulley centers; horsepower; speed of driving pulley; whether pulley described is driver or driven; whether drive is horizontal, vertical or diagonal—open, quarter-turn or crossed; if horizontal or diagonal, whether tight side of belt is on top or bottom, and if vertical or diagonal, whether driving pulley is at top or bottom; diameter and face of pulley at other end of drive.

Give material, thickness (single, double or number of ply) and width of belt.

State troublesome conditions, if any.

Co-operative Service.

Transmission problems are analyzed, and recommendations for equipment guaranteed to give satisfactory service are made without charge or obligation.

Catalogue illustrating many successful applications and giving detailed reports of tests sent on request.

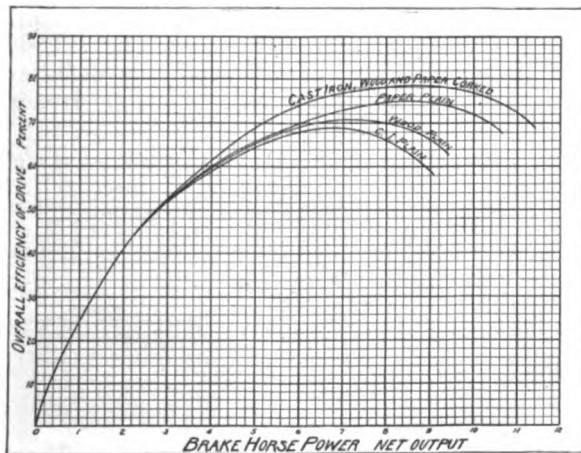
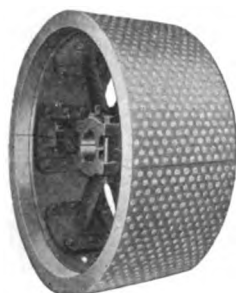
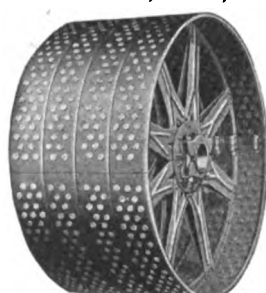


DIAGRAM ILLUSTRATING COMPARATIVE EFFICIENCY OF CORK INSERT PULLEYS AND OTHER TYPES
Compiled from tests made at Lowell Textile School, Lowell, Mass.

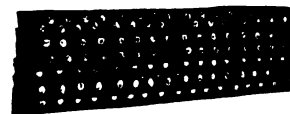


Wood Rim



Steel

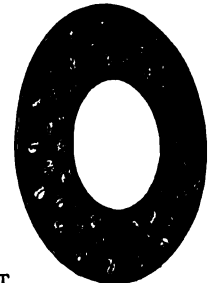
CORK INSERT PULLEYS—WOOD RIM, STEEL, PAPER, AND CAST IRON
To meet the heaviest requirements of motors, machinery and shafting



BRAKE FACING



CORK INSERT
FRICTION
FILLER



CORK INSERT
FRICTION DISK



Paper



Cast Iron

DODGE SALES AND ENGINEERING COMPANY

DISTRIBUTER OF THE PRODUCTS OF

DODGE MANUFACTURING COMPANY AND DODGE STEEL PULLEY CORPORATION

Power Transmission Machinery

GENERAL OFFICES
MISHAWAKA, IND.

MANUFACTURING PLANTS
MISHAWAKA, IND.
ONEIDA, N. Y.
TORONTO, CANADA

ENGINEERING AND SALES OFFICES

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SEATTLE, WASH., 522 First Avenue, South

SALES OFFICE NOT CARRYING STOCK
HOUSTON, TEX., 1008 Scanlon Building

Dealers Carry Complete Stocks in All Principal Cities

Products.

A complete line of POWER TRANSMISSION MACHINERY, including DODGE ROPE DRIVING EQUIPMENT; SAFETY COLLARS; KEYLESS COMPRESSION COUPLINGS; ADJUSTABLE BALL and SOCKET DROP HANGERS; BEARINGS; FRICTION CLUTCHES; CAST IRON GEARING. PULLEYS of all sorts: "INDEPENDENCE" WOOD SPLIT, "STANDARD" SPLIT IRON, IRON CENTER WOOD RIM; "ONEIDA," "KEYSTONE," and "NATIONAL" STEEL; SPLIT BUSHINGS for Tight and Loose Pulleys.

Also manufacturers of Flywheels, Rope Sheaves, Wood Lagging for Rope Wheels; in fact everything for the mechanical transmission of power.

Engineers.

Through more than 30 years' experience in meeting transmission problems in every line of industry, Dodge engineers are prepared to give most competent service in the selection and arrangement of transmission equipment for maximum efficiency and economy.

Dodge Rope Driving Equipment.

This company is the originator of the American system of rope driving, and is best equipped to give to every important detail of design and manufacture that careful and experienced attention so necessary to insure successful and economical operation. Equipment for English system rope drives is also manufactured by this company. Dodge literature on rope driving is very complete.

Dodge Safety Collars.

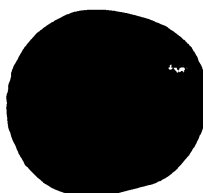
Dodge safety collars are made solid and split for all sizes of shafting, and comply with all the legal requirements as to safety by having set-screws and bolts protected. Finished and polished on periphery and faced on ends.



Solid Split
DODGE SAFETY COLLARS

Dodge Keyless Compression Couplings.

The design of the Dodge coupling is excellent and its construction so simple that an ordinary workman can erect it as



DODGE KEYLESS COMPRESSION COUPLINGS



DODGE ADJUSTABLE BALL AND SOCKET DROP HANGERS

satisfactorily as a skilled mechanic or millwright. The only care needed is to tighten all bolts gradually and evenly to insure true running.

Dodge Adjustable Ball and Socket Hangers and Bearings.

Adjustable ball and socket drop post hangers are made with three types of bearings: capillary type, ring type, and standard.

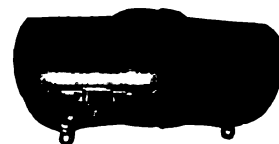
Capillary Type—This bearing is mechanically and scientifically correct in every detail.

The Dodge patent capillary oiler is a wooden block, with alternate saw cuts, through which the oil rises by capillary attraction from reservoir to the shaft. The capillary oiler is a non-agitating oiler. There is not the slightest whipping and churning of the oil. Any sediment precipitates to the bottom of the reservoir and only the good clear oil is brought up to the shaft.

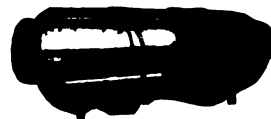
The action of the capillary oiler is definite and positive and can be relied upon absolutely. It can not fail.

Ring Type—In this bearing the well-known method of oiling by rings is employed, in connection with a bearing of the most superior design and finish.

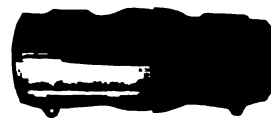
Standard Type—This plain oiling type of bearing is exceptionally well made for a bearing of this kind, and is relatively inexpensive.



Capillary Type



Ring Type



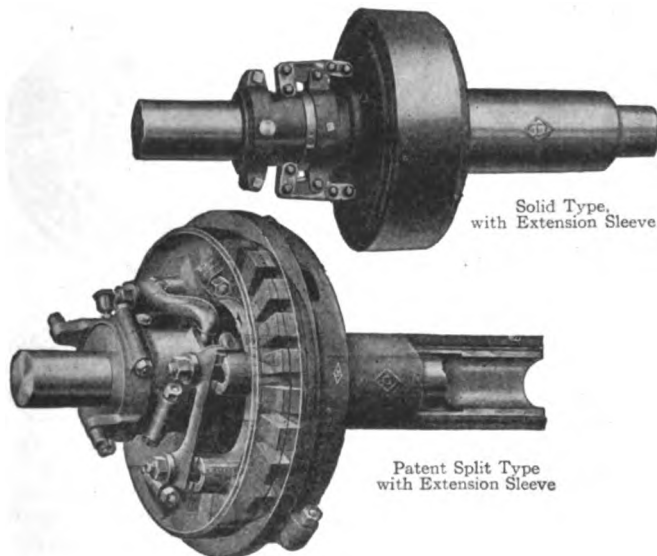
Standard Type

TYPES OF BEARINGS USED IN DODGE HANGERS

Continued on next page

Dodge Friction Clutches.

These clutches are manufactured also in the form of cut-off couplings. All sizes, to meet all conditions of service.



DODGE FRICTION CLUTCHES

Dodge "Independence" Wood Split Pulleys.

Rim machined inside and out. Pulley is accurately balanced, runs true, grips shaft securely and has greater transmitting efficiency than any metal pulley.

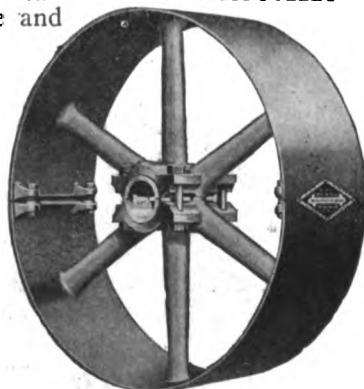
Made in all sizes and carried in large stocks for instant shipment by all branches and by hundreds of leading dealers. Special sizes made and shipped within 24 to 48 hours from receipt of order.



DODGE "INDEPENDENCE" WOOD SPLIT PULLEY

Dodge "Standard" Split Iron Pulley.

Carried in stock. Made with interchangeable metallic bushings.



DODGE "STANDARD" SPLIT IRON PULLEY

Dodge Iron Center Wood Rim Pulley.

Split Type—Single Arm



Split Type—Double Arm

DODGE IRON CENTER WOOD RIM PULLEYS

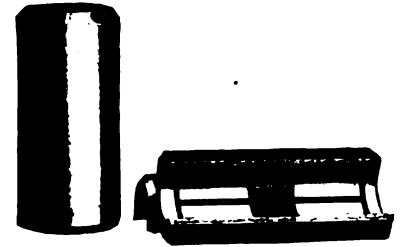
For heavy and shock loads, for high and absolute speeds, this pulley is supreme. Rim is machined inside and out. Pulley is carefully balanced and accurately finished in every detail, and is made solid or split.

Split Bushings.

For tight and loose pulleys. Very easily placed upon the shaft with split pulleys, without necessity of taking down shafting or disturbing any equipment.

Cast in one piece, bored and turned and then split by fracture. The uneven, ragged edges bring the two halves together to a smooth, accurate fit, held in secure position by compression of the pulley hub.

A large reservoir in center holds lubricating oil. Circular and lengthwise gains distribute oil evenly in bearings, returning it to oil chamber when pulley is not in motion. Oil chamber is filled through a convenient spring oiler.

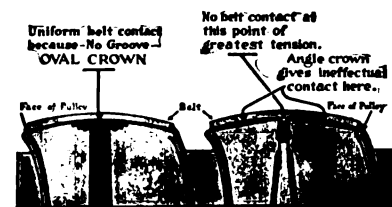


SPLIT BUSHINGS

"Oneida" Steel Split Pulley.

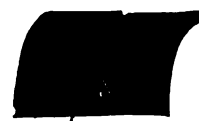
Strength with Light Weight—The lightest belt pulley made—and the strongest. No revolving superfluous pulley weight. Less weight, less friction in shaft journals—and less power loss.

Perfect Oval Crown—Greatest possible belt grip or adhesion. Transmits maximum power at minimum expense of belt pull or tension. Loose belts mean less bearing friction and saving of belts.



OVAL CROWN VS. ANGLE CROWN

Strong Windcutting Arms—Securely riveted to broad bearing of special fishplates. Arms set edgewise, offering little resistance to air.



OTHER PULLEYS

Face over-hang. No arm support under belt. Belt tension causes vibration here.



THE "ONEIDA"

No face over-hang. Two sets of arms to support load either side. Strong, rigid construction.

Rivets that Can Not Shear—Metals first stamped male and female—no lateral or shearing strain on rivets.

No Setscrews or Keyways—Pulleys held to shaft by compression of hub.

No mutilated shafts, or pulleys running out of true.

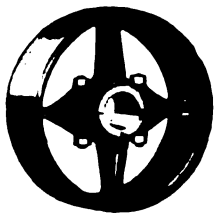


RIVETS COUNTER-SUNK

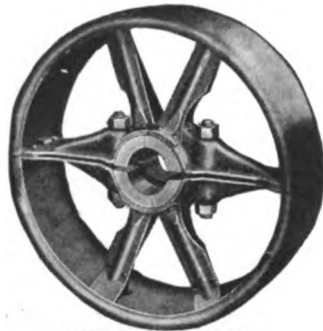
Double Arms—"Oneida" pulleys are built "double arm" or "double spider" in sizes beginning at 8-in. face in the smaller sizes, 10-in. and 12-in. face in medium sizes, and 14-in. face in larger sizes.



"ONEIDA" PULLEY
Showing double arm construction for wide faces



"ONEIDA" PULLEY
Sizes, 8 to 11 in. inclusive, in diameter. Takes "G" hub, with standard bore of $3\frac{1}{2}$ in.



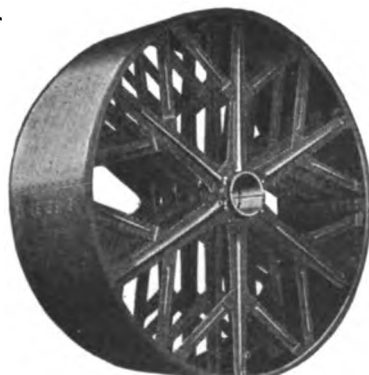
"ONEIDA" PULLEY
Sizes, 12 to 20 in. inclusive, in diameter. Takes "G" hub, with standard bore of $3\frac{1}{2}$ in.



"ONEIDA" PULLEY
Sizes, over 17 in. in diameter. Standard bore $3\frac{1}{2}$ in. for sizes up to 36 in. Over 36 in. take $4\frac{1}{4}$ -in. bore



"ONEIDA" PULLEY
40x8 in. and larger, auxiliary arms give added strength



"ONEIDA" MAIN DRIVE PULLEY 14 FT. IN DIAMETER

Main Drive "Oneidas."

Evidence that "Oneida" design is basically correct is found in the fact that this is the only steel split pulley that is, or can be, successfully built in sizes up to 14 ft. diameter, for main drive purposes. "Oneida" main drives of 168-in. diameter, with 40-in. face, are driving as high as 750 h. p., with absolute

safety and satisfaction. Several thousands of these mammoth "Oneida" pulleys are in constant use, under a wide variety of conditions.

"National" Steel Split Pulley.

Made 3, 4 and 5 in. in diameter. Three-in. pulleys have hubs 3 in. long and standard bore of $1\frac{1}{8}$ in.; 4-in. and 5-in. pulleys have standard bore of $1\frac{1}{4}$ in. and hubs 3 in. long.

Interchangeable metal bushings are furnished for all shaft sizes in sixteenths.

One bushing and the socket wrench are supplied free with each pulley. Each pulley (with wrench) is packed separately in a neat pasteboard box, on which is plainly stenciled the size of the pulley.



"NATIONAL" STEEL SPLIT PULLEY

"Keystone" Steel Split Pulleys.

A Substantial, Grooveless Rim—Made of $\frac{3}{8}$ -in. or $\frac{1}{4}$ -in. steel (according to diameter) the "Keystone" rim is solid, rigid, substantial.

It has the strongest, thickest rim of any steel pulley.

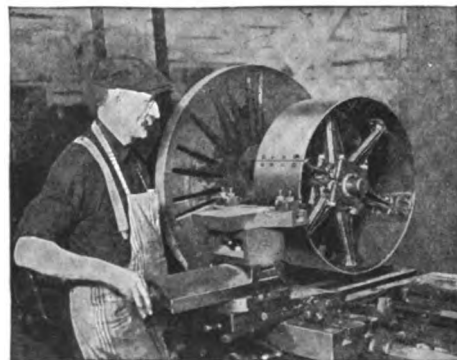
It will not break under sudden strain or high speed or bend or dent in transit or handling.

It has no groove or seam in the center of the face to lessen belt adhesion.

It has no beads or turnover edges to catch and hold dirt, lint, sawdust, flour dust, moisture, etc., which might throw the pulley out of balance. Hence, the "Keystone" is a clean pulley, particularly desirable wherever steam, moisture or dust abounds.

Because of its extraordinary strength, this substantial rim provides long wear and absence of vibration, as well as ideal power saving belt adhesion.

Because a "Keystone" has no beads, it is placed in a lathe after being carefully trued and the edges of the rim are faced, assuring a true running, well balanced pulley.



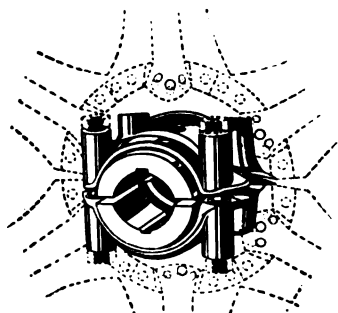
FACING THE EDGES OF A "KEYSTONE" PULLEY RIM

Rivets that Will Not Shear—In the "Keystone" the metals, through which a rivet passes, are interlocked male and female by countersinking. The "flange" thus formed on the metals takes all the lateral strain. The rivet is called upon merely to hold the metals together. The countersinking of the rim makes rivets come slightly below the face of the rim and therefore not in contact with the belts.



SECTIONAL VIEW SHOWING COUNTERSUNK METALS

Strong Flexible Hub—Setscrews or keys—that mutilate shafts—are rarely necessary with the "Keystone."



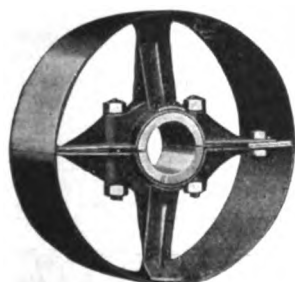
THE "KEYSTONE" HUB
Interwoven hub and arms with
malleable iron reinforcing yoke

The hub is made sufficiently flexible to provide positive, permanent compression on the shaft by the mere tightening of the compression bolts.

This construction provides ample strength with sufficient flexibility for positive compression on the shaft.

Bores and Bushings—By a simple system of cast iron and compressed steel bushings, "Keystone" steel pulleys can be made to fit from 24 to 48 different sizes of shafting (according to standard bore) by merely changing the bushing. Supplied in all sizes of shafting in multiples of $\frac{1}{8}$ in. from standard bores to small size shafting.

Every bushing is accurately turned and bored and made to fit into the holes in the hubs of pulleys, virtually keying them in place. Keyseating is not required except in extraordinary cases. A complete set of bushings is furnished free with each pulley. Pulleys having bores larger than standard are subject to extra charge. Keyseating bushing at a nominal extra charge.



4-ARM PULLEY

Pulleys of diameters up to 12 in. and narrow widths of face are made with 4-arm, 2-bolt spider. Standard bore, $\frac{3}{4}$ in. Made double arm for 8-in. face and over



"KEYSTONE" STEEL PULLEY
Sizes, 17 to 40 in. in diameter



DESIGN OF "KEYSTONE"
STEEL PULLEY
Sizes, 12 to 17 in. in diameter

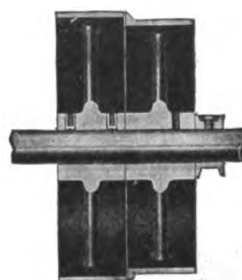


SMALL SIZE "KEYSTONE"
STEEL PULLEY

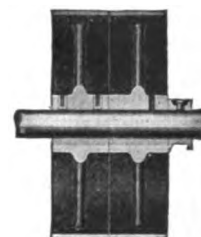
Small size "Keystone" steel pulleys beginning with 8-in. face, medium sizes beginning with 12-in. face, and large sizes beginning with 14-in. face, are made with two or more sets of arms. This gives additional strength and lasting qualities.

Hub and arms are interwoven and in the larger sizes a reinforcing yoke of malleable iron is used inside a sheet steel hub casing.

Since steel has twice the structural strength of cast iron, it is obvious that "Keystone" steel pulleys may be operated with entire safety at speeds that would be impossible to attain with cast iron pulleys.



Flanged

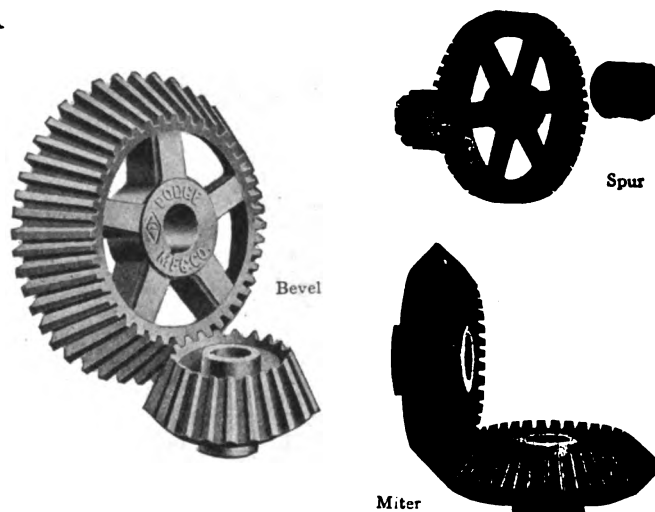


Standard

DODGE TIGHT AND LOOSE PULLEYS

Cast Iron Gearing.

A complete line of cast iron gears is manufactured.



DODGE CAST IRON GEARING

Superiority of Dodge Products.

The Dodge line is the most complete, highly developed and thoroughly standardized line of power transmission machinery.

Besides many other products such as illustrated here, the Dodge line also includes heavy flywheels, rope driving equipment of all kinds, elevating and conveying machinery—in fact, everything for the mechanical transmission of power and the continuous handling of materials.

Prices.

Use standard steel pulley list for "Oneida" and "Keystone" Steel Pulleys. Send for catalogue, price list and discounts.

Catalogues.

Complete illustrated catalogues, containing price, part and dimension lists, and valuable engineering data, may be had promptly for the asking.

THE HILL CLUTCH CO.

Power Transmission Machinery

CLEVELAND, OHIO

EASTERN SALES OFFICE: NEW YORK, N. Y., 50 Church Street—Telephone, Cortlandt 8078

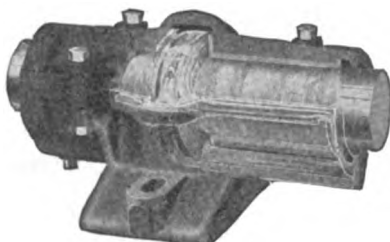
Products.

HILL COLLAR OILING BEARINGS; HILL FRICTION CLUTCHES (Smith Type).

Also manufacturers of Hill Rope Drives, Belt Tighteners, Drop Hangers, Floor Stands, Shafting, Couplings, Cast Iron Pulleys, Rope Sheaves, Gears, Sprockets, Flywheels, Bench Legs, Concrete Inserts, Gray Iron Castings, Special Machinery.

Hill Collar Oiling Bearings.

In the Hill Collar Oiling bearing, instead of depending upon a loose ring or chain for conveying the oil to the journal, a fixed collar is employed, thus providing a positive means of elevating the oil.



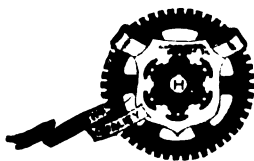
SECTIONAL VIEW HILL COLLAR OILING BEARING, CLEVELAND TYPE (Patented)

In the Cleveland Type Hill Collar Oiling bearing, the oil stored in a reservoir in the bottom of the bearing is continuously elevated by a heavy split collar. Metal wipers deflect the oil, which is then distributed along the full length of the journal. Two or three revolutions of the shaft and the bearing is thoroughly lubricated. It is not only in the positive and copious means of oiling that the Collar Oiling bearing excels, for the collar also serves as a thrust collar, and operates in a bath of oil and thrusts against babitted seats. No outside collars are required, unless the end thrust is extremely severe. All other types of bearings require outside shaft collars, which bear iron against iron with no lubrication.

Hill Collar Oiling bearings are furnished in all styles of ball and socket and rigid mountings.

The Hill Friction Clutch.

Superiority—THE HILL CLUTCH CO. has unequalled facilities for the design and manufacture of friction clutches. For 37 years Hill power transmission machinery has been acknowledged to lead all others. No other manufacturer has had a wider experience in the



TRADE-MARK

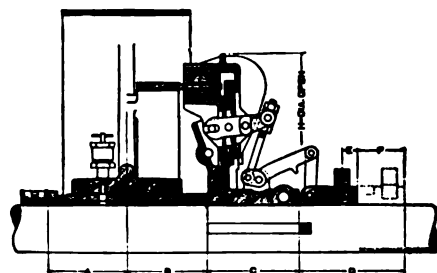
manufacturing of friction clutches, and complete power transmission machinery equipment or a greater knowledge of the varying conditions of operation that must be met.

Efficiency—The advantages of the Smith Type Hill clutch lie in its unequalled mechanical stability, tremendous starting power, ease of adjustment, and removal of wearing parts.

To obtain such rigidity all parts of the toggle mechanism are of steel and forgings, with the single exception of the connecting lever which is of cast iron.

The friction surfaces are wood to iron, which is a combination offering great frictional resistance. The wood shoes are made from the best grade of well seasoned maple. Large shoe area is supplied, and all of the shoe area is equally effective. The

frictional resistance is the same at all points. This is due to the heavy cast iron jaws, rigid guides, and the balanced toggle action transmitting the pressure effort of the operator.



DIMENSION DIAGRAM, HILL FRICTION CLUTCH PULLEYS—SOLID OR SPLIT

DATA, SINGLE ARM PULLEY

Diam., in.	12	13	14	15	16	17	18 & 19	20 & 21	22 to 35, incl.	36 to 47, incl.	48.
Face, in.	13	14	15	16	17	18	19	20	21	22	24

STANDARD BEARING LENGTHS FOR CLUTCH PULLEYS

Face, in.	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	14	15	16	17
A plus B, in.	7	8	9	10	11	12	13	14	15	16	17	18	19

Face, in.	18	19	20	21	22	23	24	25	26	27	28	29	30
A plus B, in.	20	20	20	22	22	24	24	26	26	28	28	30	30

SPACE ON SHAFT

H. p. at 100 r. p. m.	9	12	15	20	27	35	45	60	75	90
C, in.	4 1/4	4 3/4	5	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2
D, in.	5	5 1/4	5 1/2	5 3/4	6 1/4	6 3/4	7 1/4	7 3/4	8 1/4	8 3/4

H. p. at 100 r. p. m.	110	140	175	230	350	480	625	875	1100	1300
C, in.	9 1/4	9 3/4	11	12	12	14	17	18	19	20
D, in.	9 1/2	10 1/2	11	11	11	12	14 1/2	16	18	20

"A" = "B" for all pulleys.

Pulleys having faces wider than those listed will be furnished with 2 sets of arms



Three-arm—Nos. 9 to 45, inclusive



Four-arm—Nos. 60 to 90, inclusive



Four-arm—Nos. 110 to 230 inclusive



Six-arm—Nos. 350 to 1300 inclusive

FOUR DESIGNS OF HILL SMITH TYPE FRICTION CLUTCH

W. A. JONES FOUNDRY & MACHINE CO.

Speed Reducers and General Power Transmitting Machinery

4401-4451 West Roosevelt Road

TELEPHONE:
LAWDALE 5040

CHICAGO, ILL.

BRANCH ENGINEERING OFFICE AND WAREHOUSE: 20 Murray Street, NEW YORK, N. Y.

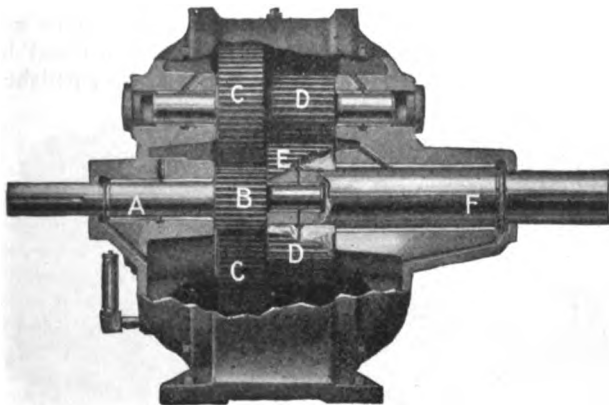
Products.

SPUR GEAR SPEED REDUCERS; ENCLOSED WORM GEAR DRIVES; CUT GEARS of Cast Iron, Cast Steel, Forged Steel, Bronze, Rawhide and Bakelite; NOISELESS PINIONS; ELEVATORS and CONVEYORS; CAST TOOTH GEARS and SPROCKET WHEELS; CAST IRON PULLEYS, Solid and Split; LEMLEY BALL BEARING LOOSE PULLEYS; LEMLEY FRICTION CLUTCH PULLEYS; HANGERS; PILLOW BLOCKS; COUPLINGS, Rigid and Flexible; SAFETY SET COLLARS, Solid and Split.

Also Rope Sheaves, Ball Bearings, Roller Bearings, and other General Power Transmitting Machinery.

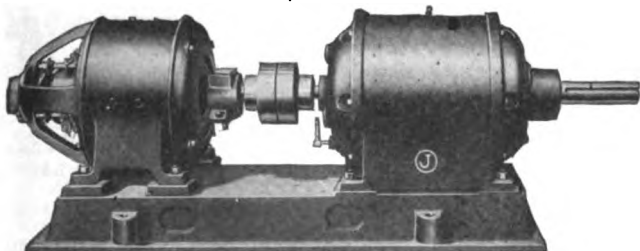
Spur Gear Speed Reducers.

Jones spur gear reducers are designed for reducing speeds between electric motors and driven machines or shafts; are a great improvement over belts, open gears, and other cumbersome methods. They are now being used very generally in many industries.



SECTIONAL VIEW, JONES SPUR GEAR SPEED REDUCER, SINGLE TYPE

A singularly compact installation has been made possible by placing the drive and driven shafts on the same center line, and mounting three countershafts around them, evenly spaced and at equal distances from the drive and driven shafts. All three countershafts are supported by bronze bushed bearings at both ends close to the gears, and a bronze bushed hole in the end of the



JONES SPUR GEAR SPEED REDUCER AND MOTOR MOUNTED ON CAST IRON BASE

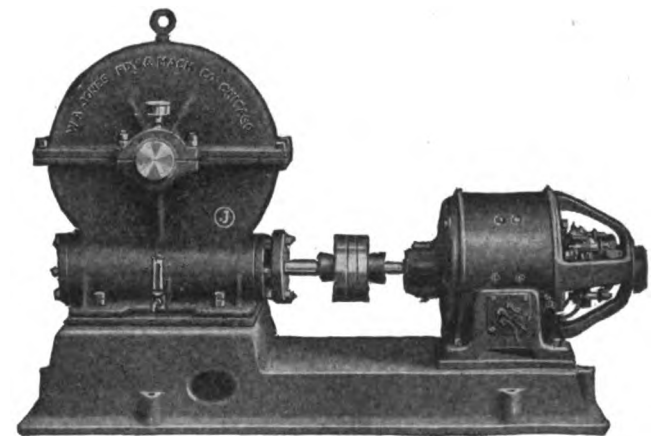
slow speed shaft provides a bearing for the end of the high speed shaft.

The housing is shown in section, so that only the upper of the three countershafts is visible. The pinion B, mounted on the high speed shaft A, meshes with and drives the three gears C, which are integral with the three pinions D. These mesh with and drive the gear E, which is mounted on the slow speed shaft F. Just plain spur gear drives, with no internal gears or overhung shafts.

The adaptability of the Jones reducer is increased by the dustproof, acidproof housing. This complies with all safety laws. Special analysis steel in all gears makes for long life.

Enclosed Worm Gear Drives.

Jones enclosed worm gear drives are either furnished with standard shaft projections for connecting to motors and driven units, or they can be mounted on cast iron bases with flexible couplings with or without motors. The worm gears are usually made of cast iron, bronze, or with a bronze rim for the teeth with a cast iron center. When the gear teeth are bronze, the worm should be made of steel, but if they are of cast iron, then the worm should be either steel or bronze. The gears can be furnished in single, double, triple or quadruple thread, and in any reduction that is possible through ordinary worm gears. Ball bearing thrust collars are provided at each end of the worm, which is made solid on the worm shaft. The housing is oiltight, therefore



WORM GEAR DRIVE WITH MOTOR MOUNTED ON CAST IRON BASE

the drive can operate in lubricant continually. The teeth of the gears are accurately cut on hobbing machines, and the threads of the worm are made on a thread miller. Every drive is provided with an oil gage, grease cups for the gear shaft bearings, stuffing boxes for the worm shaft, and an eyebolt to aid in transporting the drive.

Our engineers will gladly assist in any speed reduction problem.

Cast Iron Pulleys.

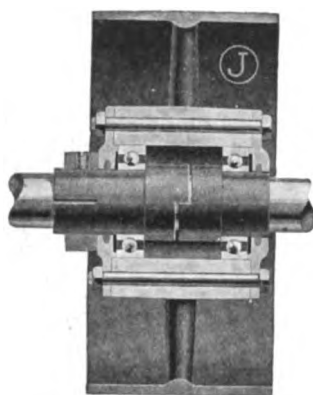
Jones cast iron machine molded pulleys are made either solid or split, in any diameter from 1 in. to 12 ft. or more, for any width of belt from $\frac{1}{2}$ in. to 72 in., or wider, and for any shaft diameter. They are accurately bored, with the rims turned true, and are either keyseated, setscrewed, or both, and balanced. All sizes can be shipped promptly. Urgent orders are given special attention.



CAST IRON PULLEY

Lemley Ball Bearing Loose Pulley.

This ball bearing pulley eliminates loose pulley troubles and prevents power losses. It will run true even at unusually high speeds. The outer ball races are carried in the pulley hub, and the inner supported concentric with the shaft by two sleeves which engage each other and are held tight to the shaft by a set collar. Gurney ball bearings have been used exclusively.

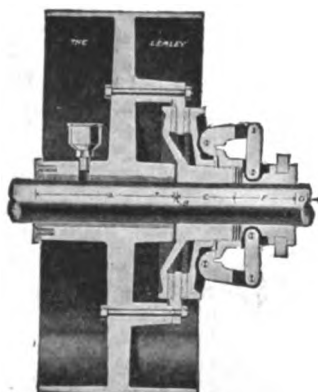


LEMLEY BALL BEARING LOOSE PULLEY

Lemley Friction Clutch Pulley.

This friction clutch pulley can be furnished either solid or split, with any size of pulley, and for any shaft diameter. Gears, sprockets or rope sheaves can be furnished with this clutch in the same manner. One threaded split ring adjusts all toggles at the same time, insuring even pressure on the friction surfaces. The friction is between iron and wood. The iron cannot wear, and when the wood wears it can be replaced cheaply and easily, and it is not necessary to remove the clutch from the shaft.

Special clutch catalogue sent on request.



STYLE "B" LEMLEY FRICTION CLUTCH PULLEY

Cut and Cast Tooth Gears of All Kinds.

Jones cast tooth gears are molded from patterns, accurately bored, faced on end of hub and keyseated or setscrewed. They can be furnished in cast iron, cast steel or in any other material used for the purpose. For slow speeds, they answer the purpose very well. Spurs, bevels, miters, worm gears and worms

can be furnished with cast teeth. A very complete line of patterns is carried. Gear catalogue sent on request.

Cut tooth gears are furnished in spurs, bevels, miters, worms, worm gears or spirals, made of cast iron, cast steel, forged steel, bronze, Bakelite, rawhide or any other material useful for the purpose. They are slightly more expensive than cast tooth gears, but will be found much more satisfactory and economical. On account of the accuracy of cut teeth, they can be safely used under working loads one-third greater than allowed for cast teeth. Cut gears, furthermore, consume from 20% to 40% less power in friction. They are quiet and smooth running compared to cast gears.

A very complete line of gear blank patterns is carried. Modern foundry, machining and cutting equipment expedite deliveries.



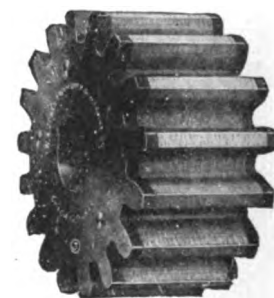
SPUR GEAR



MITER GEAR

Noiseless Pinions.

Rawhide, Bakelite, Fabroil, or fiber are used extensively for noiseless pinions. Rawhide pinions are probably better known, although they are affected by atmospheric conditions. They are usually furnished with brass flanges. Bakelite is self-supporting, and is not affected in the least by heat, cold, or water. It is as strong and as durable as cast iron, and as noiseless as rawhide. Side flanges are not necessary, although they can be furnished when desired. Cut pinions of any other non-metallic material used for this purpose are also furnished. Cast iron gears are recommended for use with non-metallic pinions.

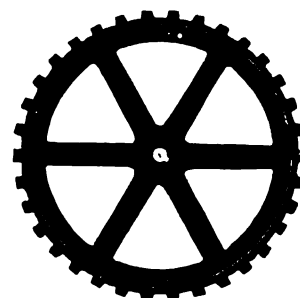


RAWHIDE PINION

Sprocket Wheels.

Jones sprocket wheels are ordinarily made of gray iron, bored and keyseated, setscrewed, or both. They can also be furnished with flint rims for slightly higher prices.

Quantities of detachable chain belting and attachments always carried in stock.



SPROCKET WHEEL

Elevators and Conveyors.

The Jones plant is fully equipped to furnish complete elevators and conveyors, according to specifications.

Lemley Friction Clutches.

Throughout the entire line of Jones transmission equipment, even the commonest items are distinguished by the attention given to those details of manufacture which are too often neglected by transmission makers. An example of this precision is found in the Lemley friction clutch.

These clutches are made for line and countershaft drives, or for cut-off couplings, as well as for gas engines. All parts are in plain view and readily accessible. The friction surfaces can be replaced without removing the clutch from the shaft, and therefore the best operating conditions can be maintained without difficulty. The friction surfaces are wood, fiber or burnproof surfaces in double contact with iron.

Toggle adjustment is made by means of a split threaded ring, which adjusts all toggles at once, and assures even pressure. Special safeguards prevent the friction surfaces from coming into contact when disengaged. Style B is made with pulley complete, and all clutches can be obtained solid or split with plain or ball bearings.

Ask for catalogue containing full details and prices.

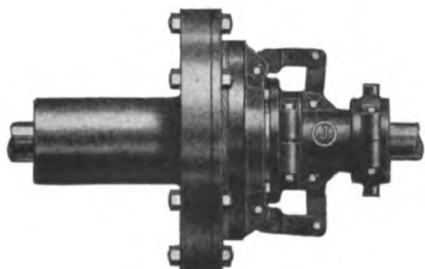
Hangers.

The Jones Universal drop hanger is of unusually sturdy and neat construction. Its remarkable strength

is partly due to the arch bracing and wide reinforcing ribs which strengthen it wherever strains are heavy. Strong case hardened steel setscrews support the bearing and permit free universal movement, but prevent any rotary motion with the shaft. The range of adjustment is exceptionally wide, simplifying erection and allowing ample accommodation for shafts of large diameter. The Jones duplex oiling bearing, described below, makes lubrication automatic and unfailing. Jones maintains a large warehouse stock of all standard sizes.



UNIVERSAL ADJUSTMENT HANGER



STYLE "B." FRICTION CLUTCH WITH SLEEVE

Duplex Oiling Bearings.

This bearing can be used in all Jones Universal drop hangers, post hangers, and pillow blocks, as well as on all standard hangers of other makes. It combines the wick and ring oiling principles, is finished on both ends, and has an unusually large reservoir, to which the oil from the bearing is automatically returned by wipers at both ends. Babbitt of the finest grade is used, which is accurately bored and reamed.



DUPLEX OILING BEARING

A few other items of the line are shown below. Write for transmission catalogue, giving complete description, sizes and prices.



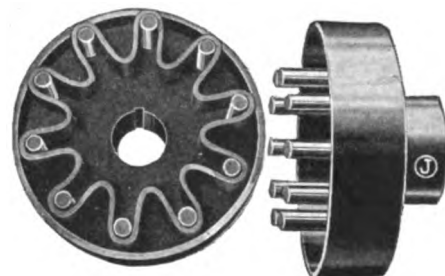
FLANGE COUPLING

Machined all over, insuring true balance and preventing vibration, even at high speeds, thereby minimizing friction, wear and depreciation. Boltholes reamed for tight fitting turned coupling bolts. Reduction couplings are stocked as well as the regular type for all standard shaft sizes.



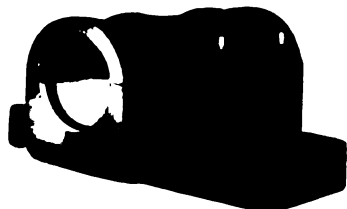
KEYLESS COMPRESSION COUPLING

Removes the necessity of fitting keys and aligning shafts. The parts are assembled by tightening the bolts gradually, and the shafts are held firmly by the compressed sleeve. Cannot slip, even under the heaviest loads, and alignment is automatic.



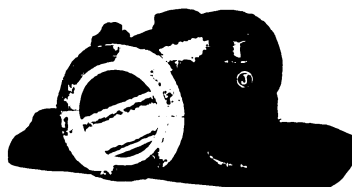
STYLE "B" FLEXIBLE COUPLING

The most flexible made. Steel pins in both members are connected by an endless, flexible, oil treated leather belt, which takes care of extreme misalignment. Absolutely noiseless, and requires no lubrication or attention.



DUPLEX OILING RIGID PILLOW BLOCK

Exceptionally strong design. Accurately bored, reamed and faced on both ends. Base is finished, and slotted holes in base provide for lateral adjustment. Furnished with duplex oiling bearing, described above.



PLAIN OILING RIGID PILLOW BLOCK

Both ends faced and joints machined. Accurately bored and reamed, with oil-holes tapped to hold grease cups, if desired. Grease cups furnished only if specified. Slotted holes provide for lateral adjustment. Extra heavy design.



Solid



Split

SAFETY SET COLLARS

Made solid and split in all standard sizes and fitted with hardened steel setscrews. Bolts and setscrews protected by side flanges. Accurately bored and faced on end, and made in compliance with all safety laws.

THE KINNEY MANUFACTURING CO.

Manufacturers of Friction Clutches and Cut-off Couplings

3529-3541 Washington Street
BOSTON, MASS.

BRANCH OFFICES

NEW YORK, N. Y.

PHILADELPHIA, PA.
SAN FRANCISCO, CAL.

CHICAGO, ILL.
HOUSTON, TEX.

KANSAS CITY, MO.

Products.

FRICTION CLUTCH PULLEYS and CUT-OFF COUPLINGS.

For Road Oiling Equipment, see page 110; for Pumps and Strainers, see pages 896-97.

Interchange Clutch (Pulley or Cut-off Coupling).

Seven sizes, 2 to 40 h.p. per 100 r.p.m.

As the name implies this clutch may be used on the driving or driven end of a belt, chain or gear drive, or by exchanging the long sleeve member for a short hub member it may be used as a cut-off coupling.

In construction this clutch is the simplest friction

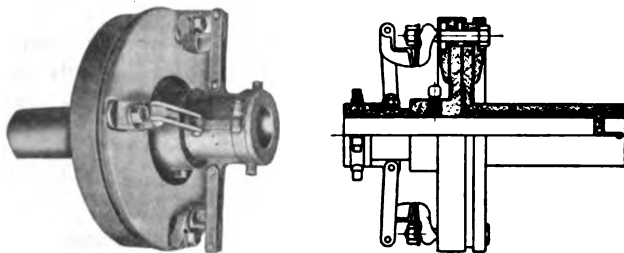
guide bearing, the principal cause of cut-off coupling trouble is eliminated. It keeps the shafts in line and eliminates trouble caused by lack of lubrication.

Oiltight Clutch.

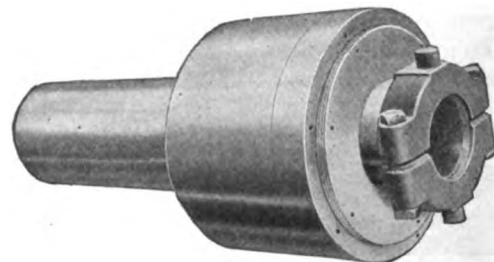
Eight sizes, 2 to 80 h.p. per 100 r.p.m.

The smallest friction clutch made per horsepower. As the case is oiltight it may be filled with oil, which insures thorough lubrication of all working members.

It is made with single or multiple disks, depending upon the horsepower required for the speed and space available.



INTERCHANGE PULLEY CLUTCH



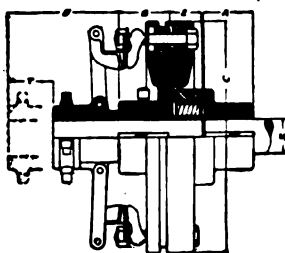
THE OILTIGHT CLUTCH

clutch made. When clamped together it forms a solid bolt coupling.

The power is transmitted directly through the two substantial flat disks and not through bolts, loose joints or working parts.

This clutch is practically indestructible. The wear of the parts does not affect their power or efficiency. They seldom need adjustment or repairs.

These friction pulleys are a perfect substitute for tight and loose pulleys. They possess many advantages not possible to obtain by the use of tight and loose pulleys. They do away with the shifting of belts, which is a source of much annoyance and expense. They provide a safety device against accidents and eliminate strains on belting and machinery.



CUT-OFF COUPLING

To convert the interchange pulley clutch into a cut-off coupling, the disk with long sleeve is exchanged for a roller bearing short hub disk, as shown in line drawing. The bore of this disk is the proper size to drive tightly on the driving shaft.

By the use of the roller

Cut-off Coupling (Worrall Type).

Six sizes, 65 to 1200 h.p. at 100 r.p.m.; 200 to 2000 h.p. at 300 r.p.m.

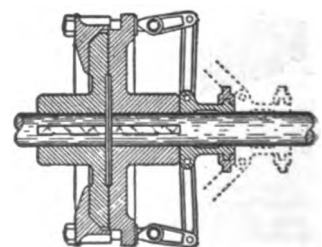
This clutch has been on the market for a great many years and has demonstrated its superiority over all other clutches for heavy duty.

Power is directly transmitted through the two flanges keyed firmly to the shafts and not through bolts, loose joints or working parts. When disengaged the flanges are entirely separated, eliminating all friction.

The clutch and shafts are automatically centered when in use by the bevel face disk. This is the only positive method of centering heavy shafts. There is no end thrust upon the shifter or shaft bearings.



CS1



CUT-OFF COUPLING

MEDART PATENT PULLEY COMPANY

Power Transmission Machinery

GENERAL OFFICES AND WORKS
ST. LOUIS, MO.

ENGINEERING SALES OFFICES: PHILADELPHIA, PA. and CHICAGO, ILL.
OFFICE and WAREHOUSE: 211 Vine Street, CINCINNATI, OHIO

Products.

Specialists, not alone in PULLEYS, but manufacturers of Every Appliance for Use in Connection with the Mechanical Transmission of Power, including TURNED and POLISHED STEEL SHAFTING; GEARS.



Line Shafting Equipment.

Founded 40 years ago, with the Medart patented steel rim pulley as the nucleus, our business has experienced a gradual well planned development in the single field of making complete equipment for the mechanical transmission of power, and in building machinery also for straightening, turning and polishing round bars of steel, bronze, copper, etc. Today the name "Medart" is synonymous with "*everything* in the line shafting equipment" and "the best machinery for straightening and turning round metal bars," particularly of steel.

Although common impression, due to our corporate name perhaps, has been that the name "Medart" means "Specialists in Pulleys alone," the facts are that pulleys—every type: cast iron, wood split, and steel rim—constitute only a small percentage of our production, and we are importantly engaged in the manufacture of turned and polished steel shafting, couplings, collars, hangers, bearings, bearing supports, friction clutches, gearing, rope sheaves, belt tighteners, American and English system rope drives and so on. In fact, we cover the mechanical transmission field, and have fully equipped some of the largest and best known plants that are noted for high efficiency.

Shafting.

That we are the only exclusive manufacturers of a complete line of power transmission machinery which manufactures shafting in our own mill, on a basis permitting us to quote mill prices, is something engineers and buyers should keep in mind when securing proposals covering tentative line shafting installations. Shafting in any considerable overhead equipment comprises a heavy percentage of the total tonnage involved. Hence, we are able to quote very attractively covering all line shafting equipments. It will be to your great advantage to secure all overhead equipment from one source of supply—at a saving.

"Medart" shafting is produced by the turning and polishing process.

Transmission Appliances.

Our flange couplings are all male and female design. We fit them to shafts under hydraulic pressure and afterwards face off to insure true alignment. Also we offer compression keyed-on, three-part keyless, universal joint and jaw clutch type couplings.

Our line of hangers and bearings and bearing supports includes different types, all heavy and well designed. Hanger frames are of the 4-way adjustment types. Bearings are either ring, collar or wick oiling or fitted with grease cups—adapted for ball and socket or screw adjustment. Pillow blocks of every style, including base plates, wall boxes, floor stands, brackets, etc.

Our V-groove type friction clutch, having an interchangeable sleeve to which may be fitted either a pulley, gear, sprocket or rope sheave, made solid or split construction, is noted for its great strength, matchless frictional power, simplicity and long life in service. Is adapted for conversion to cut-off coupling.

Pulleys.

Our steel rim pulley—light in weight, perfect in balance—is superior to any possible construction of pressed and riveted sheet steel, because stronger, stiffer, and will stay round. Made all sizes up to 16 ft. in diameter and 50-in. face. Our equipment for manufacture of cast iron pulleys, 3 in. to 16 ft. in diameter, is complete from the best foundry conditions and the most modern types of moulding machines to the highest efficiency in machine-shop practice. Medart wood split pulleys do the work—and they will last as long as the shafting will last.

Our heavy duty "Hercules" all-steel pulley is matchless. It will withstand successfully more abuse than any other make or construction of pulley. It is built to suit specific conditions, and guaranteed on a money-back basis.

Gears.

It does not matter what is needed in gears—we can build them. We have thousands of patterns, and, besides, the most efficient moulding machines and gear cutting shop equipment.

General Catalogue, etc.

Send for our General Catalogue and discounts. Let us quote your next specifications.

GEO. W. PYOTT CO.

Manufacturers of Power Transmission Appliances; Elevating and Conveying Machinery

TELEPHONE:

HAYMARKET 8100

OFFICE AND WORKS

North Avenue and Noble Street
CHICAGO, ILL.

Products.

A complete line of POWER TRANSMISSION MACHINERY. Some of the articles included in this line and described herewith are:

LINE SHAFT HANGERS.

GEARS of all types.

CAST IRON PULLEYS.

PYOTT BALL BEARING LOOSE PULLEYS.

CAST IRON SPROCKET WHEELS, Plain or Chilled

Rims.

ROPE TRANSMISSION.

PYOTT CROWLEY FRICTION CLUTCH.

PYOTT CROWLEY CLUTCH PULLEY.

The GEO. W. PYOTT Co. will supply promptly everything required for the Mechanical Transmission of Power.

Also manufacturers of Package and Barrel Elevators, Spiral Conveyors, and Belt Conveying Systems.

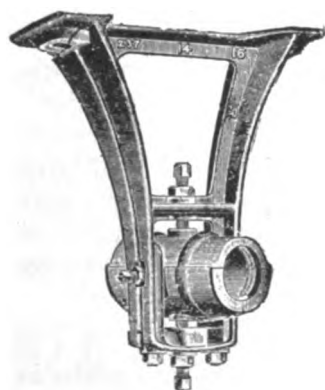
Line Shaft Hangers.

This company manufactures and keeps in stock a complete line of 4-point adjustable hangers, pillow blocks, wall brackets and floor stands.

Having side as well as vertical adjustment it is much easier to erect and correctly align them than the older types. Where buildings have settled or shrunk, it is only necessary to readjust the set screws, without moving the frame, to relieve the pressure on the bearings caused when the alignment is disturbed.

These frames can also be fitted with Pyott standard ring oiling boxes as shown.

All other types of line shaft and factory equipment are also manufactured.



LINE SHAFT EQUIPMENT OF ALL TYPES

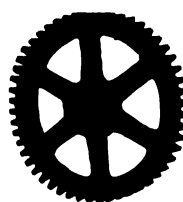
Gears.

All types of gears, cast or cut teeth.

Cut gears made of cast steel, forged steel, cast iron, bronze, rawhide or Bakelite in any size up to an 80-in. diameter.

The GEO. W. PYOTT Co. can furnish gears with involute stub teeth having a 20° pressure angle at a similar price to those with the common tooth form of 14½° angle. All spiral, spur and worm gears hobbled in machines of the most modern design.

Prices furnished on request. This company makes a specialty of filling gear orders on short notice, thus avoiding the expensive delay due to plant tie up.



SPUR GEAR



WORM GEAR



BEVEL GEAR

Cast Iron Pulleys.

Cast iron pulleys are permanent and are suited to a wider range of service than any other type of pulley.

Pyott pulleys are commercially perfect, symmetrical in appearance, accurately balanced, strong and true running.

This company also manufactures the Pyott stock split pulley with standard bore and interchangeable bushings.

Pulleys up to and including 36 in. in diameter are balanced to perform standard transmission work at a speed not in excess of 300 r.p.m., and pulleys 37 in. in diameter and over at a rim speed not in excess of 3000 ft. per minute.



PLAIN CAST IRON PULLEY

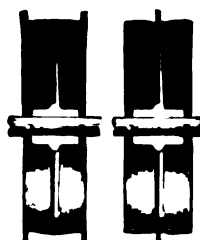


Fig. 7 Fig. 8
FLANGED PULLEYS



Fig. 10, Style "A"
TIGHT AND LOOSE PULLEYS



Fig. 11, Style "B"

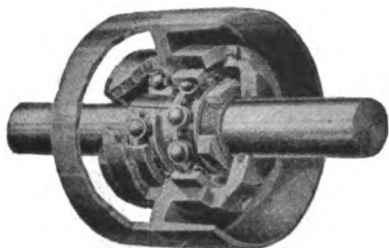
Pyott Ball Bearing Loose Pulleys.

This company's ball bearing loose pulleys have established their permanence by their performance. They are simple in construction and mechanically correct.

Can not wear the shaft and require but little attention. A little lubricant occasionally is all that is necessary to keep them in good running order. Will carry belt at any working load or speed without heating.

Pyott ball bearing loose pulleys are dustproof, clean and noiseless.

Installed in a plant, they will obviate all loose pulley troubles.



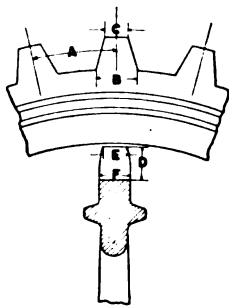
BALL BEARING LOOSE PULLEY

Cast Iron Sprocket Wheels, Plain or Chilled Rims.

Sprocket wheels suitable for all types of chain can be furnished and they can be fitted with jaw clutches or with friction clutches. Also gap wheels for dragline conveyors.



CAST IRON SPROCKET WHEEL



DIMENSION DIAGRAM

DIMENSIONS IN INCHES

Chain No.	A	B	C	D	E	F
25	3/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
32	1 1/8	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
33	1 1/8	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
35	1 1/8	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
42	1 1/8	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
51	1 1/8	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
52	1 1/8	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
57	2 1/8	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
62	1 1/8	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
66	1 1/8	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
78	2 1/8	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
85	4 3/8	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
103	3 3/8	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
124	4 3/8	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2

Rope Transmission.

Complete installations of either American or English system drives. Rope sheaves with grooves of every description also furnished; tension carriages, track, track hangers, tail rope sheaves and weights.

Also V belt sheaves for short center drives.

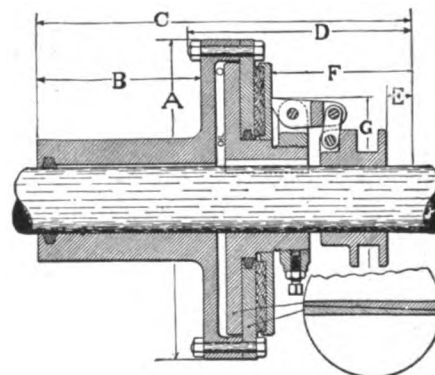


CAST IRON SHEAVE FOR MANILA OR WIRE ROPE

Pyott Crowley Friction Clutch.

The advantage of the Geo. W. Pyott Crowley friction clutch lies in its unequalled simplicity and enormous pulling power.

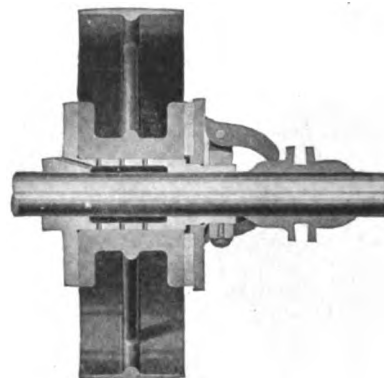
Has a guaranteed greater pulling power than any other friction clutch. Built for unusual strain and hard service. Moving parts run in oil incased from dust. One setscrew adjustment. Pulls with tapered wedge, disks rotating in opposite directions. No end thrust, instant release, no springs.



CROSS SECTION, PYOTT CROWLEY FRICTION CLUTCH

Pyott Crowley Clutch Pulley.

For countershaft and light drives, the Geo. W. Pyott Crowley clutch pulley as shown in accompanying illustration is recommended.



CROSS SECTION, PYOTT CROWLEY CLUTCH PULLEY

T. B. WOOD'S SONS COMPANY

Power Transmission Machinery

CHAMBERSBURG, PA.

Product.

The T. B. WOOD'S SONS COMPANY line of POWER TRANSMISSION EQUIPMENT; a few of the articles comprising the line are described herewith as follows:

SAFETY SET COLLARS.

COUPLINGS.

HANGERS.

PILLOW BLOCKS.

CAST IRON PULLEYS.

FRICTION CLUTCHES.

BELT TIGHTENERS.

BELT and CLUTCH SHIFTING MECHANISMS.

ROPE TRANSMISSION, both AMERICAN and ENGLISH SYSTEMS.

COUNTERSHAFTS.

In addition to these we are in position to furnish on short notice any article necessary for the Mechanical Transmission of Power.

Safety Set Collars.

Made either solid or split, bored for all sizes of shafting. Finished all over and fitted with hardened set-screws.

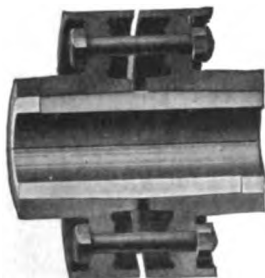
All screws, bolts and nuts are protected by flanges projecting beyond heads and nuts.



SAFETY SET COLLAR

Couplings.

This line consists of flange or plate couplings, double cone, ribbed and Universal Giant compression couplings, the latter being the coupling that requires no keys; shifting jaw clutch couplings, either spiral or square jaws, solid sleeve and Universal joint couplings.



UNIVERSAL GIANT COMPRESSION COUPLING

Hangers.

Many different types of hangers are included in this line, all of a modern design, possessing unique adjusting and power saving features, fitted with either ring or chain oiling or plain grease cup bearings.

This company is also prepared to equip hangers with closed end bearings and bearings recessed for concealed collars. This line comprises line shaft, heavy and extra heavy headshaft drop hangers, post hangers and bracket hangers, being made in both the ball and socket or the four-setscrew or Peerless types.

Adjustable girder clamps of a unique design are also made by this company for attaching its hangers to steel girders.

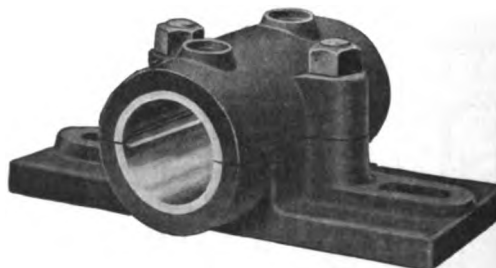


HEADSHAFT HANGER

Pillow Blocks.

From many different patterns, this company is prepared to supply rigid and adjustable pillow blocks suitable for operation under various conditions.

This classification comprises plain flat boxes, standard rigid, wick, ring and chain oiling rigid pillow blocks and post boxes, solid journal boxes, ball and socket and four-setscrew ring oiling adjustable pillow blocks; also plain or wedge adjusting cast iron and steel arch wall frames, base plates, cast iron wall brackets, plain or wedge adjusting ball and socket floor stands and fire wall sleeves.



PILLOW BLOCK

Cast Iron Pulleys.

This company manufactures and is prepared to furnish cast iron pulleys of every description, all of a correct design, having metal properly distributed.

These cast iron pulleys are machine moulded, carefully finished and well balanced.



CAST IRON PULLEY

Universal Giant Friction Clutches.

These clutches are of the disk type, of a consistent design throughout and are made either solid or split, the same type of construction being used for all sizes and all speeds.

The clutch is complete within itself either for use as a cut-off coupling or in connection with ordinary pulleys, gears, rope sheaves, sprockets or any regular or special part that it is desired to use as a driving or driven mechanism.

The sleeve and body of this clutch being independent, both are held rigidly in lateral position upon mounting and sustain no end thrust whatever when the clutch is thrown in or out of engagement. The friction surfaces are protected from dust, dirt and other foreign substances.

If desired, clutch may be equipped with special cover to protect mechanism.

All styles of shifting devices can be supplied including fork and lever stands, compound levers, worm geared and single or double spur geared shifter stands.

Also, stationary and adjustable mule pulley stands and single and double brace binder frames.

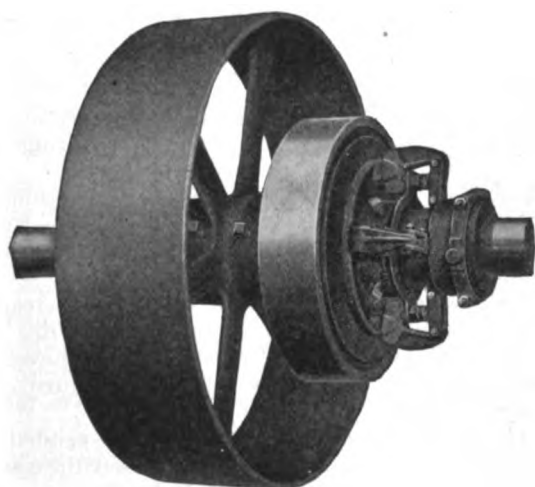
Belt and Clutch Shifting Mechanism.

Belt shifters supplied which may be attached to any of the hangers; and for friction clutches, fork and lever stands, compound levers, worm geared and single or double spur geared shifter stands can be supplied.

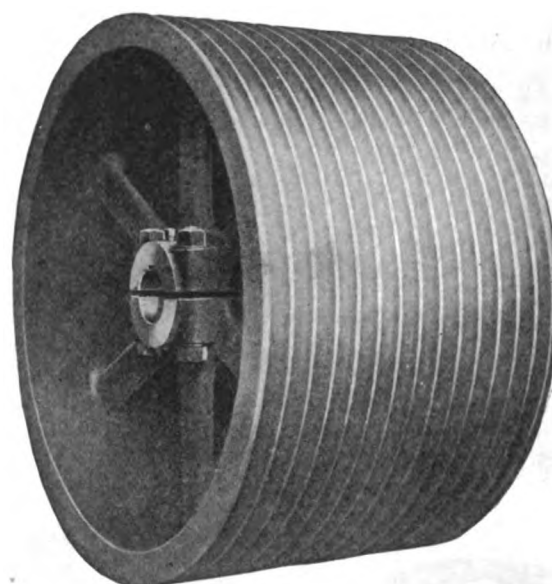
Rope Transmission.

Complete installations of either American or English system drives. Rope sheaves with grooves of every description also furnished; tension carriages, track, track hangers, tail rope sheaves and weights.

A corps of competent engineers, with years of experience in designing and installing satisfactory rope driving equipments, is always ready to plan drives to meet conditions as they may exist.



UNIVERSAL GIANT FRICTION CLUTCH



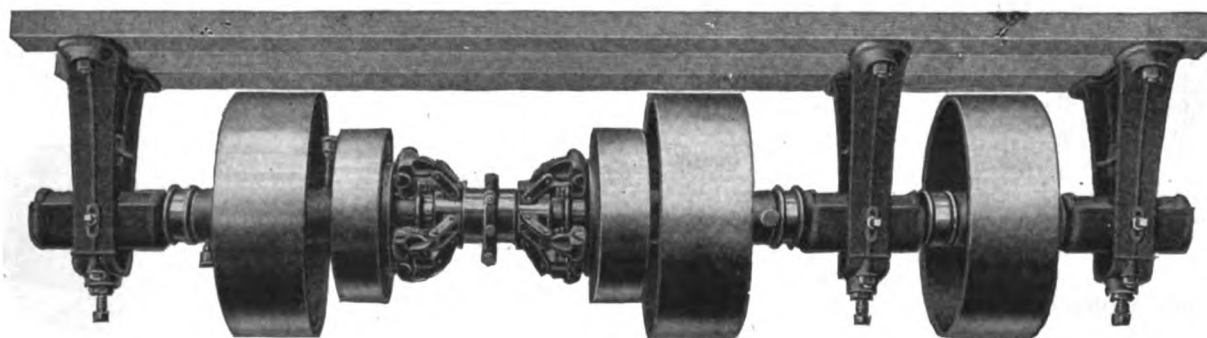
ROPE SHEAVE

Belt Tighteners.

Included in this line are belt tighteners made with "A" frames and vertical side frames, all with screw adjustment; in addition, rack and pinion tighteners for horizontal or vertical use, also swinging tighteners.

Countershafts.

By assembling standard equipment, this company is able to economically produce in a very short time, a line of countershafts that have never been surpassed either as to quality of workmanship and efficiency, or variety of design.



COUNTERSHAFT

REEVES PULLEY COMPANY

COLUMBUS, IND.

Products.

- "THE REEVES" WOOD SPLIT PULLEY.
- "THE REEVES" WOOD SPLIT PULLEY CLUTCH.
- "THE REEVES" VARIABLE SPEED TRANSMISSION.

Wood Split Pulley.

"The Reeves" Wood Split Pulley is built of thoroughly seasoned, kiln dried and acclimated hardwood, so that such a thing as shrinking or swelling of wood in "The Reeves" Pulley is unknown.

The rim segments are cut to uniform dimensions and laid in hot glue of the highest grade and each one quadruply nailed, forming a rim that is next to indestructible.

The arms are placed edgewise to the load, extend through and are built into the rim, being both glued and nailed together. Wind resistance is reduced to a negligible consideration by the edgewise construction and the openings between the arms. "The Reeves" arms support the rim its full width, whereas, the rim of a steel or iron pulley is supported only at the center.

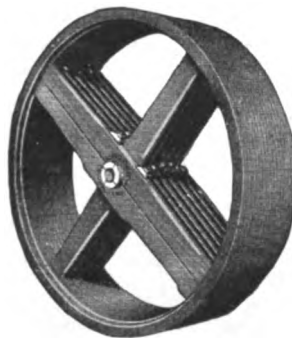
"The Reeves" Pulley is finished with moistureproof shellac varnish, is not affected by climatic changes, steam or acid fumes.



BLOCK PULLEY
Under 10 in. in diameter



SINGLE ARM WOOD SPLIT
PULLEY
10 to 34 in. in diameter



DOUBLE ARM WOOD SPLIT
PULLEY
36 in. in diameter and larger

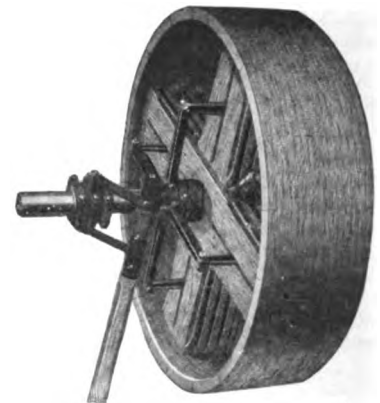
Can be used any place where it does not come in direct contact with water.

"The Reeves" Pulley is stronger than a metal pulley, is from 40% to 80% lighter, costs considerably less and will transmit more power with equal belt tension.

Wood Split Pulley Clutch.

"The Reeves" Wood Split Pulley Clutch is a complete self-contained friction clutch with but fourteen parts, only six of which move or have any wear in the single arm type, and ten in the double arm type. Combined with this extreme simplicity is great strength, accessibility of parts, ease of erection and operation. The belt wheel is the reliable "The Reeves" Wood

Split Pulley, which has achieved such unparalleled success in the power transmission field in the past thirty years. Every part is made split so the clutch may be placed on the shaft quickly by any one capable of using an ordinary wrench and without disturbing any other equipment. Manufactured in any size from 16-in. diameter up to 120-in.



"THE REEVES" WOOD SPLIT
PULLEY CLUTCH

Variable Speed Transmission.

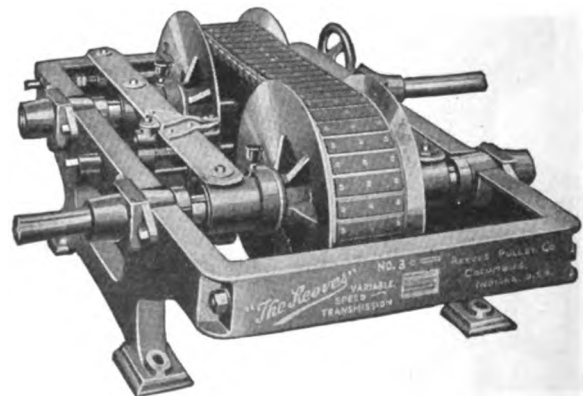
"The Reeves" Variable Speed Transmission is applicable to any machine of any nature requiring speed changes.

Wherever step cones, taper cones, expanding pulleys, gears, variable speed engines, variable speed motor or other makeshift devices have been used, "The Reeves" Transmission may be applied.

It gives quickly any speed between fastest and slowest, without stopping; does not step from one speed to another, but gives gradual change, steady power and perfect control of the machine driven. A turn of the hand wheel secures just the speed needed.

"The Reeves" Transmission may be suspended from the ceiling, or set upon the floor and used the same as an ordinary countershaft. You belt direct from the line shaft or motor to one shaft of the transmission which is driven at a constant speed while the other shaft is variable. From the variable shaft you belt to the machine to be regulated. Either shaft may be used as driver or driven.

These transmissions are built in 14 sizes to transmit anywhere from 2 h.p. to 150 h.p. and in 7 classes to provide variation as low as 2 to 1 or as high as 10 to 1.



"THE REEVES" VARIABLE SPEED TRANSMISSION

Catalogues.

Write for special catalogues of the above lines.

THE FAFNIR BEARING COMPANY

CONRAD PATENT LICENSEE

Double Ball Bearing Hanger Boxes

NEW BRITAIN, CONN.

BRANCH OFFICES

DETROIT, MICH., 752 David Whitney Building
CLEVELAND, OHIO, 916-17 Swetland BuildingCHICAGO, ILL., 1301 Michigan Avenue
NEW YORK, N. Y., 5 Columbus Circle

Products.

DOUBLE BALL BEARING HANGER BOXES.
BALL BEARINGS.

Double Ball Bearing Hanger Boxes.

The astounding amount of power wasted daily through poor line shaft bearings in hundreds of factories is not at all in keeping with the improvements in boiler plants and other equipment in many of these same factories. If this waste were unavoidable it would have to be tolerated, but such is not the case.

By replacing plain bearing boxes with Fafnir Double Ball Bearing Hanger Boxes, all loads are carried by high carbon, chrome alloy steel Fafnir Ball Bearings. It will result in 20% to 25% reduction in the power formerly required to run the loaded shafting; the power required in starting will be more than cut in half.

In the cross section below, particular attention is invited to the driving collar, which is an exclusive Fafnir

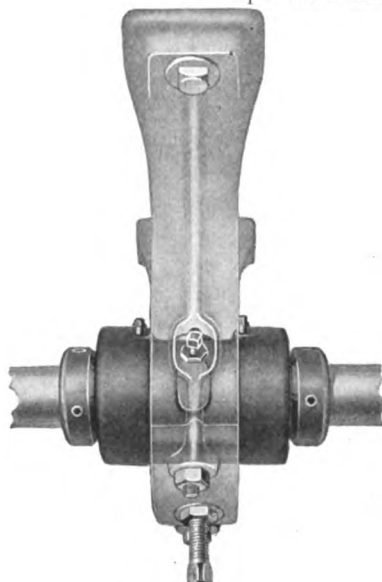
feature. A collar is secured to the shaft at each end of the box by large setscrews. These collars perform two important functions—they drive the ball bearing inner rings and transmit all end thrust loads to the balls.

Fafnir Double Ball Bearing Hanger Boxes are interchangeable with plain bearing boxes in any modern standard hanger frame, post hanger or adjustable pillow block. Furthermore, it is a very simple matter to install them, as it is only necessary to slip each box over the shaft as a unit, tighten the hanger screws and secure driving collars in position.

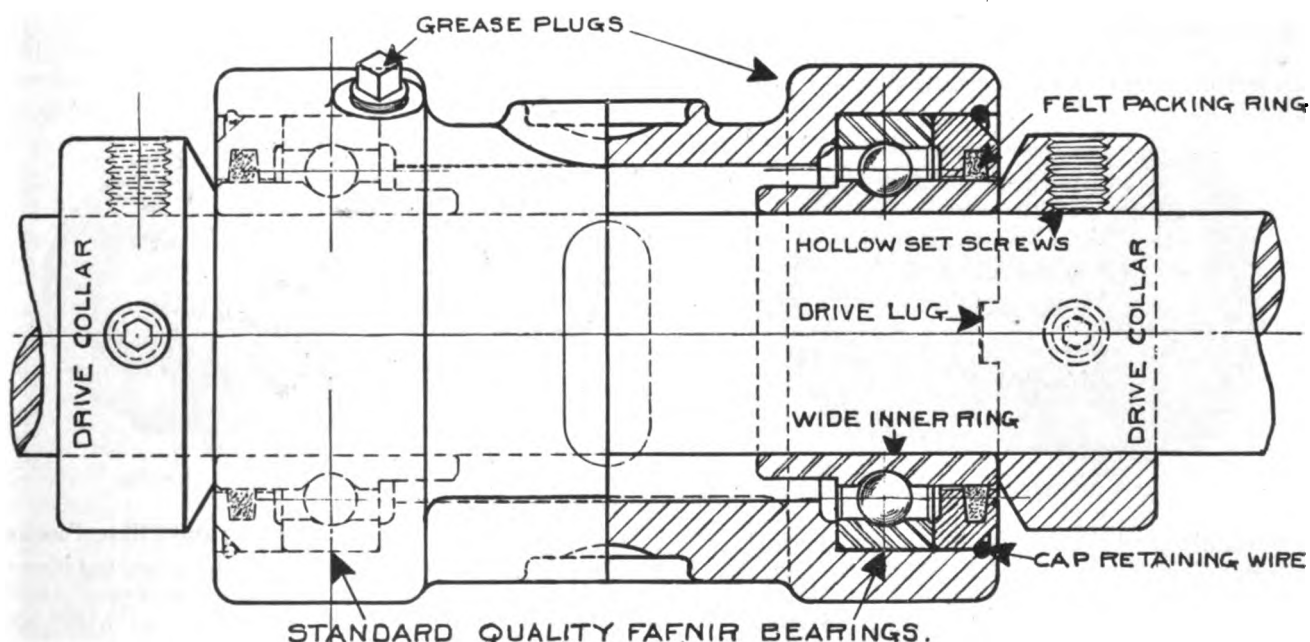
Fafnir Double Ball Bearing Hanger Boxes have proved to be a paying investment wherever they have been installed.

Fafnir Ball Bearings.

Fafnir Ball Bearings are manufactured in all standard types and sizes, including bearings with *wide type* inner rings for loose pulley applications.

FAFNIR DOUBLE BALL BEARING
HANGER BOX INSTALLED IN
FRAME

Box No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Shaft diam., in.	$\frac{1}{2}$	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{1}{8}$	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{3}{4}$
Wide inner bearing No.	1015	1103	1107	1111	1115	1203	1207	1211	1215	1303	1307	1311	1315
Price, box and bearings.	\$22.50	25.40	27.80	30.00	38.80	44.50	51.50	60.00	76.00	87.20	103.60	132.60	162.40



STANDARD QUALITY FAFNIR BEARINGS.

DETAILS OF FAFNIR DOUBLE BALL BEARING HANGER BOX

HYATT ROLLER BEARING CO.

NEW YORK, N. Y.

BRANCHES

CHICAGO, ILL.

DETROIT, MICH.

NEWARK, N. J.

Products.

FLEXIBLE ROLLER BEARINGS.
SHAFT HANGERS.
BEARING BOXES.
PILLOW BLOCKS.
POST HANGERS.

Scope of Use of Hyatt Roller Bearings.

Hyatt roller bearings are used for steel mill cars and roller tables, trolleys, cranes, hoists, machine tools of all kinds, line shafts, concrete machinery, all kinds of trucks and cars, textile machinery, conveyors, automobiles, tractors, mine cars, etc.

Roller Bearings.

These bearings are antifriction bearings that merit the careful consideration of every engineer, because they are designed and constructed according to sound engineering principles.

The chrome-vanadium steel rollers are heat treated to a hardness that successfully resists wear. Assembled in a correctly designed substantial cage, they provide an antifriction unit that is simple to apply and that is dependable and effective. Hyatt roller bearings have been used for years with unvarying success in industrial machinery.

The rapidly growing use of antifriction bearings in all classes of machinery to conserve power, to cut down lubrication and attention costs and to insure dependability of operation, is a matter of especial interest to every engineer.

Eventually antifriction bearings will entirely displace plain friction bearings as succeeding years increase the demand for more economical, more dependable operation of machinery. The gigantic wastes that have existed in our country due to its abundance of fuels

of the shaft and the bearing to stand up under shock loads without permanent deformation.

Line Shaft Roller Bearings.

Hyatt line shaft roller bearings are made for all standard sizes of shafting and, being split, can be slipped into position without removing pulleys, couplings or hangers.

The boxes are filled with oil after which they need not be lubricated for 4 months.

The bearing consists of a series of flexible rollers of chrome-vanadium steel, retained in position by a substantial steel cage. Being hollow and having helical openings throughout their length, the rollers continually cover all bearing surfaces with oil.

Hyatt bearings are sturdily and accurately constructed and give satisfactory service.

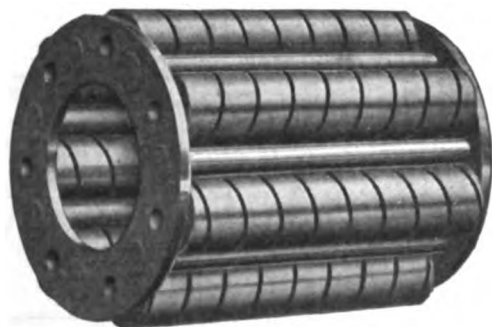
Many are still in operation after 25 to 30 years of practical service earning dividends through savings in power, oil and labor.

The widespread need for increased efficiency in production has caused more attention to be paid to the power savings made possible by reducing the friction of moving parts of machinery.

The perfection of anti-friction bearings has eliminated a large percentage of the power waste caused by ordinary friction bearings.

The true rolling motion of Hyatt line shaft roller bearings eliminates at least 50% of the friction that exists in plain babitted bearings, making possible a reduction of 15% of the total power.

By the use of Hyatt line shaft roller bearings present equipments can be increased without enlarging the power plant, or a 15% reduction in the power bill can be effected—a saving of special importance at this time.



HYATT ROLLER BEARING



HYATT LINE SHAFT ROLLER BEARING

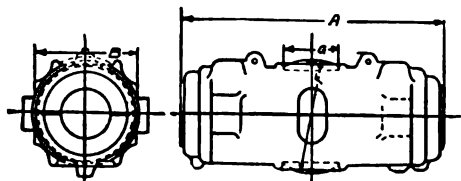
and materials are being slowly but surely checked, and antifriction bearings are one of the soundest means of eliminating these wastes.

By reason of the slight flexibility of the roller, Hyatt bearings carry the load on an area. This materially reduces the unit load and enables the surfaces

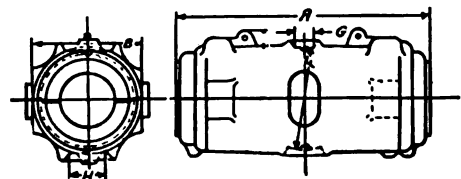
Hyatt Bearing Boxes, Shaft Hangers and Pillow Blocks.

This company is prepared to furnish bearing boxes, shaft hangers, pillow blocks and post hangers of excellent design and construction, dimensions of which are given on the following page.

Full information sent on request.



DIMENSION DIAGRAM OF BALL AND SOCKET B. & S. BEARING

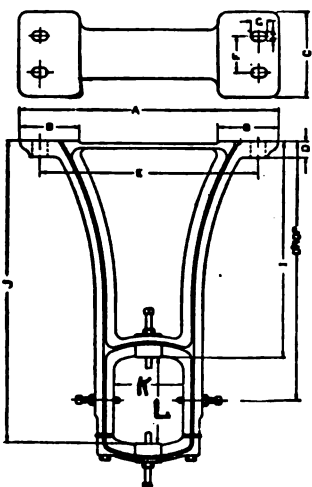


DIMENSION DIAGRAM OF UNIVERSAL GIANT FRAME U. G. BEARING

DIMENSIONS OF HYATT STANDARD BEARINGS

Either U. G. or B. & S. bearings may be used in four setscrew hangers

Diam. shaft, in.	Approx. weight, lbs.	A		B		F		G		H
		B. & S.	U. G.	B. & S.	U. G.	B. & S.	U. G.	B. & S.	U. G.	U. G.
1 1/4	11	8 1/4	8 1/4	3 3/8	3 3/8	3 3/8	3 3/8	1 1/4	1 1/4	1 1/4
1 1/2	14	9 1/4	9 1/4	3 3/8	3 3/8	3 3/8	3 3/8	1 1/4	1 1/4	1 1/4
1 3/4	22	10 1/4	10 1/4	4 1/4	4 1/4	4 1/4	4 1/4	1 3/4	1 3/4	1 3/4
2	38	11 1/2	11 1/2	4 1/4	4 1/4	4 1/4	4 1/4	1 3/4	1 3/4	1 3/4
2 1/4	46	13	13	5 1/8	5 1/8	5 1/8	5 1/8	1 3/4	1 3/4	1 3/4
2 1/2	60	14	14	5 1/8	5 1/8	5 1/8	5 1/8	1 3/4	1 3/4	1 3/4
2 3/4	67	15 1/4	15 1/4	5 1/8	5 1/8	5 1/8	5 1/8	1 3/4	1 3/4	1 3/4
3	110	16 1/2	16 1/2	6 1/8	6 1/8	6 1/8	6 1/8	2 1/4	2 1/4	2 1/4
3 1/4	182	17 1/4	17 1/4	7 1/4	7 1/4	7 1/4	7 1/4	2 1/4	2 1/4	2 1/4
3 1/2	230	19 1/2	19 1/2	8 1/4	8 1/4	8 1/4	8 1/4	2 1/4	2 1/4	2 1/4
3 3/4	280	20	20	8 1/4	8 1/4	8 1/4	8 1/4	2 1/4	2 1/4	2 1/4
4	330	22 1/4	22 1/4	9 1/4	9 1/4	9 1/4	9 1/4	2 1/4	2 1/4	2 1/4
4 1/4	380	24 1/4	24 1/4	10 1/4	10 1/4	10 1/4	10 1/4	2 1/4	2 1/4	2 1/4
5	500	30	30	12	12	12	12	2 1/4	2 1/4	2 1/4

DIMENSION DIAGRAM OF HYATT STANDARD SHAFT HANGERS
FOR 1 1/4- and 1 1/2-IN. SHAFT SIZES

Drop	A	B	C	D	E	F	G	H	I	J	Bolts
7	14 1/4	4 1/4	4 1/4	1 1/4	11	...	1 1/4	7/8	3 3/4	10 1/4	2-5/8
10	15 3/4	4 1/4	4 1/4	1 1/4	12	...	1 1/4	7/8	4 1/4	13 1/4	2-5/8
13	16 3/4	4 1/4	4 1/4	1 1/4	13	...	1 1/4	7/8	5 1/4	16 1/4	2-5/8
16	17 3/4	4 1/4	4 1/4	1 1/4	14	...	1 1/4	7/8	6 1/4	19 1/4	2-5/8
19	18 3/4	4 1/4	4 1/4	1 1/4	15	...	1 1/4	7/8	7 1/4	22 1/4	2-5/8
22	19 3/4	4 1/4	4 1/4	1 1/4	16	...	1 1/4	7/8	8 1/4	25 1/4	2-5/8
25	20 3/4	4 1/4	4 1/4	1 1/4	17	...	1 1/4	7/8	9 1/4	28 1/4	2-5/8
28	21 3/4	4 1/4	4 1/4	1 1/4	18	...	1 1/4	7/8	10 1/4	31 1/4	2-5/8

FOR 1 1/4- AND 2 1/4-IN. SHAFT SIZES

Drop	A	B	C	D	E	F	G	H	I	J	Bolts
7	17	4 1/4	5	1 1/4	13	...	1 1/4	7/8	3 3/4	10 1/4	2-5/8
10	18	4 1/4	5	1 1/4	14	...	1 1/4	7/8	4 1/4	13 1/4	2-5/8
13	19	4 1/4	5	1 1/4	15	...	1 1/4	7/8	5 1/4	16 1/4	2-5/8
16	20	4 1/4	5	1 1/4	16	...	1 1/4	7/8	6 1/4	19 1/4	2-5/8
19	21	5	7	1 3/4	17	...	1 1/4	7/8	7 1/4	22 1/4	4-1/2
22	22	5	7	1 3/4	18	...	1 1/4	7/8	8 1/4	25 1/4	4-1/2
25	23	5	7	1 3/4	19	...	1 1/4	7/8	9 1/4	28 1/4	4-1/2
28	24	5	7	1 3/4	20	...	1 1/4	7/8	10 1/4	31 1/4	4-1/2
31	25	5	7	1 3/4	21	...	1 1/4	7/8	11 1/4	34 1/4	4-1/2
34	26	5	7	1 3/4	22	...	1 1/4	7/8	12 1/4	37 1/4	5-1/2

FOR 2 1/4- AND 2 1/2-IN. SHAFT SIZES

Drop	A	B	C	D	E	F	G	H	I	J	Bolts
7	18 1/2	5 1/4	5 1/4	1 3/4	13 1/4	...	1 1/4	1	2 1/2	11 1/4	2-5/8
10	19 1/2	5 1/4	5 1/4	1 3/4	14 1/4	...	1 1/4	1	3 1/4	14 1/4	2-5/8
13	20 1/2	5 1/4	5 1/4	1 3/4	15 1/4	...	1 1/4	1	4 1/4	17 1/4	2-5/8
16	21 1/2	5 1/4	5 1/4	1 3/4	16 1/4	...	1 1/4	1	5 1/4	20 1/4	4-5/8
19	22 1/2	6	7 1/4	1 3/4	17 1/4	...	1 1/4	1	6 1/4	23 1/4	4-5/8
22	23 1/2	6	7 1/4	1 3/4	18 1/4	...	1 1/4	1	7 1/4	26 1/4	4-5/8
25	24 1/2	6	7 1/4	1 3/4	19 1/4	...	1 1/4	1	8 1/4	29 1/4	4-5/8
28	25 1/2	6	7 1/4	1 3/4	20 1/4	...	1 1/4	1	9 1/4	32 1/4	4-5/8
31	26 1/2	6	7 1/4	1 3/4	21 1/4	...	1 1/4	1	10 1/4	35 1/4	4-5/8
34	27 1/2	6	7 1/4	1 3/4	22 1/4	...	1 1/4	1	11 1/4	38 1/4	4-5/8

DIMENSIONS OF HYATT STANDARD SHAFT HANGERS (Continued)

FOR 2 1/4- AND 3 1/4-IN. SHAFT SIZES

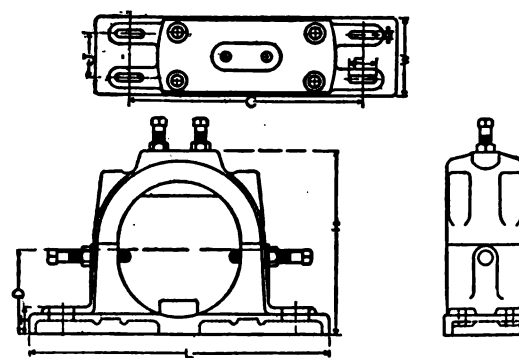
Drop	A	B	C	D	E	F	G	H	I	J	Bolts
7	20 1/2	6	6 1/4	1 1/4	15	...	2 1/4	1 1/4	2 1/4	11 1/4	2-5/8
10	21 1/2	6	6 1/4	1 1/4	16	...	2 1/4	1 1/4	2 1/4	14 1/4	2-5/8
13	22 1/2	6	6 1/4	1 1/4	17	...	2 1/4	1 1/4	2 1/4	17 1/4	2-5/8
16	23 1/2	6 1/4	8 1/4	1 1/4	18	...	2 1/4	1 1/4	2 1/4	20 1/4	4-5/8
19	24 1/2	6 1/4	8 1/4	1 1/4	19	...	2 1/4	1 1/4	2 1/4	23 1/4	4-5/8
22	25 1/2	6 1/4	8 1/4	1 1/4	20	...	2 1/4	1 1/4	2 1/4	26 1/4	4-5/8
25	26 1/2	6 1/4	8 1/4	1 1/4	21	...	2 1/4	1 1/4	2 1/4	29 1/4	4-5/8
28	27 1/2	6 1/4	8 1/4	1 1/4	22	...	2 1/4	1 1/4	2 1/4	32 1/4	4-5/8
31	28 1/2	6 1/4	8 1/4	1 1/4	23	...	2 1/4	1 1/4	2 1/4	35 1/4	4-5/8
34	29 1/2	6 1/4	8 1/4	1 1/4	24	...	2 1/4	1 1/4	2 1/4	38 1/4	4-5/8
36	30 1/2	6 1/4	8 1/4	1 1/4	25	...	2 1/4	1 1/4	2 1/4	40 1/4	4-5/8

FOR 3 1/4-IN. SHAFT SIZES

Drop	A	B	C	D	E	F	G	H	I	J	Bolts
7	20 1/2	7	6 1/4	1 1/4	14 1/2	...	1 1/4	1 1/4	3 1/4	12 3/4	2-1
10	20 1/2	7 1/2	8	1 1/4	14 1/2	...	1 1/4	1	5 1/4	14 3/4	4-7/8
13	20 1/2	7 1/2	8	1 1/4	14 1/2	...	1 1/4	1	8 1/4	17 3/4	4-7/8
16	21 1/4	7 1/2	8	1 1/4	15 1/4	...	1 1/4	1	11 1/4	20 3/4	4-7/8
19	22 1/4	7 1/2	8	1 1/4	16 1/4	...	1 1/4	1	14 1/4	23 3/4	4-7/8
22	23 1/4	7 1/2	8	1 1/4	17 1/4	...	1 1/4	1	17 1/4	26 3/4	4-7/8
25	25 1/2	7 1/2	9 1/4	1 1/4	19 1/2	...	1 1/4	1	20 1/4	29 3/4	4-7/8
28	28	7 1/2	9 1/4	1 1/4	22	...	1 1/4	1	23 1/4	32 3/4	4-7/8
31	31 1/2	7 1/2	9 1/4	1 1/4	25	...	1 1/4	1	26 1/4	35 3/4	4-7/8
34	31 1/2	7 1/2	9 1/4	1 1/4	25	...	1 1/4	1	29 1/4	38 3/4	4-7/8
36	33	7 1/2	9 1/4	1 1/4	26 1/2	...	1 1/4	1	31 1/4	40 3/4	4-7/8

FOR 3 1/2- AND 3 3/4-IN. SHAFT SIZES

Drop	A	B	C	D	E	F	G	H	I	J	Bolts
10	24	7 1/4	7 1/4	10	2	18 1/4	4 1/4	2 1/4	1 1/4	...	4-7/8
13	25 1/4	7 1/4	7 1/4	10	2	19 1/4	4 1/4	2 1/4	1 1/4	...	4-7/8
16	26 1/4	7 1/4	7 1/4	10	2	20 1/4	4 1/4	2 1/4	1 1/4	...	4-7/8
19	28 1/4	8	12	2 1/4	21 1/4	6	2 1/4	1 1/4	...	...	4-7/8
22	30	8	12	2 1/4	23 1/4	6	2 1/4	1 1/4	...	...	4-7/8
25	31 1/4	8	12	2 1/4	25 1/4	6	2 1/4	1 1/4	...	...	4-7/8
28	33 1/4	8	12	2 1/4	26 1/4	6	2 1/4	1 1/4	...	...	4-7/8
31	34 1/4	8	12	2 1/4	28 1/4	6	2 1/4	1 1/4	...	...	4-7/8
34	36 1/4	8	12	2 1/4	30	6	2 1/4	1 1/4	...	...	4-7/8



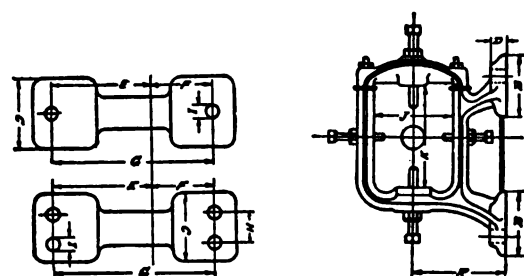
DIMENSION DIAGRAM OF HYATT CAST IRON PILLOW BLOCK FRAMES

Ball and socket seats make bearings self-aligning

Diam. shaft, in.	Dimensions									
	L	W	T	H	D	C	F	G	J*	
1 1/4-1 1/2	10 3/4	2 7/8	3/4	6 1/4	2 3/4	8 1/4	1	5/8	...	...
1 1/2-2	12 1/4	3 3/8	1 1/4	7 3/8	3 1/4	9 3/4	1 1/4	3/4	...	...
2-2 1/4	14 1/4	4 1/8	1 3/4	9 1/8	4 1/8	11 1/2	1 1/2	7/8	...	...
2 1/4-3	16	4 3/4	1 1/2	10 1/4	4 1/2	12 3/4	1 3/4	1	...	...
3-3 1/4	17 1/4	6	1 3/8	11 3/8	5 1/4	14	1 3/4	1 1/8	...	3 1/4
3 1/4-4 1/4	24 1/4	9	2	16 1/4	7 3/4	19 1/4	2 1/4	1 1/2	...	5
5 1/4-5 1/2	28 1/4	10 1/4	2 1/4	18 1/4	8 1/4	23	2 3/4	1 1/2	...	6

*Under J sizes not shown have one end hole.

Split frame—order ball and socket type Hyatt bearing for pillow block frame



DIMENSION DIAGRAMS OF HYATT CAST IRON POST HANGER FRAMES

FOOT-DRIVEN TABLES													
Diam. shaft, in.	Length of box, in.												
	A	B	C	D	E	F	G	H	I	J	K	R	
1 1/4-1 1/2	12	4	4	1	5 1/4	3 1/4	9 1/4	...	3/4	4 1/4	6	5	8 1/4-9 1/4
1 1/2-2	14 1/4	4 1/4	4 1/4	1 1/4	7 1/4	4 1/4	11 1/4	...	7/8	5 1/4	7 1/4	6	10 1/2-11 1/2
2-2 1/4	16 1/4	5	5	1 1/4	9 1/4	5 1/4	13 1/4	...	1	6 1/4	8 1/4	6 1/2	13
2 1/4-3	18 1/4	6	6	1 3/8	11 1/4	6 1/4	15 1/4	...	1 1/4	7 1/4	9 1/4	8	14-15 1/4
3-3 1/4	21 1/4	7	7	1 3/8	13 1/4	7 1/4	17 1/4	...	1 1/2	8 1/4	9 1/4	9 1/4	16 1/2-17 1/4
3 1/4-4 1/4	25 1/4	9	9	1 10/16	15 1/4	8 1/4	19 1/4	...	1 3/4	9 1/4	12	12	19 1/2-20-22 1/4
4 1/4-5 1/4	28 1/4	11 1/4	11 1/4	2	17 1/4	9 1/4	21 1/4	...	2	11 1/4	13 1/4	13 1/4	24 1/2-24 3/4

G-A BALL BEARING MANUFACTURING CO.

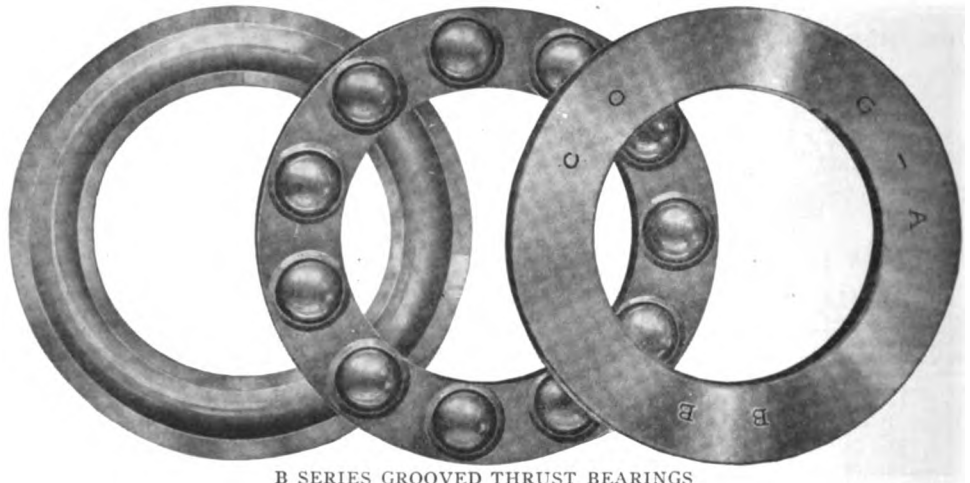
123 to 141 Albany Avenue
CHICAGO, ILL.

Products.

G-A BALL THRUST BEARINGS.

Material.

The rings of these bearings are made of the highest grade chrome bearing steel, free (commercially) from such impurities as sulphur and phosphorus; hence, a supreme quality. These rings are hardened by a special process whereby every ring is subjected to the same heat, rendering the metal hard and tough and superior in every way to the results obtained by case hardening. The balls used are of the very highest grade of chrome steel balls, being accurate to within 0.0001 in.

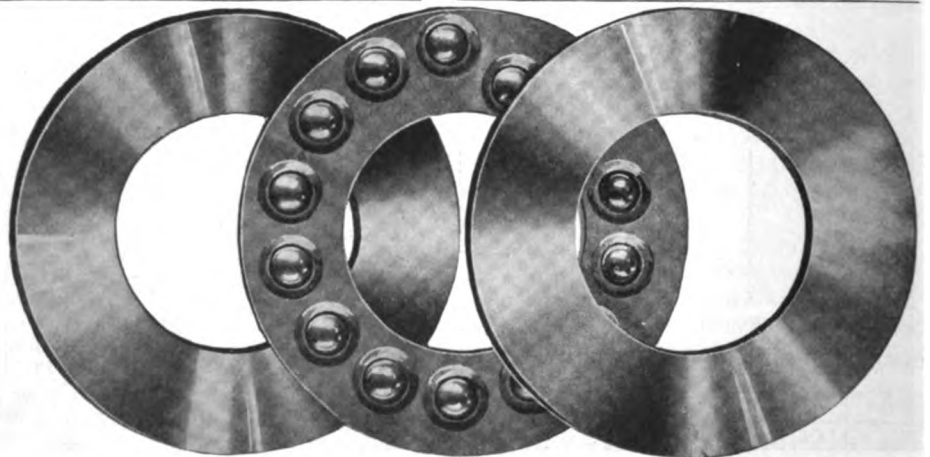


B SERIES GROOVED THRUST BEARINGS
One direction; grooved races; flat seats; inch standard

No. of bearings	Inside diameter, in.	Outside diameter, in.	Height, in.	Balls, in.	Price	No. of bearings	Inside diameter, in.	Outside diameter, in.	Height, in.	Balls, in.	Price
1-B	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{4}$	\$4.25	10-B	$1\frac{1}{2}$	$2\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	\$8.25
2-B	$\frac{3}{8}$	$1\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{4}$	4.60	11-B	$1\frac{3}{4}$	$2\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	9.20
3-B	$\frac{3}{4}$	$1\frac{3}{4}$	$\frac{3}{8}$	$\frac{1}{4}$	5.00	12-B	$1\frac{7}{8}$	$2\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	10.00
4-B	$\frac{7}{8}$	$1\frac{3}{4}$	$\frac{3}{8}$	$\frac{1}{4}$	5.40	13-B	2	$2\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	10.85
5-B	1	$1\frac{3}{4}$	$\frac{3}{8}$	$\frac{1}{4}$	5.85	14-B	$2\frac{1}{4}$	$3\frac{1}{4}$	$\frac{7}{8}$	$\frac{1}{2}$	12.25
6-B	$1\frac{1}{8}$	$1\frac{3}{4}$	$\frac{3}{8}$	$\frac{1}{4}$	6.25	15-B	$2\frac{1}{2}$	$3\frac{1}{4}$	1	$\frac{1}{2}$	14.40
7-B	$1\frac{1}{4}$	$2\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{2}$	6.60	16-B	$2\frac{3}{4}$	4	1	$\frac{1}{2}$	16.80
8-B	$1\frac{3}{8}$	$2\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{2}$	7.00	17-B	3	$4\frac{1}{4}$	$1\frac{1}{8}$	$\frac{1}{2}$	18.60
9-B	$1\frac{1}{2}$	$2\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{2}$	7.50	18-B	$3\frac{1}{2}$	5	$1\frac{1}{4}$	$\frac{1}{2}$	27.75
						19-B	4	$5\frac{3}{4}$	$1\frac{3}{8}$	$\frac{1}{2}$	35.00

Thrust Washers.

The races of the "C" series bearings are flat. The load carrying capacity of the bearing is, therefore, considerably less than that of thrust bearings with grooved races. The bearings are not recommended for high speed work.



C SERIES THRUST WASHERS
One direction; flat races and seats; inch standard

No. of bearings	Inside diameter, in.	Outside diameter, in.	Height, in.	Balls, in.	Price	No. of bearings	Inside diameter, in.	Outside diameter, in.	Height, in.	Balls, in.	Price
1-C	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{4}$	\$2.40	18-C	$1\frac{1}{2}$	$2\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{4}$	\$3.90
2-C	$\frac{3}{8}$	$1\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	2.40	19-C	$1\frac{3}{8}$	$2\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{4}$	5.25
3-C	$\frac{3}{4}$	$1\frac{3}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	2.40	20-C	$1\frac{7}{8}$	$2\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{4}$	5.25
4-C	$\frac{7}{8}$	$1\frac{3}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	2.40	21-C	$1\frac{7}{8}$	$3\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	5.25
5-C	$\frac{1}{2}$	$1\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	2.70	22-C	$1\frac{1}{2}$	$2\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{4}$	5.25
6-C	$\frac{3}{8}$	$1\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	2.70	23-C	$1\frac{3}{8}$	$3\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	6.75
7-C	$\frac{7}{8}$	$1\frac{3}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	2.70	24-C	$1\frac{7}{8}$	$3\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	6.75
8-C	$\frac{1}{2}$	$1\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	2.70	25-C	2	$3\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	6.75
9-C	1	$1\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	2.70	26-C	$2\frac{1}{4}$	$3\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	7.50
10-C	$1\frac{1}{4}$	$1\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{4}$	2.70	27-C	$2\frac{3}{4}$	$3\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	7.50
11-C	$1\frac{1}{4}$	$2\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	3.00	28-C	$2\frac{3}{4}$	$3\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	8.25
12-C	$1\frac{1}{4}$	$2\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	3.00	29-C	$2\frac{1}{2}$	$3\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	8.25
13-C	$1\frac{1}{4}$	$2\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	3.00	30-C	$2\frac{3}{4}$	$4\frac{1}{4}$	1	$\frac{1}{4}$	9.00
14-C	$1\frac{1}{4}$	$2\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	3.00	31-C	$2\frac{3}{4}$	$4\frac{1}{4}$	1	$\frac{1}{4}$	9.00
15-C	$1\frac{1}{2}$	$2\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	3.90	32-C	3	$4\frac{1}{4}$	1	$\frac{1}{4}$	9.75
16-C	$1\frac{1}{2}$	$2\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	3.90	33-C	$3\frac{1}{2}$	$4\frac{1}{4}$	1	$\frac{1}{4}$	13.50
17-C	$1\frac{1}{2}$	$2\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	3.90	34-C	$3\frac{1}{2}$	$5\frac{1}{4}$	1	$\frac{1}{4}$	18.00

THE NORMA COMPANY OF AMERICA

High Speed Antifriction Bearings and Precision Measuring Instruments

Anable Avenue

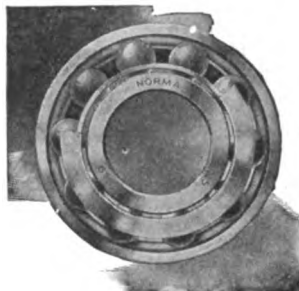
LONG ISLAND CITY, N. Y.

Products.

"NORMA" BALL BEARINGS; "NORMA" ROLLER BEARINGS; "NORMA" THRUST BEARINGS; "NORMA" COMBINATION RADIAL and THRUST BEARINGS; "MINIMETER" MEASURING INSTRUMENTS.

"Norma" Ball Bearings.

These are essentially high speed, high duty bearings preëminently adapted to conditions where long service and silent running are sought, under high speed operation. It must be evident that a bearing that will give satisfaction at high speeds will maintain the same high standard of performance at low and moderate speeds.



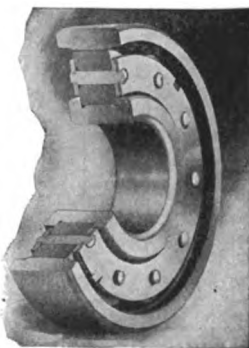
"NORMA" BALL BEARING

The silence and speedability of the "Norma" bearing are due to the following distinctive features: open type and separable construction giving instant access without tools to every part for inspection or cleaning, facilitating lubrication, and permitting the independent rigid mounting of both inner and outer races; rigid mounting of both races preventing wear in the housing, with consequent vibration and noise and misalignment; extremely high precision maintained by the use of the "Minimeter"; materials of high quality improved by special treatments; workmanship and inspection of extreme refinement.

Made in both single and double types, in all the internationally standardized sizes.

"Norma" Roller Bearings.

These heavy duty, high efficiency units are preëminently adapted for service where shock, jar, vibration, and wide and sudden load variations will be encountered—service destructive to even the best ball bearing. One exclusive feature of the "Norma" roller bearing is that it has twice the steady load capacity of a ball bearing of the same dimensions, and a temporary overload capacity up to 50% of its own rating. Its unique feature of design is the use of cylindrical rollers between a cylindrical inner race and a convex outer race. It has all the distinctive "Norma" characteristics of design and construction: open, separable type; rigid mounting of both inner and outer races; extremely high precision; speed qualities second only to the "Norma" ball bearing.



"NORMA" ROLLER BEARING

Made in all the internationally standardized ball bearing sizes.

"Norma" Thrust Bearings.

In these units "Norma" standards of design and precision have been applied to the making of bearings with maximum efficiency under end thrust—it being

"NORMA"

TRADE-MARK

understood that even the best thrust

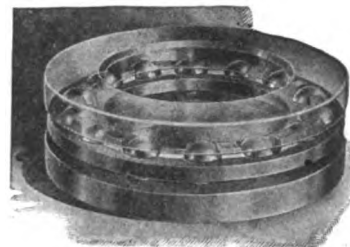
bearing can be only a compromise with true antifriction principles. "Norma" thrust bearings have the durability and the speed qualities which come with correct design, superior materials, and unsurpassed precision of dimensions—they are high speed, silent running bearings. They can be furnished in both single and double types, either with or without housings, as conditions require. The housed types have the advantages of being self-contained and preadjusted.

Made in all the internationally standardized thrust bearing sizes.

"Norma" Combination Bearings.

These high duty units afford the complete solution of that difficult problem—handling a combined radial and thrust load with the maximum of efficiency. In essentials they consist of a standard "Norma" radial unit and a standard "Norma" thrust unit united in one housing

that is self-contained and preadjusted to the limit of exactness. Two types are offered: "Norma" combined annular ball and ball thrust bearing, and "Norma" combined roller and ball thrust bearing.



"NORMA" THRUST BEARING



"NORMA" COMBINATION ANNULAR BALL AND BALL THRUST BEARING

"Minimeter" Measuring Instrument.

This instrument brings to manufacturing on a commercial scale that degree of precision in measurement which otherwise can not be obtained outside the scientific laboratory. It is a device which, measuring to the 1/10,000 part of an inch, entirely eliminates the personal equation of the operator—the feel, the touch. Its use reduces duplicate part production, interchangeable manufacture, to scientific accuracy. It is furnished in a great variety of mountings, for practically every class of internal and external measurement.

Co-operative Service.

The company's Engineering Department is at the service of any one interested in the adoption or application of antifriction bearings for any purpose. This service is maintained and freely rendered in the conviction, based upon experience and observation, that the selection of the proper type of bearing for a specific duty, and its proper mounting, are as important as the quality of the bearing itself, in the effect upon the results accomplished and upon the performance realized.

ROYERSFORD FOUNDRY & MACHINE CO.

Manufacturers of Power Plant Specialties

52 North Fifth Street
PHILADELPHIA, PA.

Products.

OLD RELIABLE "SELLS" ROLLER BEARINGS; COMPRESSION COUPLINGS; UNIVERSAL RING OILING HANGERS; SAFETY SET COLLARS; BRACKET HANGERS; PILLOW BLOCKS; COMBINATION OIL or GREASE GUNS; "ROLLERINE," the ball and roller bearing lubricant.

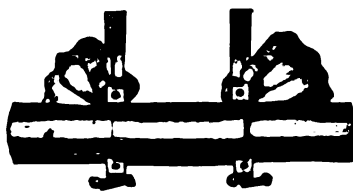
Also manufacturers of Power Transmission Machinery, Grinders, Shears, Punches, Dies, Sensitive Drill Presses, Foot Presses, Grinding and Polishing Machines, Tumbling Barrels.

Roller Bearings.

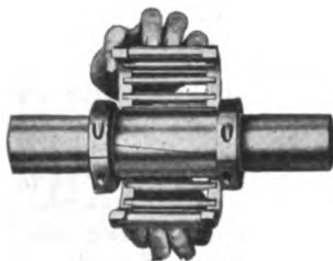
"Sells" roller bearings are made single and double roller structure, the single type being adaptable for all ordinary service. The double structure is intended for exceptionally heavy belt pulls, such as are found near most driving pulleys.



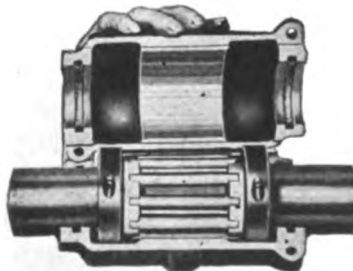
The Split Bushing



The Split Collar



The Split Roller Structure



The Split Box

DETAILS OF "SELLS" SINGLE ROLLER BEARINGS

Construction—
"Sells" roller bearings are split throughout and are therefore easily applied to existing shafting. And they fit practically all hangers, post hangers and pillow blocks. An exclusive feature of "Sells" roller bearings is the sleeve of high carbon steel that fits over the soft shaft, covering the ridges and gullies worn by the former bearing and protecting the shaft from future wear.

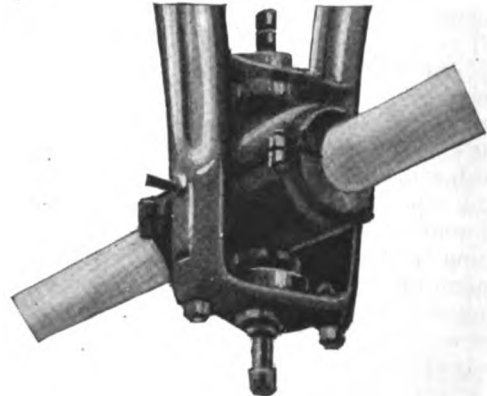
There is a lining of similar high carbon steel in the raceway of the housing to protect it from wear.

The rollers are held apart and parallel to each other, the shafting and the raceway—in addition, the "Sells" roller bearing is a full floating type.

Friction is obviously eliminated at every point.

Guarantee—In back of "Sells" roller bearings is a guarantee that it will cut the friction load in half, and reduce power costs at least 10%.

References—Sells roller bearings have been installed in thousands of factories, mills, foundries and plants. A few nationally known users are: Dodge Brothers; Gillette Safety Razor Company; French, Shriner & Urner; The Millers Milling Company; Aunt Jemima Mills Company, and United Shoe Machinery Company.



"SELLS" ROLLER BEARING INSTALLED

They fit in practically all existing hangers, post hangers and pillow blocks

DATA, "SELLS" ROLLER BEARING BOXES
With Single Roller Structure for Line Shafts and Counter Shafts

Size of shaft, in.	Length of box, in.	Width of box, in.	Height of box, in.	Prices	Code
1 1/4 & 1 1/2	6 1/2	2 1/2	2 1/4	\$6.00	Ibox
1 1/2 & 1 3/4	6 1/2	3	3 1/4	7.00	Ics
1 3/4 & 2	7 1/2	3 1/2	3 1/2	8.00	Idea
2 & 2 1/4	8	3 3/4	4 1/4	9.50	Idiot
2 1/4 & 2 1/2	8 1/2	3 1/2	4 1/2	11.00	Idol
2 1/2 & 2 3/4	9 1/2	4 1/2	5 1/4	13.50	Ignite
2 3/4 & 3	10 1/2	4 1/2	5 1/2	15.50	Ilk
3 & 3 1/4	10 1/2	5 1/2	6 1/4	19.00	Image
3 1/4 & 3 1/2	11	5 1/2	6 1/2	22.50	Imbibe
3 1/2 & 3 3/4	11 1/2	5 1/2	6 3/4	34.50	Immerse
3 3/4 & 4	12 1/2	6 1/2	7 1/4	38.50	Impose
4 & 4 1/4	14 1/2	6 1/2	7 1/2	67.00	Imposter
4 1/4 & 4 1/2	15	7 1/2	7 3/4	77.00	Improve
4 1/2 & 4 3/4	15 1/2	7 1/2	8 1/4	88.00	Inapt
4 3/4 & 5	16 1/2	8	8 1/2	100.00	Inca
5 & 5 1/4	16 1/2	8 1/2	8 3/4	113.00	Incense
5 1/4 & 5 1/2	17	8 1/2	9 1/4	128.00	Income

Subject to discount.

DATA, HEAVY DUTY "SELLS" ROLLER BEARING BOXES
With Double Roller Structures for Main or Jack Shafts and Heavy Belt Pulls

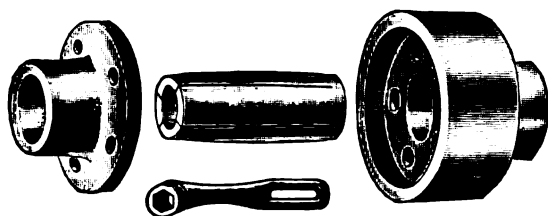
Size of shaft, in.	Length of box, in.	Width of box, in.	Height of box, in.	Prices	Code
1 1/4 & 2	13	3 1/2	4 1/2	\$19.00	Impound
2 & 2 1/4	13 1/4	4 1/2	5 1/4	23.50	Imprint
2 1/4 & 2 1/2	14 1/4	4 1/2	5 1/2	26.50	Inarch
2 1/2 & 2 3/4	15 1/4	5 1/2	6 1/4	32.50	Inborn
2 3/4 & 3	15 1/4	5 1/2	6 1/2	39.00	Inbred
3 & 3 1/4	17 1/4	5 1/2	6 3/4	59.00	Incense
3 1/4 & 3 1/2	17 1/4	6 1/2	6 3/4	66.00	Incog
3 1/2 & 3 3/4	19 1/4	6 1/2	7 1/4	94.00	Indeed
3 3/4 & 4	19 1/4	7 1/2	7 3/4	110.00	Indent
4 & 4 1/4	21	7 1/2	8 1/4	126.00	Index
4 1/4 & 4 1/2	21 1/4	8	8 1/2	140.00	Indigo
4 1/2 & 4 3/4	22 1/4	8 1/2	8 3/4	161.00	Induce
4 3/4 & 5	24	8 1/2	9 1/4	179.00	Infant
5 & 5 1/4	24 1/4	9 1/2	10	230.00	Increase
5 1/4 & 5 1/2	26 1/2	10 1/4	11 1/4	316.00	Incrout

Subject to discount.

Continued on next page

Standard Compression Couplings.

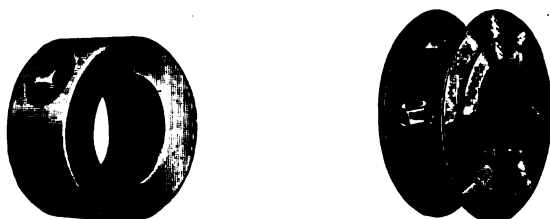
The heaviest and strongest couplings on the market. Perfectly balanced and afford accurate alignment. No projecting parts to catch or tear clothing.



STANDARD COMPRESSION COUPLINGS

Standard Safety Set Collars.

These collars are made in solid and split types. They are absolutely safe, the set screws are sunk—a good safety first feature.



STANDARD SAFETY SET COLLARS

"Rollerine."

"Rollerine" is the ideal lubricant for "Sells" roller bearings, or, in fact, any bearing. No resin oil, wax, talc, soapstone or gum of any sort is used in compounding it. It will not harden or gum.

"Rollerine" comes in quantities from quart cans to barrels.

A sample can of "Rollerine", that will prove all that has been said, will be sent free to anyone who will write for it.



CAN OF "ROLLERINE"

"Sells" Combination Oil and Grease Gun.

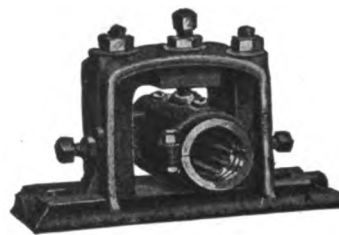
Affords the most efficient means of applying "Rollerine" to "Sells" roller bearings. It is also adapted for heavy oils and greases of all kinds.

The "Sells" combination oil and grease gun puts the lubricant where it should go.

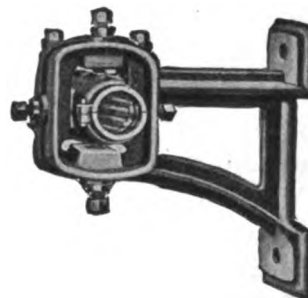


"SELLS" COMBINATION OIL AND GREASE GUN

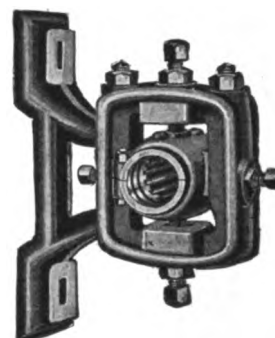
SWEET'S CATALOGUE



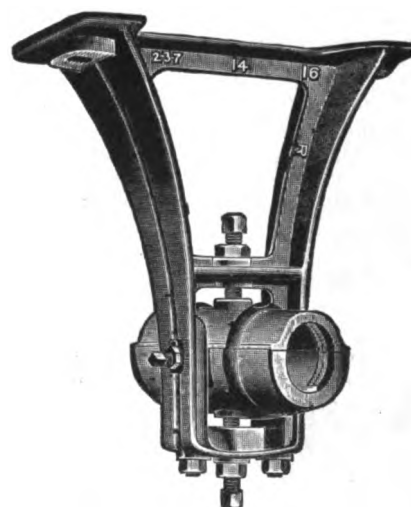
ROYERSFORD PILLOW BLOCK WITH "SELLS" ROLLER OR RING OILING BEARINGS



ROYERSFORD BRACKET HANGER WITH "SELLS" ROLLER OR RING OILING BEARINGS



ROYERSFORD POST HANGER WITH "SELLS" ROLLER OR RING OILING BEARINGS



UNIVERSAL RING OILING HANGER

Catalogue.

In addition to the products listed above, a complete line of power transmission machinery is carried by this company.

A catalogue with prices will be sent on request.

SKF INDUSTRIES, INC.

Ball Bearings and Like Precision Products

SALES, SERVICE AND RESEARCH DIVISION

165 Broadway
NEW YORK, N. Y.

OFFICES OF DISTRICT REPRESENTATIVES

ATLANTA, GA., 513 Healey Building
BOSTON, MASS., 711 Little Building
BUFFALO, N. Y., Fidelity Trust Building
CHICAGO, ILL., 1314 Marquette Building
CINCINNATI, OHIO, 134 East 4th Street

SAN FRANCISCO, CAL., 115 New Montgomery Street

CANADIAN S K F COMPANY, LTD.

TORONTO, ONT., 83 King Street, West

CLEVELAND, OHIO, 1036 Guardian Building
DETROIT, MICH., Majestic Building
NEW HAVEN, CONN., 622 Chamber of Commerce Building
NEW YORK, N. Y., 165 Broadway
PHILADELPHIA, PA., 1624 Real Estate Trust Building

MONTREAL, QUE., 412 St. James Street

Products.

SELF-ALIGNING, RADIAL and THRUST BALL BEARINGS; SELF-ALIGNING BALL BEARING HANGERS and PILLOW BLOCKS; BALL BEARING LOOSE PULLEYS and FRICTION CLUTCHES.

Also manufacturers of Single Row Deep Groove Radial Ball Bearings, Atlas Steel Balls.

Design of Ball Bearings.

SKF marked ball bearings are made in all international standard sizes and in the three following types:

Radial bearings, designed for use where the load is carried at right angles to the shaft.

Adapter bearings, a modification of the radial bearings, for use where it is not possible to machine the shaft. Thrust bearings, which take the load in the direction of the axis of the shaft.

Owing to the correct design and extreme care taken in every stage of manufacture of our ball bearings, the following features will be noted, the combination of which are only found in these bearings:

(a) Double row of balls, extra carrying capacity and greater safety.

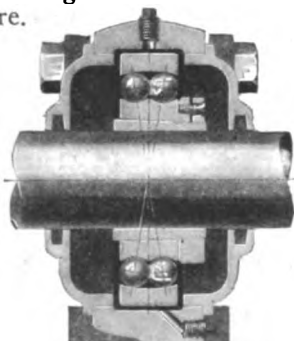
(b) Self-aligning construction is such that there can be no binding strains in the bearings. Uneven loads, or jolts and shocks of hard service can not cramp or wedge the balls. Both rows of balls carry the load.

(c) Superior workmanship and accuracy. The bearings are as free from friction as it is possible to make them.

Accuracy and high finish are essential to the successful operation of any bearing. In SKF marked ball bearings, these two factors are paramount, and the rigid control and inspection used throughout set a distinct standard in careful manufacture.



ADAPTER TYPE BALL BEARING USED IN HANGERS



CASING AND BEARING MOUNTED ON SHAFT

Construction of the Adapter Bearing.

The adapter type bearing has a split tapered sleeve known as an adapter. The bearing has a tapered bore and seats on the adapter. In practice, the sleeve is slipped on the shaft, the bearing is placed on it, and by tightening a lock nut on the sleeve the bearing is forced into place and the sleeve is clamped firmly on the shaft.

No moving part touches the shaft. Therefore there can be no wear on the shaft. The bearing and adapter are completely incased in a cast iron housing which is both oiltight and dustproof.

Power Saving with Ball Bearing Hangers.

Exhaustive tests in manufacturing plants have demonstrated that transmission losses due to friction of plain bearings amount to 20% to 40% of total power used in the plant. The chart illustrates how, by the use of self-aligning ball bearing hangers, 60% of these losses may be avoided.

A long line of shafting was mounted first in ring oiled babbitt hangers and second in self-aligning ball bearing hangers. The shafting was driven by the same motor and run at various speeds and loads.

It will be noted that on a shaft running at 150 r.p.m. under a load of 840 lbs., the use of ball bearing hangers results in a saving of 62% of the power lost by plain bearings. This means a saving of from 12% to 24% of the total cost of power.

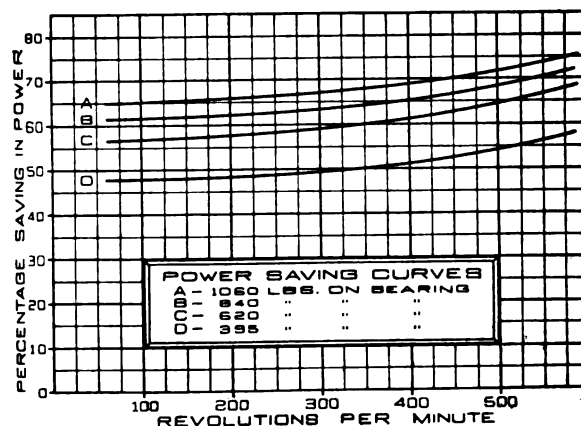


CHART ILLUSTRATING PER CENT OF REDUCTION IN POWER LOSS BY SUBSTITUTING SELF-ALIGNING BALL BEARING FOR PLAIN BEARINGS

Using Smaller Motors.

With SKF marked ball bearings the starting friction is no greater than the running friction. This is a very important fact, for, as it is not necessary to provide for heavier starting loads, a much smaller motor may be used. Shafts in cast iron, babbitt or bronze bearings frequently become "set" if the shafting equipment is idle for



BALL BEARING HANGER

any length of time. The oil is pressed out of these bearings and it is extremely difficult to start the shaft from rest. Again, when bearings are operating at normal speed, rubbing friction is constantly consuming power at a sacrifice of efficiency.

With ball bearings, rolling friction is practically uniform from rest up to very high speed. On this account self-aligning ball bearing hangers start with a minimum effort and operate at all times with the highest possible efficiency.

Where ball bearing hangers are used, the selection of a motor for shop drives reduces itself to the problem of providing alone for normal machine power consumption, without the necessity of providing for the heavy overload capacity usually required to "start up."

For example: If machines in the shop normally require 250 h.p. to drive, and an additional 50 h.p. is consumed by the line shaft in distributing this power, a saving of 50% of the power required for the line shaft will reduce the total power required by 25 h.p. or $8\frac{1}{3}\%$ of the total. With a motor costing approximately \$9.00 per h.p. there will be an initial saving of approximately \$225.00 in the motor cost.

Other Important Features.

Aside from these valuable savings, ball bearing transmission equipment will save 80% of the lubricant needed for plain bearings; 80% in maintenance bills is a conservative estimate of what ball bearings will save on repairs. The oiltight housing insures a clean shop free from dripping oil. Heating is absolutely eliminated, and so fires caused by hot bearings can be permanently avoided.

Ball bearing transmission equipment possesses numerous advantages and one or the other of these will always show their superiority. Self-aligning ball bearings save where others waste; they give service where others give trouble. A trial will convince you of their merits better than anything we can say.

Self-aligning Ball Bearing Hangers and Pillow Blocks.

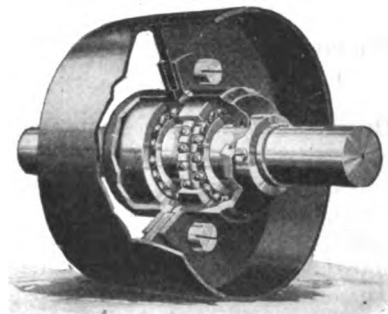
The type of construction employed in the hangers and pillow blocks embodies extreme simplicity with great strength. The ball bearings are contained in accurately machined casings which are securely positioned in the hanger or pedestal pillow block frame by a four-point adjustable suspension. Inasmuch as the ball bearings themselves are self-aligning, no pivoted "cradles" or ball and socket supports are required.

The self-aligning feature of ball bearings is of marked value for line shafting. Buildings settle, floors drop and gradually shafting will pull out of line. Misalignment may not be visible to the eye but still be enough to bind the best plain bearing.

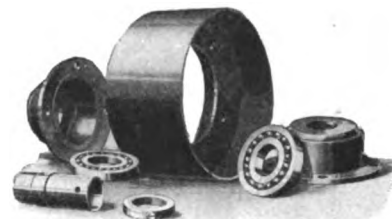
Ball bearings, on the other hand, prevent such binding. They align themselves with the shaft and operate smoothly and efficiently even when the shaft is not in perfect line. Worn bearings, heating and rebabbiting, so often found where plain bearings are used, are entirely absent in a plant using our hangers. The time and expense saved by this feature alone is sufficient to warrant their most careful consideration.

Ball Bearing Loose Pulleys.

They eliminate trouble and expense; no dripping of oil; noiseless, dustproof, highly balanced, run at any speed, require lubricating only three or four times a year. Every pulley is tested and filled with lubricant enough to last six months, before leaving the factory. Simple to install—place on the shaft and tighten one set screw.



Cut-away View

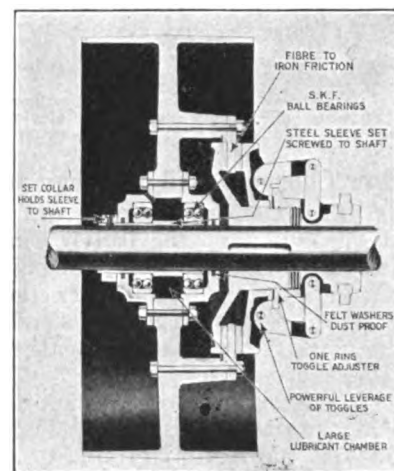


Disassembled
BALL BEARING LOOSE PULLEY

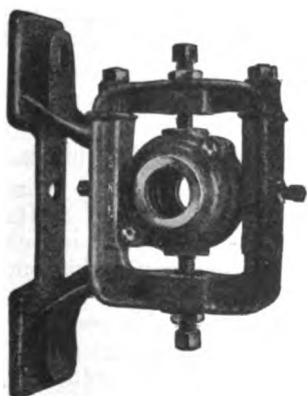
Ball Bearing Friction Clutch Pulleys.

Drive buffing lathes, emery and disk grinders, fans, punch presses, etc., direct from the shaft. The ball bearing friction clutch pulley is simple in construction, easy to install, and requires less space on the shaft than ordinary clutches.

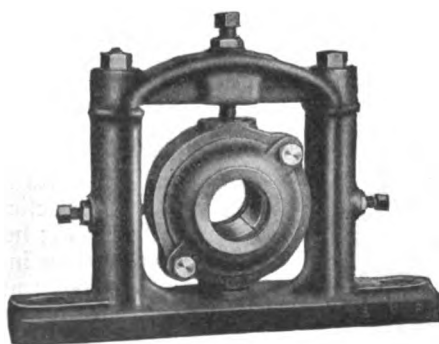
Ball bearings are dustproof, and the lubricant chamber needs refilling but two to four times a year according to conditions. Prices on application.



SELF-ALIGNING BALL BEARING
FRICTION CLUTCH PULLEY



SELF-ALIGNING BALL BEARING
POST HANGER



SELF-ALIGNING BALL BEARING PED-
ESTAL PILLOW BLOCK

For supporting shafting from the floor or from
a wall bracket



SOLID TYPE OF RIGID PILLOW BLOCK

Made in sizes $3\frac{1}{4}$ in. and under. Very compact, casing being a part of the base of the block

TRANSMISSION BALL BEARING CO., INC.

1057 Military Road
BUFFALO, N. Y.

BRANCH OFFICES

NEW YORK, N. Y., 173 Lafayette Street
CHICAGO, ILL., 549 W. Washington Boulevard

PHILADELPHIA, PA., 1305 No. 15th Street
CAMBRIDGE, MASS., 624 Main Street

Product.

CHAPMAN BALL BEARINGS for Power Transmission.

Development of the Chapman Ball Bearing.

In the earlier designs of ball bearings, load was carried on a point of contact, and when any appreciable load was put upon the bearing, the balls had a tendency to cut into raceway and pack the steel, as shown in Fig. 1. This resulted because the ball track had insufficient support to resist distortion of the steel.

The natural evolution was the development of the curved raceway, which was found to practically eliminate wear in bearing, without appreciably increasing friction (Fig. 2).

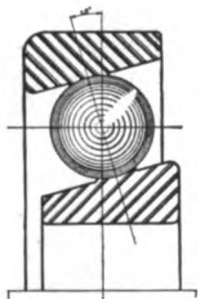


FIG. 1. INEFFICIENT "POINT CONTACT" TYPE OF BALL BEARING

Showing balls cutting into raceway and packing the steel

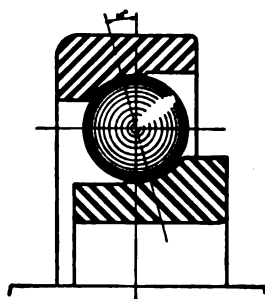


FIG. 2. CHAPMAN BALL BEARING

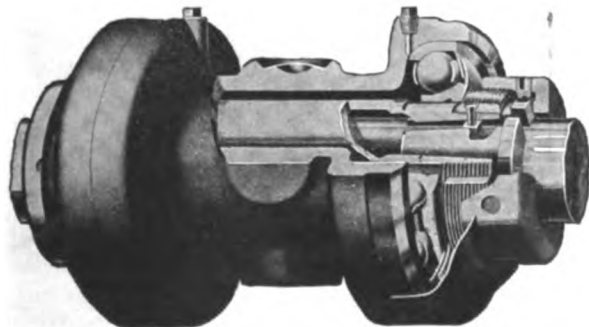
Showing curved raceway which eliminates wear without appreciably increasing friction

How Chapman Ball Bearings are Constructed.

Chapman ball bearings are the last word of careful evolution of the ball bearing and are backed by 18 years' experience in designing and manufacturing bearings for elimination of friction losses.

Constructed to fit any standard hanger frames on the market, interchanging with self-oiling boxes of the same shaft sizes.

A double row of balls approximately one-third the diameter of shaft is used. These are of best chrome alloy steel accurately ground to .0001 in. Curved raceways are made of a special grade of steel best adapted to this purpose, carefully heat treated, ground and polished. Load is taken at a 15° angle from vertical, thus permitting a percentage of thrust load in addition to its radial load.



SECTION SHOWING ARRANGEMENT OF BEARINGS

SWEET'S CATALOGUE

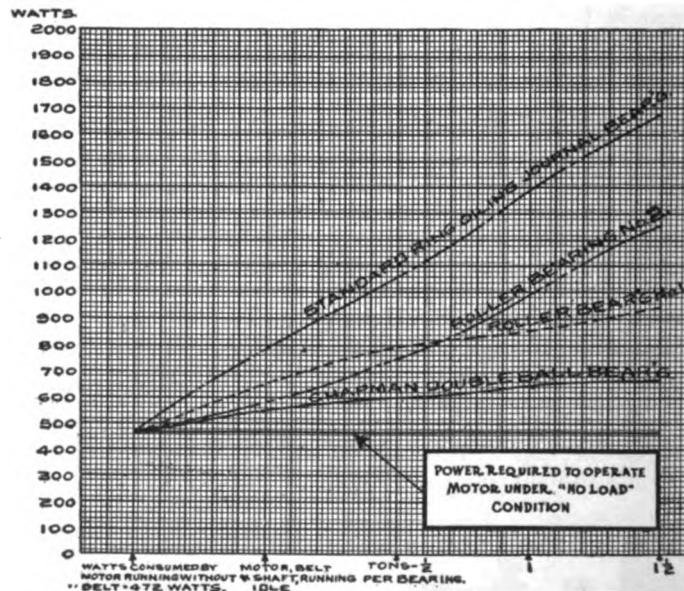
A substantial two-piece pressed steel cage, electrically welded, acts as a separator between balls. Design is such that while load is evenly distributed over whole bearing, each row of balls is a unit in itself. Bearing is securely clamped to shaft, the split taper sleeve wedges permitting locking of the bearing on varying sizes of shafting with usual commercial variations. Double grease retainers prevent escape of lubricating grease. Bearings are also dripproof and dustproof. Lubrication required only once a year. Ball and socket seats in housing insure perfect self-alignment without disturbing rolling components in any way.

Each bearing is double tested under most rigorous standards and under heavy running load before leaving factory.

Comparative Efficiency of Chapman Ball Bearings and Other Types.

The accompanying curve is the result of an exhaustive test conducted by one of the most prominent consulting engineering firms in the United States.

It shows relative comparative efficiencies of four kinds of bearings—ring oiling babbitted bearings, two types of roller bearings, and Chapman ball bearings.



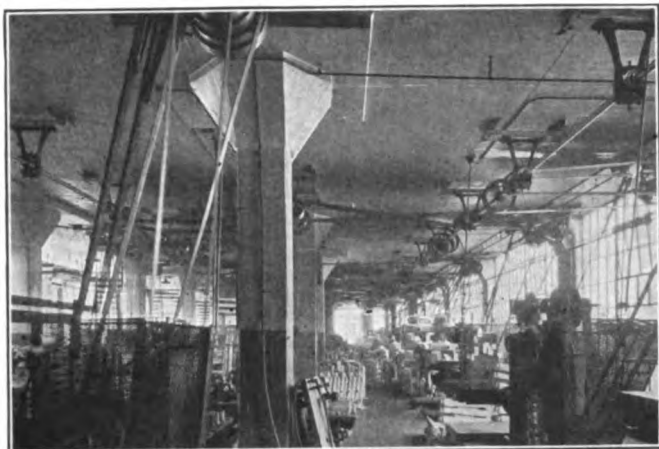
CURVE SHOWING POWER REQUIRED TO OVERCOME FRICTION OF SHAFT BEARINGS

Transmit Full Power of Prime Mover to Machines.

With line shafts revolving on Chapman ball bearings, friction is practically eliminated even when shafts are under full load; hence, full power of prime mover is delivered directly into machines themselves, without appreciable loss en route.

The power transmission experts of this company will (without expense or obligation on the part of the prospective purchaser) make a survey of an industrial plant, indicating places where decided economies in power transmission can be effected.

Continued on next page



PARTIAL INSTALLATION OF CHAPMAN BALL BEARINGS IN
PIERCE-ARROW MOTOR CAR PLANT, BUFFALO, N. Y.
Over 2500 Chapman bearings are installed in this plant

Long Life Given First Place in Design.

The experience of Chapman bearings in actual service has clearly demonstrated that this result has been achieved. That Chapman ball bearings operate continuously and unfailingly year after year is proved by thousands of important "Chapmanized" concerns.



ONE OF THE
MANY TYPES
OF HANGER
FRAMES
WHICH
CHAPMAN
BEARINGS
WILL FIT

Save 15% to 40% of Total Power Consumed.

The experience of this company shows that the actual power saved by eliminating line shaft frictional losses runs from 15% to 40%, the amount varying in different plants and industries due to load, speed, etc.

Sizes, Loads, etc.

For all ordinary work the standard sizes of Chapman bearings are amply heavy, as will be seen from the accompanying table. Where loads are excessive, heavy duty bearings should be used (see table for load carrying capacities). These heavy duty bearings are made for shafts up to 7 in. They will not wear the shaft, will not throw out lubricant and will not run hot.

For additional data, send for Catalogue 3-I.

DATA, STANDARD TYPE

Size of bearing	Revolutions per minute												
	100	150	200	250	300	350	400	500	600	700	800	1000	1200
	Maximum loads for the above speeds												
1	2720	2400	2160	2000	1840	1760	1680	1600	1480	1400	1360	1280	1200
1½	3200	2800	2480	2320	2160	2080	2000	1840	1760	1680	1600		
2	4560	4000	3640	3360	3120	2960	2880	2720	2520	2400			
2½	6400	5680	5200	4800	4520	4280	4080	3800	3600				
3	8160	7120	6480	6000	5680	5360	5120	4800					
3½	10880	9520	8640	8000	7520	7200							

Note: Loads cited above are for steady speeds and constant loads, evenly distributed on bearings. Where load is on one end of bearing, only one-half of above loads is permissible.

DATA, HEAVY DUTY TYPE

Size of bearing	Revolutions per minute												
	100	150	200	250	300	350	400	500	600	700	800	1000	1200
	Maximum loads for the above speeds												
1	3200	2800	2480	2320	2160	2080	2000	1840	1760	1680	1600		
1½	4560	4000	3640	3360	3120	2960	2880	2720	2520	2400			
2	6400	5680	5200	4800	4520	4280	4080	3800	3600				
2½	8160	7120	6480	6000	5680	5360	5120	4800					
3	10880	9520	8460	8000	7520	7200							

Note: Loads cited above are for steady speeds and constant loads, evenly distributed on bearings. Where load is on one end of bearing, only one-half of above loads is permissible.

SWEET'S CATALOGUE

Wide Range of Application.

Fan Bearings—Chapman self-aligning ball bearings for fan and blower service are made to interchange with present plain bearings of practically any make of fan. These bearings are being used by the largest fan and blower manufacturers in the world.

Loose Pulleys—Chapman ball bearing loose pulleys (either iron or wood) are furnished complete in any size. The application of these bearings has solved one of the most troublesome problems in power transmission.

They require lubrication only once or twice a year. They revolve on the bearing and not on the shaft, therefore there is no cutting of the shaft.

No babbitt metal or brass bushings to renew.

Pillow Blocks—In the construction of Chapman ball and socket pillow block bearings, the raceways, balls and cages are of the same design and material as used in the standard shafting bearings for hanger purposes.

This type not only gives perfect ball and socket adjustment, taking care of either misalignment or sprung shafts, but distance between base and center is very short, permitting its use in places where the ordinary adjustable pillow block could not be used.

Made for shafts up to 7 in.

Countershaft Bearings—The ordinary countershaft is usually equipped with cheap bearings that often cause trouble and tie up the operation of costly machines and their production. Chapman ball bearings for countershafts overcome these troubles.

Clutch Sleeves—Chapman self-contained, dustproof ball bearing clutch sleeves are thoroughly standardized and are interchangeable with plain bearing sleeves.

They eliminate lubrication troubles, keep belts free from oil and practically eliminate all friction and hot bearings.

Car Wheels—This company furnishes Chapman ball bearing car and industrial truck wheels complete with bearings assembled, in any diameter face and bore required. Send for bulletin.



FAN BEARING



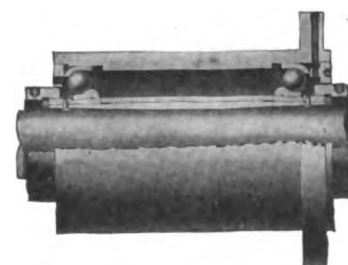
LOOSE PULLEY



PILLOW BLOCK



COUNTERSHAFT BEARING



CLUTCH SLEEVE

ESTABLISHED 1893

CULLMAN WHEEL COMPANY

Manufacturers of Sprockets

TELEPHONE:
LINCOLN 854

1338 Altgeld Street
CHICAGO, ILL.

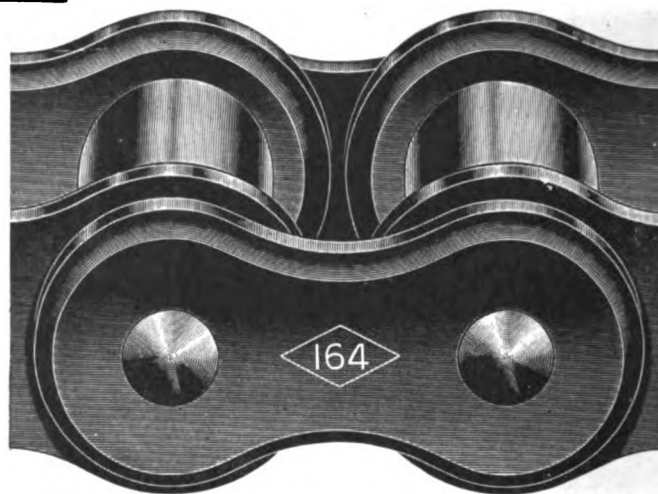
Products.

CULLMAN SPROCKETS; CHAINS.

Sprockets and Chains.

Specially designed tools, and labor saving machinery operated by skilled and experienced men who make only sprockets, enable us to furnish sprockets of the highest quality to the machinery and motor truck manufacturers. Sprockets made for standard block, roller and high speed silent chains, a few types of which are described. Sprockets in stock and made to order.

For the convenience of patrons we carry in stock, Diamond, Whitney, Baldwin, Duckworth, and Link-Belt chains—block, roller and high speed silent types.



NO. 164 DIAMOND CHAIN, FULL SIZE, FITTING 1 1/4-IN. PITCH SPROCKET



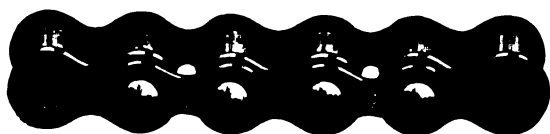
1-IN. PITCH, BLOCK CHAIN, FULL SIZE



SPROCKET WITH LARGE SIZE HOLE FOR ROLLER CHAIN

Specifications of Sprockets.

Plain steel disk sprockets in stock to fit 1-in. pitch block chain, in widths of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, and $\frac{1}{2}$ in., rang-



1-IN. PITCH, ROLLER CHAIN, FULL SIZE



HIGH SPEED SILENT SPROCKET



HUB SPROCKET

ing from 6 to 50 teeth. Sprockets with hub and larger number of teeth are made to order. Prices on application.

Plain steel disk sprockets in stock to fit roller chains in pitches of $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$, and 2 in., in widths of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1, and $1\frac{1}{4}$ in., and number of teeth ranging from 6 to 75. Sprockets with hub and larger number of teeth and

of special description are made to order. Prices on application.

Plain steel disk sprockets in stock to fit Whitney high speed silent chains, $\frac{3}{8}$ -in. pitch and $\frac{1}{2}$ -in. pitch, ranging in widths from $\frac{1}{2}$ to $1\frac{1}{2}$ in., and ranging from 15 to 50 teeth.

Sprockets to fit $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, and 1-in. pitch Whitney silent chain made to order, ranging in widths from $\frac{1}{2}$ to 6 in., in number of teeth up to 132 and in diameter up to 42 in. Made of steel or cast iron. Prices quoted on specifications of requirements.

Catalogue sent on request.



HIGH SPEED SILENT CHAIN

ALBAUGH-DOVER CO.

Manufacturers of Cut Gears

2100 Marshall Boulevard
CHICAGO, ILL.

Products.

CUT GEARS: Spur, Bevel, Miter, Spiral, Helical and Herringbone Gears; Rawhide and Bakelite-Micarta Gears and Pinions; Worms, Worm Wheels and Internal Gears; Ratchets; Heavy Duty Hardened Auto Transmission and Tractor Gears; Ignition Gears; Pump Gears; Magneto Gears; Washing Machine Gears; Sprockets.

Member of the American Gear Manufacturers' Association.

Equipment, Facilities and Co-operative Service.

Modern machinery and efficient methods enable this company to manufacture gears in the most perfect manner and with the least possible delay. Bevel gears are generated to the true involute form on either Bilgram or Gleason bevel gear shapers. Transmission gears are generated principally on Fellows shapers. Spur, helical and spiral gears are generated on a large battery of the finest and most modern gear hobbing machines.

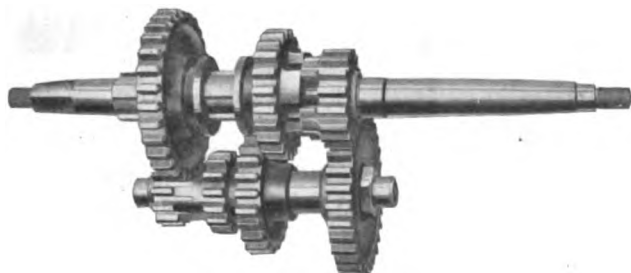
The company has also a large number of single cutter gear machines and thread milling machines. The plant, capital and engineering force afford facilities for prompt action on any special requirements. The engineering staff is at the disposal of all parties, and will gladly advise, recommend or furnish estimates upon the receipt of blue prints or sample gears.

Cut Gears.

Quality of Materials—Gears are made from bar steel, drop forgings, cast steel, semisteel, high grade cast iron, brass or bronze. Quality of materials used is the best available. Customers' material specifications are closely followed.



VARIOUS TYPES OF GEARS



TRANSMISSION GEARS



Spur Gears—Cut from the bar, steel forgings, castings, or best grade cast iron, sizes up to 48-in. diameter. Stub tooth gears, particularly for automobile drives, hardened and ground, give greater strength and are more quiet than ordinary spur gears.

Bevel Gears—The superior running qualities of Albaugh-Dover bevel gears are



BEVEL GEARS

well known—hardened and ground gears for tractor, truck and auto drives, transmissions, machine tools, etc., 4 to 1 ratio; diameters up to 20 in.; miter gears up to 16 in.

Spiral Gears—Spiral and helical gears, made from bronze, steel or cast iron, are accurately cut and smooth running; generated to eliminate thick and thin teeth and so as to get perfect involutes.

Supplied in any style for all purposes.

Herringbone Gears—Smooth running. Action is continuous, with no shocks when load is transferred from tooth to tooth; wear and objectionable side thrust are practically eliminated.

Manufactured in any metal up to 20-in. diameter.

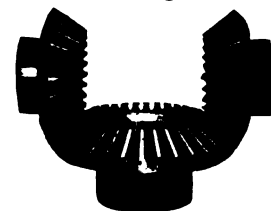
Rawhide and Bakelite-Micarta Gears and Pinions—Especially fitted for high speed service where conditions require absence of noise.

Made with brass or steel flanges reaching to top of teeth, all securely riveted or bolted together, protecting and supporting teeth. In most cases the rawhide of the pinion is made slightly wider than the face of the metal gear, which insures a quiet drive as there is no metallic contact.

Worms and Worm Wheels—Worm gear drives are used where great reduction in velocity or great increase in power is desired. The best combination of materials is used, insuring smoothness of action and long life.

Internal Gears—Manufactured in all pitches up to 4 diametral pitch and 28-in. pitch diameter.

Sprockets—All types of roller and silent chain sprockets made for all purposes, and their quality and workmanship correspond with that shown in all Albaugh-Dover gears.



SPIRAL GEARS



INTERNAL GEARS

FOOTE BROS. GEAR & MACHINE CO.

Manufacturers of Cut Gears

213 North Curtis Street
CHICAGO, ILL.

Products.

IXL Productions as follows:

ALL SPUR GEAR SPEED TRANSFORMERS, WORM GEAR SPEED TRANSFORMERS; SPUR, BEVEL, MITER and SPIRAL GEARS; WORM, INTERNAL, HELICAL and TRACTOR GEARS; TRACTION ENGINE GEARS; HEAVY DUTY HARDENED GEARS; RAWHIDE PINIONS; CLOTH PINIONS; CUT STEEL MACHINE RACKS; SPROCKETS; FOOTE-IXL TRACTOR TRANSMISSIONS.

Also Special Machinery built-to-order.

Engineering Service.

Foote Engineers are ready and willing to assist in solving any tractor or gear problems. They have indicated worthwhile economies and better methods for many manufacturers. This service is without obligation.

Literature.

Valuable catalogues, and gear data book sent on application; also transmission circulars.

Reducers.

SPUR GEAR TYPE—IXL all spur gear speed transformers are modern in every way, low priced and of highest quality. Insure efficiency, compactness, durability and strength. Built for heavy duty and continuous service. Entirely enclosed, oiltight, dustproof and fool-proof.

Can be used in many places and under conditions where worm gear reducers can not be used. The value is shown where they take the place of gearing and belting, having a reduction of from 5 to 1 up to 100 to 1 or more. Particularly adapted for use in connection with electric power, where they supply a practical and efficient method of reducing the motor speed.

WORM GEAR TYPE—The IXL worm gear speed transformers have been on the market since 1895, during which time they have demonstrated their efficiency and durability. Recent improvements have added greatly to the value. Each transformer is thoroughly tested before it leaves the factory. They are manufactured with a number of different ratios in the same size case. This is accomplished by a change from a single to a double, triple or quadruple thread in the worm, and also by changing the pitch and number of teeth.

LITERATURE—Send for complete data and information regarding the use of Foote spur gear speed reducers.

Miter and Bevel Gears.

With the use of modern machines and methods for generating, planing or cutting by the Gleason and Bilgrim system, IXL miter, angle and bevel gears are cut with the finest accuracy, thus insuring smoothness and quiet running.

Spur Gears.

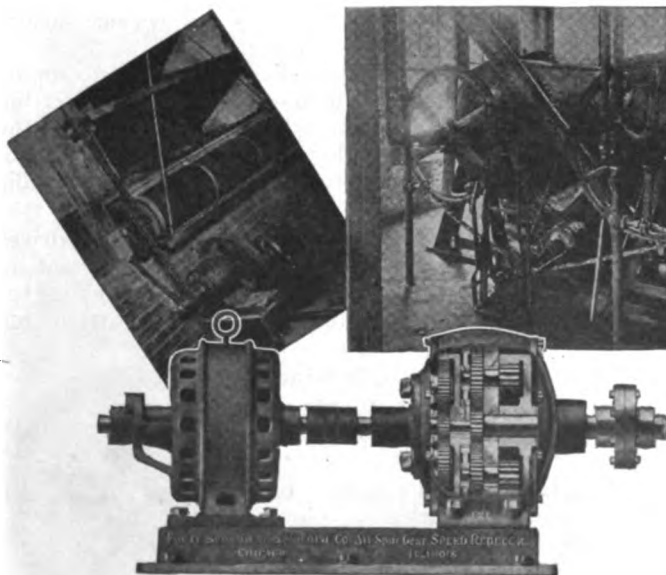
Cut spur gears all sizes up to 144 in. in diameter, made from high grade steel forgings, castings or the very best grade cast iron.



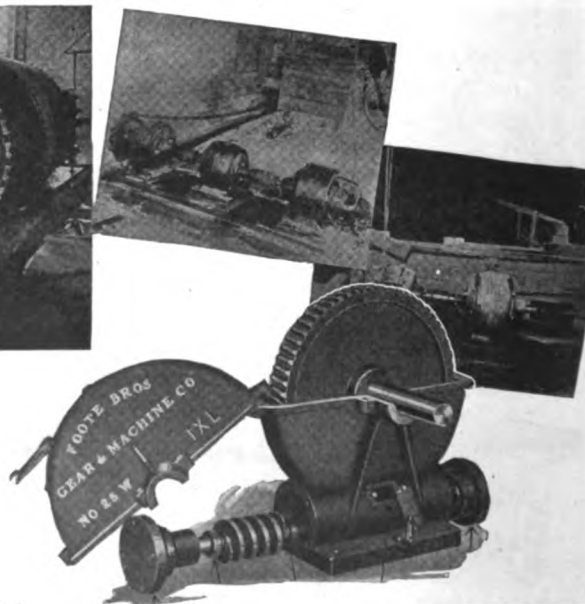
IXL BEVEL GEARS



IXL SPUR GEAR



SPUR GEAR REDUCER AND APPLICATIONS



WORM GEAR REDUCER AND APPLICATIONS

Worm Gears.

Foote Bros. are equipped to solve problems and furnish worm gear drives of any style and material desired. IXL quality worm gears are manufactured to meet all requirements, using the best combination of materials in each case.

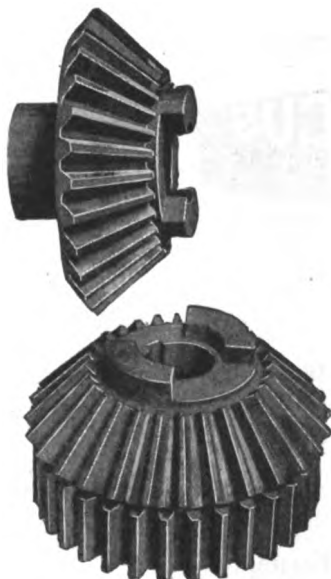
Heavy Duty Hardened Gears.

Every type of heavy duty hardened spur, bevel, spiral gears and all other gears required for all purposes, including tractors, transmissions, differentials, steering, for machine tools, etc.; also for tractor, truck and auto drives, treated by special *heat treatment* process.

These hardened steel gears have four times the actual strength of cast iron gears of equal size.

In any machine, hardened steel gears will take up considerably less space than ordinary cast iron or steel gears giving equal power.

Wearing qualities are 50 to 1 in comparison to soft steel or cast iron gears.



IXL HEAVY DUTY HARDENED GEARS

Spiral Gears.

IXL spiral gears can be supplied in any size for every purpose. Many designers have availed themselves of Foote Bros. service in solving spiral gear problems. Co-operation is gladly given with any who are interested.

Internal Gears.

IXL internal gears are made or cut of every description, either plate back or plain rings. All pitches up to 4-diameter pitch are generated on Fellows gear shaper; 3-diameter pitch and coarser are planed on Gleason's planers.

Herringbone Gears.

IXL double helical or herringbone gears in any metal or any size up to 80 in. in diameter. This form of gear has angular teeth of great strength owing to their special formation, the 2 teeth always having 2 points of contact in the plane of axis, causing them to work smoothly and noiselessly. Especially adapted for hoisting, mining and rolling mill machinery.



IXL HERRINGBONE GEAR

Sprockets.

Block, roller silent or any other style of chain sprockets furnished for any purpose, and made of any material desired, in any quantity. IXL sprockets have proved their value in all branches of industry.

Racks.

This company is prepared to cut finished IXL machine racks from almost any size blank in almost any pitch, and in continuous section of any length that can be conveniently shipped.

Rawhide Pinions.

For high speed drive in connection with metal gears IXL rawhide noiseless pinions insure maximum efficiency, elasticity and durability. IXL rawhide gears and pinions are made up with brass flanges reaching to the top of the teeth, all securely riveted and bolted together, giving protection, support and long life to the teeth. When an extra quiet drive is wanted these pinions can be made with face of rawhide slightly wider than its metal mate, thus avoiding metal contact. This style costs extra and can only be used where there is plenty of space. Thickness of flanges on both styles depends on the pitch, face and diameter.

Cloth Pinions.

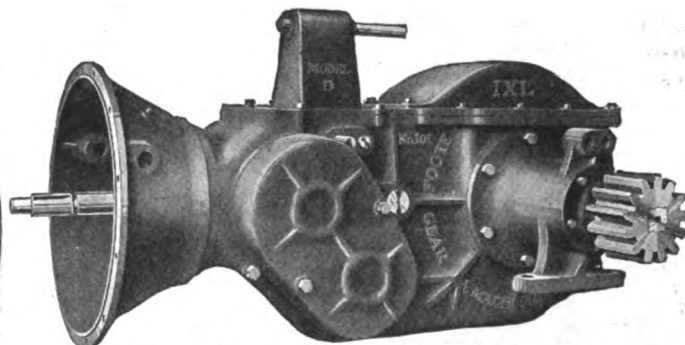
Cloth pinions have met with considerable favor, many claiming them superior, in noiseless operation, long life and high tooth strength, to all other non-metallic pinions in vogue. IXL are made of cloth or cotton filler compressed under hydraulic pressure, held by metal flanges. Prices quoted on receipt of specifications.

Foote-IXL Tractor Transmissions.

The only tractor transmission with the power pulley so arranged that it can be used inside or outside of tractor wheels for either internal chain or external drive.

Constructed of best procurable materials. Case is made from high grade semisteel, carefully machined; oilproof and dusttight. Bearing supports are rigid, keeping gears in perfect alignment under severest conditions, allowing transmission of maximum power to bull pinions. Gears are made from high grade steel treated and hardened by special process; are extra heavy, and figured for ample surplus to care for severest strains. Shafts are made of special alloy high carbon steel, allowing for extremely heavy duty without twisting or straining. All bearings are Hyatt roller mounted, doing away with friction throughout the case. Best type of lubrication.

This company was the pioneer in standardizing tractor transmissions.



MODEL D FOOTE-IXL TRACTOR TRANSMISSION

2 speeds and reverse with pair change gears on side of case which can be reversed in position giving 2 lower speed ratios. For bull pinion drive, 30 to 40 h.p. motors.

MODEL B FOOTE-IXL TRACTOR TRANSMISSION—2 speeds and reverse for bull pinion drive, 25 to 30 h.p. motors. Model C is same as the model B, but with 3 speeds and built for 40 to 50 h.p. motors.

MODEL D-U FOOTE-IXL TRACTOR TRANSMISSION—Same gear arrangement as model D with direct axle drive feature. Can be furnished with engine and front axle supporting frames eliminating further framework. For 30 to 40 h.p. A model E-U is made with same features as the D-U for 45 to 60 h.p. motors.

OTHER TRACTOR TRANSMISSIONS—Live axle and bull pinion types for 2-3, 3-4 plow tractors. Full data and specifications furnished on request.

FAWCUS MACHINE COMPANY

Manufacturers of Cut Gears and Special Machinery

PITTSBURGH, PA.

WORKS: PITTSBURGH, PA.; FORD CITY, PA.

Products and Services.

CUT GEARS, including Herringbone, Spur, Bevel and Worm.

FLEXIBLE COUPLINGS.

This company builds Special Machinery to order and invites inquiries on any kind or size of gear. Send the problem or specification.

Complete transmissions are designed.

Shop facilities are such that orders can be handled rapidly. The services of the engineers of this company are available when needed.

Size of Gears and Drives.

Cut herringbone gears, 2 in. to 20 ft. in diameter. Cut special gears, 2 in. to 20 ft. in diameter. Cut bevel gears, 2 to 48 in. in diameter. Cut worm gears, 2 in. to 10 ft. in diameter. Flexible couplings, for shafts 1 in. to 20 in. in diameter. Enclosed worm gears, 5 h.p. to 25 h.p. Standard enclosed herringbone gear drives, 25 h.p. to 1500 h.p. (Herringbone Gear Booklet on request.) Special enclosed gear drives, 25 h.p. to 15000 h.p.

Turbine reduction gears, 25 h.p. to 3000 h.p.

Uses.

For general mine and mill use wherever power is transmitted, as for steam and electric hoists, motor driven pumps and air compressors, mine machinery, rubber and steel mill drives.

Fawcus herringbone gears can be advantageously used wherever a positive means of transmitting power is required.

Special Features.

Fawcus herringbone gears transmit power more quietly and efficiently than is possible with spur gears.



TRADE-MARK

Gear and pinion teeth are cut in solid blanks on Fawcus patented machines, and each pair is given a thorough running test before shipment.

The accuracy of herringbone gears makes possible their use for high speeds and for high ratios of speed reduction.

Gears and drives are all designed to suit special conditions for power transmitted and space available.

Workmanship.

There is a vast difference between cut gears and *correctly cut* gears. This difference means less noise, less wear, less friction, less power wasted, less fuel consumed, time and money saved. Rapidity of cutting is of less importance with us than accuracy of cutting.

Guarantee.

Fawcus herringbone gears, when designed by the company's engineers and installed and taken care of in accordance with our directions, are guaranteed to give entirely satisfactory service, and to run quietly, efficiently and without showing undue wear under normal conditions of service.

How to Order Gears.

The following points should be clearly stated when ordering cut gears of a new pattern or for special uses:

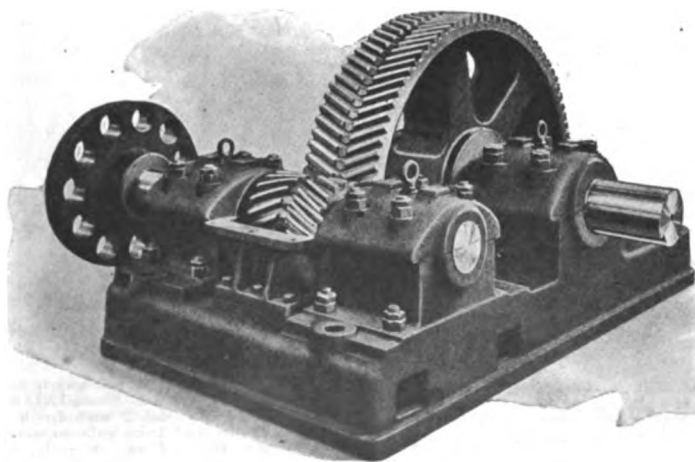
- (1) Use, power, and speed;
- (2) kind of gear (herringbone, spur, bevel, worm, etc.);
- (3) material;
- (4) outside diameter, number of teeth, and if bevel, number of teeth in mating gear;
- (5) pitch, whether circular or diametric;
- (6) length, bore, and position of hub.



SPUR GEARS



BEVEL GEARS



FAWCUS HERRINGBONE GEAR DRIVE



HERRINGBONE GEAR

WILLIAM GANSCHOW COMPANY

Manufacturers of Cut Gears

TELEPHONE:
MONROE 4561

1001 West Washington Boulevard
CHICAGO, ILL.

Products.

GANSCHOW A.B.C. SPUR GEAR and WORM GEAR SPEED REDUCERS, Direct, Right Angle and Vertical Drive; WORM, INTERNAL, HELICAL, TRACTOR and AUTOMOBILE GEARS; SPUR, BEVEL, MITER and SPIRAL GEARS; HARDENED GEARS.

Also manufacturers of Rawhide and Bakelite Noiseless Pinions.

Ganschow A. B. C. Spur Gear and Worm Gear Speed Reducers.

In Ganschow speed reducers, every principle of construction which makes for better work, at less maintenance expense, has been incorporated.

Ganschow speed reducers are simple; they contain no unnecessary parts which would tend to add to their initial expense or operation.

They are compact; the design is such that the few moving parts require but little space to work in.

They are strong; planetary overhang is well balanced, and supported by a newly patented device. Strength is brought about by a well-ribbed body, gears of hardened nickel steel, and studs and shafts also made of nickel steel ground to size.

They are economical; connect them direct with high speed motors, and they will run on and on, demanding no attention other than an occasional supply of oil which



TRADE-MARK

is uniformly distributed throughout the gearing by the splash system.

Ganschow speed reducers are dustproof and foolproof. They are made for reductions from 4 to 1 up to 250 to 1.

Gears of all Kinds.

This company operates 75 gear cutting machines with a capacity from the smallest up to 14 ft. diameter, comprising the largest gear cutting plant in the West.

The Ganschow organization has made a careful study of gearing for all purposes, and is fully equipped with data and patterns to lay out all gears in exact proportions as to correct design of arms, rim, hubs, etc.

Spur Gears—Made from bar steel forgings or high grade cast iron. Made in all sizes up to 14 ft. in diameter.

Worm Gears—In any style or material desired. The best combination of materials is used to suit the requirements of each case.



GANSCHOW SPUR GEAR SPEED REDUCER



WORM GEAR



GANSCHOW SPEED REDUCERS WITH MOTOR ATTACHED

D. O. JAMES MANUFACTURING COMPANY

Speed Reducing Transmissions and Cut Gears

1114-1124 West Monroe Street
CHICAGO, ILL.

Products.

SPEED REDUCING TRANSMISSIONS.
CUT GEARS.

Engineering Service.

This company's engineers will satisfactorily solve all speed reducing problems. They will recommend the correct drive for any purpose and furnish estimates upon receipt of the following information:

State class of work for which reducer will be used; horsepower and speed of motor; speed of driven shaft required; whether for continuous or intermittent duty; whether loads are uniform or subject to shock.

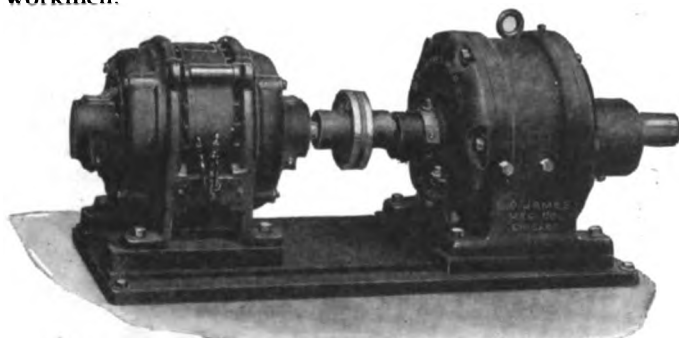
Sizes and Ratios of James Speed Reducers.

James speed reducers can be furnished for any reduction of speed from the ratio of 4:1 to 1600:1, in sizes from 1 h.p. to 100 h.p.

Spur Gear Speed Reducing Transmissions.

These centrally driven well balanced drives of great emergency strength are designed to eliminate the objectionable features in evidence in other forms of power transmission and were developed to meet the requirements of a variety of applications.

The James reducer meets the demand for a reliable and efficient method of reducing motor speeds. Being fully enclosed, it positively eliminates all chances of dirt getting in the working parts (increasing its life and lessening noise) and leaves no gears exposed to injure workmen.



JAMES SPUR GEAR REDUCER CONNECTED TO MOTOR

Compact Construction—The James reducer is a unit in itself, compactly constructed, having much the appearance of an electric motor. It occupies very little space, usually less than that occupied by the motor. It is easily installed, can be placed on the same base as the motor or arranged for ceiling suspension. It will be found highly efficient, strong and durable, the gear being entirely enclosed in housing, operating in a bath of oil under ideal conditions.

Wide Range of Adaptability—James reducers are admirably adapted for use in countless industries where more or less dirt and grit are constantly getting in the exposed gearing of some other types of reducers, causing excessive wear and requiring but a few months in many instances for their complete destruction.

James reducers find most satisfactory application in operating stokers, ore roasters, cereal cookers, elevating and conveying machinery, car pullers, car loaders, hoists,

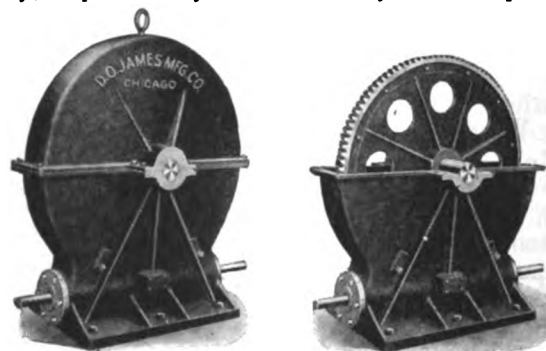
elevators, stuff chests, agitators, mixers, paint chasers, driers, etc.

Durability—The long life of the James reducer is due to the fact that the gearing is well balanced, all moving parts running in the same direction, the idlers revolving on case hardened and ground-forged steel pins. Each reducer is thoroughly tested before being shipped.

Guarantee—The James reducer is guaranteed to be free from any defective material, workmanship or design and to transmit safely the rated horsepower for which it is sold.

Incased Worm Gear Reductions.

Unusually satisfactory where a great reduction is required with a *light load* and have the same high quality, dependability and durability as the spur gear



JAMES INCASED WORM GEAR REDUCTIONS

type, the latter, however, being adapted for conditions requiring *heavy duty* and continuous service.

Worm may be run in either direction and abundant lubrication of worm and worm shaft has been provided.

When properly installed and not overloaded, they will give the utmost satisfaction. Each reducer is thoroughly tested before leaving the factory.

Points of Superiority—Worm shaft fitted in place at proper center distance, so the worm and gear run freely. Worm and gear cut and hobbled accurately.

Shaft bearings are bored, not babitted.

Housing constructed so that worm and gear may be easily removed.

Cut Gears.

This company has been a producer of high grade cut gears since 1888. Its plant is fully equipped with modern machinery for the accurate production of large or small cut gears of every description in any quantity, the unexcelled facilities of the company insuring prompt shipments and guaranteed satisfaction.



VARIOUS TYPES OF GEARS

EDW. R. LADEW CO., INC.

Manufacturers of Leather Belting and Accessories

428 Broadway
NEW YORK, N. Y.

BRANCHES

BOSTON, MASS.
NEW YORK, N. Y.

CHICAGO, ILL.
PHILADELPHIA, PA.

NEWARK, N. J.
CHARLOTTE, N. C.

PITTSBURGH, PA.
CLEVELAND, OHIO

FACTORY: GLEN COVE, N. Y.

Products.

LEATHER BELTING; BELTING ACCESSORIES and LEATHER SPECIALTIES, which include: Lace Leather, Cut Lacing, Belt Cement, Belt Preservative, Hydraulic Leather, Leather Packing, Washers, Disks, Shafting Rings, Automobile, Truck and Motorcycle Belts, Leather Welting, Straps of every description.



methods, thoroughly impregnated with a water-resistant, water-repellent material, and built up with a special waterproof cement. Even under most extreme moisture conditions, the laps or plies will not open up. For all drives where the utmost in service is sought, in the presence of

Ladew Engineering Service.

The proper application of belting is an engineering problem deserving of skilled counsel and the best experience. More belts are destroyed by abuse than by use—abuse here implying neglect of proper care as well as ill-advised applications. To correct wrong conditions where known, as well as to guard against them in advance where possible, Ladew Engineering Service is maintained. This consists in the advice and assistance of experienced belting engineers who will study any belting problem and give expert advice on its solution. Ladew service is offered free to all belt users seeking the highest belting economy—which means the lowest belting cost per horsepower per year of service.

Distribution.

Branches and distributors in all principal cities of the world carry complete stocks.

"Flintstone" Leather Belting.

Introduced in 1835, and steadily improved ever since, "Flintstone" is pre-eminently the belt for all drives where everything depends upon, and everything is expected from, the power transmission. The care in selection of leather and in methods of manufacture forbids "Flintstone" selling as a cheap belt. But, hundreds of times over, in the decades past, "Flintstone" has proved itself to be the most economical belt—the belt which gives the greatest number of years of service at the lowest cost per year. Or, stated otherwise, "Flintstone" will transmit more power over a longer period at the lowest cost per horsepower per year. The Ladew trade-mark on "Flintstone" is a guarantee of maximum belting service at minimum belting cost.



"FLINTSTONE" BELTING BRAND

"Turtle" Waterproof Leather Belting.

Introduced in 1860, "Turtle" is the original waterproof belt. It is made from center cuts of the best selected hides, tanned and curried by most approved

water, steam, oil or acid fumes, "Turtle" has a record that proves its unsurpassed qualities. The Ladew trade-mark on each "Turtle" belt is a guarantee of Ladew quality which has been a belting standard for over 80 years.



"TURTLE" BELTING BRAND

Special Belts for Special Purposes.

The Ladew line, in addition to the two main brands mentioned above, includes a number of other brands made from sections of the hide not considered suitable for "Flintstone" and "Turtle." These are high grade belts, though never sold as "first grade" belts, capable of splendid service where the conditions are clearly understood, so that the right belt can be supplied for each particular purpose. In many cases a material saving results by the use of these special belts under the advice of Ladew engineers. The Ladew Company also has unequaled facilities for producing, in short order, belts for special or unusual conditions.

Ladew Belting Accessories.

These include lace leather, cut lacing, belt cement and belt preservative—all made to the Ladew standard of quality and embodying a belting experience of more than 80 years. A Ladew leather belt, with joints laced with Ladew lacing or cemented with Ladew belt cement, will give a length and character of service which makes first cost an insignificant consideration.

Ladew Leather Specialties.

Hydraulic leathers, leather packings, leather washers and disks, shafting rings, and other mechanical specialties in leather made by Ladew are manufactured with the idea of service and sold to a trade which measures value by service rendered.

Catalogue.

"Ladew Leathering Belting" is the title of a 108-page book describing Ladew methods, processes, policies and products. "Ladew Leathers" (56 pages) describes leather products in great variety.

MAIN BELTING COMPANY

13th and Carpenter Streets
PHILADELPHIA, PA.

BRANCH OFFICES

NEW YORK, N. Y., 2 Rector Street CHICAGO, ILL., 17 North Jefferson Street ATLANTA, GA., 64 South Forsyth Street
PITTSBURGH, PA., 33 Terminal Way SAN FRANCISCO, CAL., 156 Second Street
MONTREAL and TORONTO: MAIN BELTING COMPANY OF CANADA, LTD.

Products.

LEVIATHAN and ANACONDA BELTING for power transmission, elevating and conveying.

Also Special White Food Conveyor Belting and Package Conveyor Belting.

Duck Brand Liquid Dressing; Blaxtick Bar Dressing; Belt Fasteners.

For Conveyor Rollers, see page 713.

Which Belt to Use and Where.

Neither Leviathan nor Anaconda takes precedence over the other in point of quality. Each belt is made to the highest standards in material and workmanship with the distinct purpose of meeting efficiently specific conditions. To enable the user readily to determine which belt is pre-eminently suited to the position the following is suggested.

Leviathan—This should be used on main, counter and machine drives under all ordinary conditions in general industries such as railroad and machine shops, iron and steel mills, lumber and woodworking plants, brick, stone, slag, cement, sand, and general ore-reducing plants, cottonseed and peanut oil mills.

Anaconda—Adapted to positions where severe conditions extraneous to the drive itself are encountered.

WATER—Paper mills, dye houses, bleacheries, canneries, packing houses, tanneries, etc.

MACHINE OIL—Automatic machinery, leaky bearings, oil tempering shops, etc.

HOT ATMOSPHERE—Hot air blowers, drying rooms, laundries, etc.

CORROSIVE GASES—Forge shops, foundries, pyrites roasters, spring manufacturing plants, etc.

ACID FUMES—Chemical plants, sheet mills, tin products and fertilizer plants, smelters, etc.

STEAM—Canneries, dye houses, bleacheries, packing houses, laundries, etc.

SLIPPERY DUST—Flour mills, gypsum and talc mills, bronze-powder plants, etc.



TRADE-MARK

Leviathan and Anaconda in Elevating and Conveying—Leviathan is adapted to all normal industrial conditions. Anaconda is supplied in such special conditions as handling hot materials, materials of chemical content, grain and slippery dust.

How the Guarantee of the Main Belting Company Protects the User.

Leviathan-Anaconda belts are made in various ply of solid fabric impregnated with special compound; so treated, stretched and aged as to produce a strong, pliable belting, well nigh indestructible.

The MAIN BELTING COMPANY's patented stretching and treating processes produce, in Leviathan and Anaconda, belts of far greater density than any other belts of their type. Because of this extreme density they are unaffected by changes in the humidity of the atmosphere. This density increases their resistance to wear in the same way that compressing an automobile brake lining by a hydraulic press increases its resistance to wear.

The pliability, tensile strength and co-efficient of friction are also enhanced by the treatment.

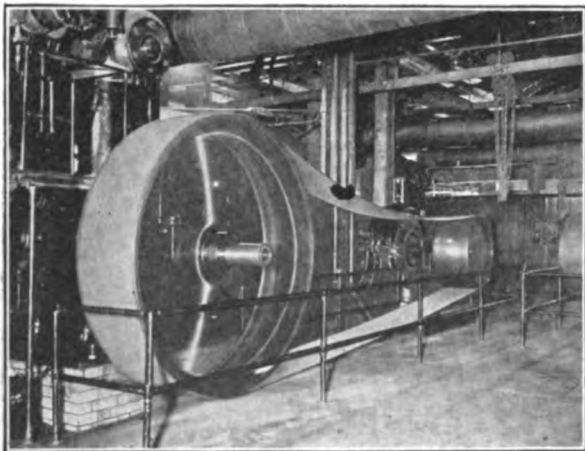
Excessive stretch, which is the prime fault of ordinary commercial belts, is positively removed by the MAIN BELTING COMPANY's exclusive processes. This is one of the reasons why we alone among the manufacturers of belting make a "Stretch Guarantee."

Guarantee Against Stretch—For every 1% a belt stretches after the first cut, the MAIN BELTING COMPANY will refund 3% of the purchase price. The first cut is excepted merely because it is generally recognized that it is more a matter of taking up slack than taking out stretch.

The guarantee will apply on every belt we recommend—and we do not recommend Leviathan or Anaconda for positions where they do not belong.

Literature.

For information regarding power transmission problems, see our book on power transmission.



AN ENDLESS ANACONDA RUNNING A MILE A MINUTE

In the Philadelphia railroad powerhouse illustrated there are 6 20-in. by 6-ply Anacondas, each developing 10% more than its rated power. Just 5 years ago the first of these powerful endless belts was installed. Subsequently water leaking on one of these drives destroyed a leather belt and later caused a rubber belt to slip off the pulleys. Naturally, as the other belts gave out, Anacondas replaced them.



TWENTY-FIVE HUNDRED TONS A DAY

This 30-in. by 8-ply Leviathan belt and a rubber belt were installed at the same time on precisely similar conveying jobs—2500 tons of coarse stone a day up a 20° grade. In six months the rubber belt was about ready for the scrap heap while the Leviathan was still as good as new and had not stretched enough to need cutting. This Leviathan belt has been doing the work for 5 years, a remarkable record considering the nature of the load.

UNITED STATES RUBBER COMPANY

Mechanical Rubber Goods

1790 Broadway
NEW YORK, N. Y.

BRANCHES IN EVERY INDUSTRIAL CENTER

Products.

TRANSMISSION, CONVEYOR and ELEVATOR
BELTING.

PACKING and PUMP VALVES.

USCO SHEET RUBBER FLOORING.

RUBBER (PARACORE) INSULATED WIRE and
CABLE.

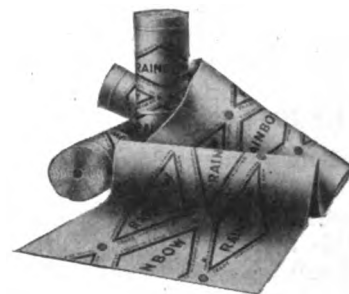
RUBBER HOSE.



TRADE-MARK

To aid in determining the brand or style which will be best suited to the particular requirements, our pack-

ing men are at your disposal.



RAINBOW PACKING

Manufacturing and Distributing Facilities.

We manufacture a line of mechanical rubber goods that is complete in every detail, and constructed with due consideration for the conditions of service to be encountered.

A service of distribution which includes branches in every industrial center and representatives in all parts of the world, enables us to assure customers of prompt and efficient service.



RAINBOW BELTING

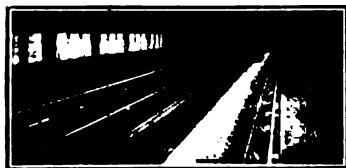
Belting.

For every transmission requirement, or conveying, or elevating condition, a type of belting is manufactured that will give the longest satisfactory service.

Rainbow friction surface belting is designed for severe transmission service and will soon prove itself a big factor in power economy. It is a properly balanced combination of duck and rubber, uniform in construction and possesses high tensile strength with minimum stretch.

For high speed over small pulleys our Pilot belt is suggested.

Every U. S. conveyor belt is made particularly for the work it is to perform. The construction of the body, the kind and thickness of cover—all are determined by the character of the installation.



U. S. COAL CONVEYOR BELT

Packing and Pump Valves.

The UNITED STATES RUBBER COMPANY manufactures a complete line of packings and pump valves. A correct type or style can be found to meet practically every mechanical need. All have been tested under the severest conditions, all have proved their merit.

Flooring and Stair Treads.

Usco sheet rubber flooring is constructed of two layers: bottom of black cushion rubber, top of color blocks which form the design and provide a hard wearing surface. Both layers are vulcanized into one seamless sheet. Resilient, sanitary, almost noiseless, and easily cleaned. Usually made in sheets 7 by 14 ft. or smaller, but can be furnished in practically any size.

Usco sheet rubber stair treads have the same outstanding characteristics. Made up on special order only, to fit steps or landings of any size or shape.

Wire.

The materials entering into the construction of Paracore wires and cables are carefully selected. The utmost care taken through their various manipulations, together with thorough tests maintained throughout the entire process of manufacture, insure both uniformity and quality. Unsurpassed facilities for the production of rubber insulated and lead incased wires and cables, enable us to produce them to meet every possible requirement and to withstand the most exacting conditions.

Hose.

For pneumatic service of the severest kind, our 48-10 air hose is as near the perfect hose for this work as it is possible to produce. The outer cover is tough and will stand the abrasion met in air tool service. The inner tube resists the action of oil that works through from the compressor.

Our line of hose is complete in every detail, and can be supplied in standard brands for every use to which hose can be put.



48-10 AIR HOSE

Other Products.

Hard rubber goods, acid gloves, special rubber boots, friction tape and splicing compound, plumbers' specialties, rubber tiling, mats and matting, and a large variety of miscellaneous moulded rubber specialties.

THE BRISTOL COMPANY

Manufacturers of Belt Fasteners and Safety Set Screws

WATERBURY, CONN.

BRANCH OFFICES

BOSTON, MASS., Old South Building
PITTSBURGH, PA., Frick Building
CHICAGO, ILL., Monadnock Building

NEW YORK, N. Y., 114 Liberty Street
DETROIT, MICH., Book Building
ST. LOUIS, MO., Boatmen's Bank Building
SAN FRANCISCO, CAL., Rialto Building

Products.

BRISTOL'S PATENT STEEL BELT LACING, BELT PLATES, BELT RIVETS and SAFETY SET SCREWS.

For Bristol's Recording Instruments, see pages 1048-1049.

Bristol's Patent Steel Belt Lacing.

Quickly and easily applied. Guarantees repairs to broken belts in the shortest possible time. No special tools required; all that is needed is a hammer, a block of soft wood and one's hands.

For all kinds of belts from the lightest split leather to the extra heavy conveyor belts.



NO. 1 STYLE, BRISTOL'S PATENT STEEL BELT LACING

Packed in assorted widths, or furnished packed all one width. Each box contains enough to lace 100 in. in width of belt. Saves time and can be applied quickly without special tools.

No. 00, for belts from $\frac{1}{8}$ to $\frac{1}{4}$ in. thick, \$1.00 per box. No. 0, for belts from $\frac{1}{4}$ to $\frac{1}{2}$ in. thick, \$1.00 per box.

No. 1, for belts from $\frac{1}{4}$ to $\frac{1}{2}$ in. thick, \$1.50 per box.
No. 2, for belts from $\frac{1}{2}$ to $\frac{3}{4}$ in. thick, \$2.00 per box.
No. 3, for belts from $\frac{3}{4}$ to 1 in. thick, \$2.50 per box.
No. 4, for belts from 1 to 1 1/4 in. thick, \$3.00 per box.
No. 5, for belts from 1 1/4 to 1 1/2 in. thick, \$3.50 per box.



NO. 11 STYLE, BRISTOL'S PATENT STEEL BELT LACING, FOR RUBBER AND COTTON BELTS

No. 100, for belts from $\frac{1}{8}$ to $\frac{1}{4}$ in. thick, \$1.00 per box.
No. 10, for belts from $\frac{1}{4}$ to $\frac{1}{2}$ in. thick, \$1.00 per box.
No. 11, for belts from $\frac{1}{2}$ to $\frac{3}{4}$ in. thick, \$1.50 per box.
No. 12, for belts from $\frac{3}{4}$ to 1 in. thick, \$2.00 per box.
No. 13, for belts from 1 to 1 1/4 in. thick, \$2.50 per box.
No. 14, for belts from 1 1/4 to 1 1/2 in. thick, \$3.00 per box.
No. 15, for belts from 1 1/2 to 1 3/4 in. thick, \$3.50 per box.
No. 17, for belts from 1 3/4 to 2 in. thick, \$4.95 per box.
No. 19, for belts from 2 to 2 1/2 in. thick, \$6.05 per box.



STAGGERED POINT STYLE BRISTOL'S PATENT STEEL BELT LACING, FOR ALL KINDS OF BELTS

No. 1100, for belts from $\frac{1}{8}$ to $\frac{1}{4}$ in. thick, \$1.00 per box.
No. 110, for belts from $\frac{1}{4}$ to $\frac{1}{2}$ in. thick, \$1.00 per box.
No. 110 1/2, for belts from $\frac{1}{2}$ to $\frac{3}{4}$ in. thick, \$1.25 per box.
No. 111, for belts from $\frac{3}{4}$ to 1 in. thick, \$1.50 per box.
No. 112, for belts from 1 to 1 1/4 in. thick, \$2.00 per box.
No. 113, for belts from 1 1/4 to 1 1/2 in. thick, \$2.50 per box.
No. 114, for belts from 1 1/2 to 1 3/4 in. thick, \$3.00 per box.
No. 115, for belts from 1 3/4 to 2 in. thick, \$3.50 per box.
No. 117, for belts from 2 to 2 1/4 in. thick, \$4.95 per box.
No. 119, for belts from 2 1/4 to 2 1/2 in. thick, \$6.05 per box.

Bristol's Patented Steel Belt Plates and Rivets.

May be used on rubber and cotton belts. Bristol's rivets are furnished with improved sharpened points,

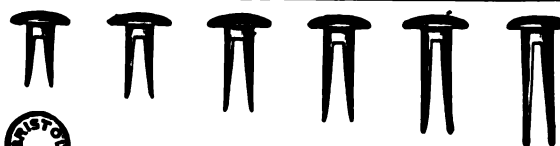
TRADE MARK
BRISTOL'S
REG. U. S. PAT. OFF.

and when applied, will roll back and grasp around the fibers without cutting them. Made in a complete line of styles and sizes.



BRISTOL PATENT BELT PLATE

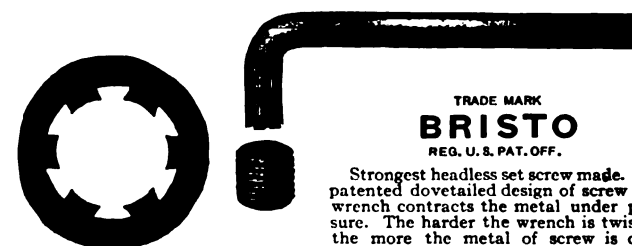
Size No.	List price, per gross	Size No.	List price, per gross	Size No.	List price, per gross
700	\$1.44	720	\$4.32	730	\$8.64
710	1.44	721	4.32	731	11.52
711	2.88	722	5.76	732	12.96
712	4.32	723	7.20	733	14.40
713	5.76	724	8.64	736	Assorted
714	5.76	726	Assorted	740	14.40
716	Assorted			741	17.28



BIFURCATED BELT RIVETS

No. 809 With Small Shank		No. 810 With Large Shank		No. 811 With Extra Large Shank	
Length, in.	Per gross	Length, in.	Per gross	Length, in.	Per gross
1 1/2	\$.40	1 1/2	\$.60	1 1/2	\$.80
1 3/4	.40	1 3/4	.60	1 3/4	.80
2	.40	2	.60	2	.96
2 1/4	.40	2 1/4	.60	2 1/4	.96
2 1/2	.45	2 1/2	.68	2 1/2	1.10
2 3/4	.45	2 3/4	.75	2 3/4	1.20
		3	.75	3	1.20
		3 1/4	.85	3 1/4	1.35
		3 1/2	.85	3 1/2	1.35
				3 3/4	1.50

"Bristo" Patented Safety Set Screw.



Showing Dovetail Design

TRADE MARK
BRISTO
REG. U. S. PAT. OFF.

Strongest headless set screw made. The patented dovetailed design of screw and wrench contracts the metal under pressure. The harder the wrench is twisted, the more the metal of screw is compressed. Set screws with special points or special lengths furnished to order.

"BRISTO" SAFETY SET SCREW

No.	Diam., in.	Length, in.	U. S. std. threads per in.	Price 100 screws and 8 wrenches
40	1/4	1 1/2	20	\$5.00
50	3/8	1 1/2	18	5.00
60	1/2	1 1/2	16	5.00
70	5/8	1 1/2	14	6.00
80	3/4	1 1/2	13	7.00
90	7/8	1 1/2	12	8.00
100	1	1 1/2	11	10.00
120	1 1/4	1 1/2	10	12.00
140	1 1/2	1 1/2	9	15.00
160	1 3/4	1 1/2	8	20.00

Fig. 13828B

In ordering, specify quantity, number and length.

CRESCENT BELT FASTENER COMPANY

381 Fourth Avenue
NEW YORK, N. Y.

BRANCH OFFICES: BIRMINGHAM, ENG. and TORONTO, CAN.

Products.

CRESCENT BELT FASTENERS.
CRESCENT PLATES.
CRESCENT RIVETS.

Crescent Belt Fasteners.

Crescent Belt Fasteners maintain the maximum strength of the belt at the joint and the Crescent joint is not destructive to the belt in operation. It is not subject to wear against the pulleys and assures efficient and economical operation for the full life of the belt.

Owing to the fact that the Crescent method makes a joint that is permanent, Crescent joined belts last longer. The Crescent method saves time and labor. They are safe and approved by the Underwriters' laboratories.

Crescent Belt Fasteners consist of two separate and distinct parts, which are licensed only for use in combination. This is a technical product to perform a technical operation, and properly used, assures the maximum in service and life from belts.

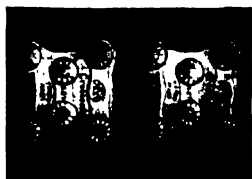
Uses—Crescent Belt Fasteners are used on transmission, elevating and conveying belting of every length, width, thickness, kind, and make.

Advantages—Crescent Belt Fasteners sustain the belt's full strength and reinforce it at the joint. None of the belt material is cut away, punched out or weakened. None of the lengthwise power carrying fibers are severed. A Crescent joint hugs the pulley snug and tight, and insures full, even, continuous transmission of power. The curvature of Crescent Plates conforms to the pulley.

The edges of Crescent Plates are beveled, and afford the correct flexibility to prevent cracking the belt behind the joint.

Crescent Belt Fasteners insure continuous operation. A Crescent joint is quickly and easily made with no other tools than a hammer.

Shortening and Rejoining—Simply remove the Crescent Rivets from one side of the joint only, cut out the slack and rejoin with a row of new Crescent Rivets. The work of a moment and a trifling expense.



OUTSIDE OF CRESCENT JOINT SHOWING CRESCENT PLATES AND RIVETS

Economy—As Crescent Plates are not subject to wear they outlast the belt and can be used over and over again. And as Crescent Belt Fasteners save time in applying, avoid interruptions and require no supervision or maintenance, this is undoubtedly the most economical means of joining belting in the world.

Crescent Plates are attached singly or in multiple according to the size of the belt. The service chart on this page shows the sizes of Crescent Plates and Crescent Rivets to insure the best results for every condition of work.

Crescent Belt Fasteners are recommended and regularly installed by belting manufacturers as the strongest, safest, most durable and economical method.

For information write to Service Department.

CRESCENT PLATES AND CRESCENT RIVETS FOR ALL SIZES OF BELTING

High Speed Light Work	High Speed Light Work Pulleys 2 in. or larger	For $\frac{3}{4}$ and 1 in. of belt width, No. 20 Crescent High-speed Plate " 1 " " " " " 40 " " " " " $1\frac{1}{4}$ " " " " " 44 " " " " " 2 " " " " " 60 " " " "
	High Speed Light Work Pulleys $4\frac{1}{2}$ in. or larger	For wider belting use two or more Crescent Plates of the same grip
	For attaching all Crescent High Speed Plates use Crescent Small Shank Rivets as follows: Belt thickness, in. Size rivets	For $1\frac{1}{4}$ in. of belt width, No. 66 Crescent High-speed Plate, For wider belting use two or more Crescent Plates of the same grip
	2/16 5/16 3/16 6/16 4/16 7/16 5/16 8/16 6/16 9/16 7/16 10/16	Crescent Small Shank Rivets Note—To determine the quantity of Crescent Rivets needed to attach a given quantity of Crescent Plates, multiply the number of gross of plates ordered by the bold face figures of the size number of the Crescent Plate. Example: 3 gross No. 127 Crescent Plates— $3 \times 12 = 36$ gross of Crescent Large Shank Rivets required.
Regular Work, Ordinary Conditions	Light Work Pulleys 3 in. or larger Belting $\frac{3}{4}$ in. to 4 in. wide	For $\frac{3}{4}$ and 1 in. of belt width, No. 25 Crescent Short Grip Plate " $1\frac{1}{4}$ " " " " " 45 " " " " " 2 " " " " " 65 " " " " " $2\frac{1}{4}$ " " " " " 85 " " " " " 3 " " " " " 805 " " " "
	General Work Pulleys 6 in. or larger Belting $1\frac{1}{4}$ in. to 8 in. wide	For wider belting use two or more Crescent Plates of the same grip
	General Work Pulleys 9 in. or larger Belting 2 in. to 12 in. wide	For $1\frac{1}{4}$ in. of belt width, No. 67 Crescent Medium Grip Plate " 2 " " " " " 607 " " " " " $2\frac{1}{4}$ " " " " " 87 " " " " " 3 " " " " " 107 " " " " " $3\frac{1}{4}$ " " " " " 127 " " " " " 4 " " " " " 147 " " " "
	Heavy Work Pulleys 12 in. or larger Belting 5 in. to 36 in. wide	For wider belting use two or more Crescent Plates of the same grip
Extremely Heavy Work	Extremely Heavy Work Large pulleys Belting up to 72 in. wide	For 2 in. of belt width, No. 63 Crescent Special Grip Plate " $2\frac{1}{4}$ " " " " " 83 " " " " " 3 " " " " " 103 " " " " " $3\frac{1}{4}$ " " " " " 123 " " " "
	For attaching all the above Crescent Plates with Crescent Large Shank Rivets as follows: Belt thickness, in. Size rivets	For wider belting use two or more Crescent Plates of the same grip
	2/16 5/16 3/16 6/16 4/16 7/16 5/16 8/16 6/16 9/16 7/16 10/16 8/16 11/16 9/16 12/16 10/16 13/16 11/16 14/16	Crescent Large Shank Rivets Note—An additional 50% of Crescent Rivets will provide for rejoining when shortening your belt. Better order to have them handy. See "Note" above.
	Extremely Heavy Work Large pulleys Belting up to 72 in. wide	For 3 in. of belt width, No. 1611 Crescent Jumbo Plate " 4 " " " " " 2211 " " " " For wider belting use two or more Crescent Plates of the same grip
	For attaching Crescent Jumbo Plates use Crescent Jumbo Rivets as follows: Belt thickness, in. Size rivets	For wider belting use two or more Crescent Plates of the same grip
	5/16 10/16 6/16 11/16 7/16 12/16 8/16 13/16 9/16 14/16 10/16 15/16 11/16 16/16 13/16 18/16	Crescent Jumbo Rivets Note—Be sure to specify enough Crescent Rivets for attaching the Crescent Plates ordered. See "Notes" above.

The Crescent Rivet Extractor is a convenient tool for removing Crescent Rivets when shortening and rejoining belt.

Every Crescent Plate and Crescent Rivet is marked with the registered trade-mark, "Crescent." Specify "Crescent Belt Fasteners" by name on all orders. Write to service department for further details and prices.

AIR REDUCTION SALES COMPANY

Manufacturers of Airco Oxygen, Acetylene, and Welding and Cutting Apparatus

HOME OFFICE
120 Broadway
NEW YORK, N. Y.

DISTRICT OFFICES AND PLANTS

ATLANTA, GA.
BOSTON, MASS.
BUFFALO, N. Y.

CHICAGO, ILL.
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DETROIT, MICH.
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OKLAHOMA CITY, OKLA.
ST. LOUIS, MO.

PHILADELPHIA, PA.
PITTSBURGH, PA.
RICHMOND, VA.
SEATTLE, WASH.

WAREHOUSES AND OTHER PLANTS AT INTERMEDIATE POINTS

Products.

OXYGEN; ACETYLENE; WELDING and CUTTING APPARATUS and SUPPLIES; ACETYLENE GENERATORS.

Also Carbide, Nitrogen.

Airco Engineering Service.

The AIR REDUCTION SALES COMPANY maintains a corps of oxy-acetylene welding and cutting specialists to assist in solving oxy-acetylene welding or cutting problems and in training welders in the art.

Airco Oxygen.

Of a uniform high quality. It is shipped to users from Airco distributing stations located at important centers. There is an Airco distributing station conveniently near every Airco user. Each station is equipped with sufficient capacity, as to cylinders, to take care of the user's requirements on short notice. Airco Oxygen cylinders are of two sizes—containing approximately 110 cu. ft. and 220 cu. ft. of Airco Oxygen.

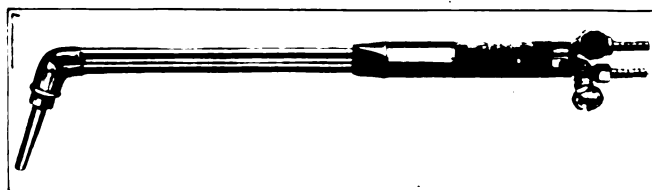
Airco Acetylene.

Manufactured from calcium carbide at the Airco Acetylene plants located throughout the United States. Airco Acetylene cylinders are of a special design which insures maximum safety and fulfils all the requirements of the Interstate Commerce Commission and the various Safety Councils.

Airco Acetylene cylinder policy represents the greatest economy to the user. The same excellent methods prevail in the distribution of Airco Acetylene as for Airco Oxygen.



AN AIRCO PORTABLE OUTFIT



AIRCO "A" WELDING TORCH



TRADE-MARK

Airco "A" Welding Torch.

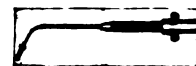
Designed for welding material from $\frac{1}{8}$ in. thick to the thickest metal practical to weld with the oxy-acetylene process. Furnished in lengths of 16, 20, 26 or 34 in., with 45°, 67½°, or 90° angle head, and 10 sizes of welding tips. The standard length, 20 in., weighs only 31 oz.

Airco "B" Welding Torch. (Sheet Metal Torch.)

Manufactured to meet the demand for a light, well balanced, substantially built torch for use in manufacturing plants where the same operation is done day in and day out and where the thickness of material does not exceed approximately $\frac{1}{4}$ in. The torch is furnished with 3 angles of head, namely: 45°, 75° and 90°; and weighs only 15 oz. It is furnished with 7 interchangeable tips designed for use in welding metal from $\frac{1}{8}$ in. to approximately $\frac{1}{4}$ in.

Airco "C" Welding Torch. (Lead Welding Torch.)

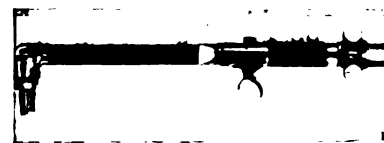
Manufactured to meet the demand for a torch with a hot, concentrated flame for delicate operations, such as very light sheet metal, dental and jewelry work. Furnished with 4 interchangeable tips for welding material from $\frac{1}{8}$ in. to approximately $\frac{1}{4}$ in. and weighs only 13 oz.



AIRCO "C" WELDING TORCH

Airco "D" Cutting Torch.

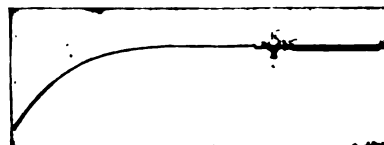
Designed along the same principles as Airco welding torches. Furnished with 3 angles of head, namely: 67½°, 90° and straight head and with interchangeable tips for use in cutting material up to the maximum cut capable of being made with the oxy-acetylene flame. Weighs 47 oz. with tip and hose connections attached.



AIRCO "D" CUTTING TORCH

Airco Carbon Burning Torch.

Used for removing carbon from cylinders of internal combustion motors. Simply and strongly constructed and will more than pay for itself in a very short time, by the saving made over the usual costs of removing carbon from motor cylinders. Very popular in garage and automobile repair plants.



AIRCO CARBON BURNING TORCH

Airco Acetylene Generators.

Manufactured in sizes ranging from a capacity of 25 cu. ft. of acetylene per hour to 300 cu. ft. per hour. Every effort has been made in the design and construction to make the generators foolproof by means of interlocking levers and other simple safety devices.

GIBB INSTRUMENT CO.

Manufacturers of Welding Apparatus

348 Palmer Avenue East
DETROIT, MICH.

Products.

ARC WELDING EQUIPMENT.

Also, Welding Accessories: Welding and Cutting Electrodes, Handles, Operators' and Inspectors' Masks and Shields, Gloves, Aprons, etc.

Development of Zeus A.C. Arc Welder.

The GIBB INSTRUMENT CO. has been a pioneer in the movement towards better welding equipment. It has developed the Zeus A. C. arc welder, which replaces the motor generator type and its complex mechanism, moving parts and high cost of upkeep, and the oxy-acetylene type with its excessive operating costs.

The Zeus welder fulfills to the maximum degree all of the requirements of welding equipment—high operating efficiency, high welding speed, low operating costs and uninterrupted service.

The Zeus welder represents the closest approximation to the ideal welding apparatus that has been attained, and its efficiency is unequalled by any other welding apparatus. It has many practical advantages that will appeal to the user of such apparatus. The Zeus welder is sold only for the work to which it is best adapted. Some work can best be handled by gas welding for which a Zeus will not be sold.

Submit welding problems to this company for satisfactory solution.

High Operating Efficiency.

The Zeus A. C. arc welder consists of an especially designed transformer with a convenient regulator for the accommodation of varying size work. Roughly, this regulates the heat of the arc. The inherent reactance of the machine automatically stabilizes the arc and prevents the burned weld due to excessive arc length.

The Zeus arc will become extinguished with attempts to lengthen beyond $\frac{1}{8}$ in. Owing to the *stability of the current*, the arc is easily maintained within this length. For the same reason constant heat is assured.

High Welding Speed.

The Zeus A.C. arc welder requires no preheating of the work. Further, since by means of the regulator any temperature may be maintained by the arc, the question of speed is answered.

Low Operating Costs.

The Zeus A. C. arc welder can be operated at less cost than any other type of welder. Assuming the rate to be 4¢ per kw. h., comparative operating costs would be as follows:

Zeus A. C. arc welder.....	13¢ to 15¢ per hour
Motor generator set.....	30¢ to 50¢ per hour
Resistance type.....	50¢ to \$1.00 per hour
Oxy-acetylene.....	\$1.50 to \$2.00 per hour

The reason for the low current consumption of the Zeus welder is that from 90% to 95% of the circuit energy finds its way to the arc, and is dissipated neither in motor losses nor in the heating of regulating resistances.

Uninterrupted Service.

The substantial construction of the transformer (made of stationary copper and iron) has made the Zeus A. C. arc welder the most simple, rugged and durable electric apparatus.

In accordance with the most approved transformer design, the Zeus is oil cooled, eliminating the necessity of a fan or a cool position. As the case is sealed, there is no chance for grit or dirt to cause a breakdown of insulation and short circuit.

The only accessory to the transformer is the regulator, consisting of a wheel and rack and pinion, to which is attached the secondary of the transformer.

There are no rotating parts, nothing to get out of order and no upkeep expense.

Other Advantages.

The Zeus welder is compact, lending itself to portability.

The Zeus A.C. arc welder is built on the unit system. It can be added to as work demands. The loss of one machine does not close the shop.

It will weld the heaviest iron and steel castings as well as plate of No. 16-gage thickness.

In service, the Zeus A. C. arc welder has proved efficient, speedy, economical and trustworthy.



ZEUS A.C. ARC WELDER COMPLETE

THE IMPERIAL BRASS MFG. CO.

Oxy-acetylene Welding and Cutting Equipment and Acetylene Generators

1200 West Harrison Street
CHICAGO, ILL.

Products.

IMPERIAL WELDING, CUTTING, CARBON and LEAD BURNING EQUIPMENT.

IMPERIAL AUTOMATIC ACETYLENE GENERATORS for Welding and Cutting.

IMPERIAL OXYGEN-HYDROGEN EQUIPMENT.

Also manufacturers of Watrous Patent Plumbing and Liquid Soap Fixtures, Automotive Accessories, Special Building Hardware, Cast Bronze Signs and Name Plates.

Imperial Welding, Cutting, Carbon and Lead Burning Equipment.

Imperial oxy-acetylene process equipment is thoroughly practical, economical and safe. It is furnished in four outfits as listed below to meet the various requirements of service.

The mixing principle of Imperial torches is scientific and practical. They are approved by the Underwriters' Laboratories of the National Board of Fire Underwriters. No other regulator so accurately and uniformly controls delivery of gases; none has its automatic safety features.

No. 1 Imperial Welding and Carbon Burning Outfit—For all general welding work from thin sheet metal to heaviest castings.

Consists of Type B Imperial welding torch with 10 welding tips, extension carbon burning torch, regulators, 4 gages, hose, connections, goggles, handbook, carrying case, complete supply of welding materials, ready for service. Each \$90.00.

No. 3 Imperial Cutting Outfit—For light and heavy cutting of steel and wrought iron.

Consists of Type E Imperial cutting torch with 2 housings and 4 tips, regulators, 4 gages, hose, connections, goggles, handbook, carrying case, etc., complete, ready for service. Each \$115.00.

No. 4 Imperial Combination Welding, Cutting and Carbon Burning Outfit—A splendid equipment for garages and all general work; combination welding and cutting torch performs both operations.

Consists of Type B Imperial welding torch with cutting attachment, 10 welding and 3 cutting tips, carbon burning torch, regulators, 4 gages, hose, connections, goggles, handbook, carrying case, complete supply of welding materials, ready for service. Each \$110.00.

No. 5 Imperial Duplex Welding, Cutting and Carbon Burning Outfit—Best all-purpose apparatus obtainable at any price. Fully adequate to handle all welding and cutting for which the process is adapted.

Consists of a complete No. 1 Imperial welding outfit as described above and also includes a Type E Imperial cutting torch with 2 housings and 4 tips, an extra pair of goggles and 25-ft. length of hose, complete. Each \$140.00.

Imperial Oxygen-hydrogen Equipment—Torches and regulators for oxygen-hydrogen cutting and welding work can also be supplied. Full data and prices on request.

Imperial Automatic Acetylene Generator.

The Imperial automatic acetylene generator is of the medium pressure, carbide to water type. It produces pure acetylene gas from carbide and water for welding, cutting and lead burning by the oxy-acetylene process.

The Imperial acetylene generator possesses many marked advantages over other makes. The most important of these being the absence of weights, clockwork and complicated mechanism. In the Imperial generator, the carbide feed is simple, sure and dependable, and is automatically controlled by the gas consumed by the torch; the generating of the gas automatically stops when the torch is extinguished and automatically starts again when the torch is relighted, thus maintaining a constant, even gas pressure.

Interlocking safety levers make the Imperial generator absolutely foolproof, and compel the users to follow the proper sequence of the operations necessary to start or shut off the generator. A dependable safety blowoff makes it impossible to obtain more than 15 lbs. pressure.

The gas purifier has a water seal which cools the gas and absolutely prevents a back flash reaching the generator.

A truck for generator and one cylinder of oxygen is supplied with all 15-lb. and 25-lb. generators unless it is desired to have it omitted.

Price List—15-LB. GENERATOR—15 lbs. carbide capacity, 15 gals. water capacity, produces 15 cu. ft. of gas per hour or 75 cu. ft. per charge, complete with truck, \$175.00. Deduct \$20.00 if truck is not wanted.

25-LB. GENERATOR—25 lbs. carbide capacity, 25 gals. water capacity, produces 25 cu. ft. of gas per hour or 125 cu. ft. per charge, complete with truck, \$200.00. Deduct \$20.00 if truck is not wanted.

50-LB. GENERATOR—50 lbs. carbide capacity, 50 gals. water capacity, produces 50 cu. ft. of gas per hour or 250 cu. ft. per charge, complete without truck, \$275.00.

100-LB. GENERATOR—100 lbs. carbide capacity, 100 gals. water capacity, produces 100 cu. ft. of gas per hour or 500 cu. ft. per charge, complete without truck, \$425.00.



IMPERIAL WELDING OUTFIT AS USED WITH
IMPERIAL ACETYLENE GENERATOR

METALWOOD MANUFACTURING CO.

Hydraulic Machinery and Equipment

Leib and Wight Streets
DETROIT, MICH.

Products.

HYDRAULIC STRAIGHTENING PRESSES.
HYDRO-PNEUMATIC QUICK OPERATING PRESSES.
HYDRAULIC PRESSES.
HYDRAULIC ARBOR PRESSES.
HYDRAULIC BROACHING PRESSES.
HYDRAULIC FORCING AND ASSEMBLY PRESSES.
HYDRAULIC ACCUMULATORS.
HYDRAULIC HIGH DUTY PUMPS.
PIPE AND FITTINGS FOR HYDRAULIC LINES.
DROP FORGED STEEL HYDRAULIC FITTINGS.
CAST STEEL FLANGED HYDRAULIC AND STEAM FITTINGS.

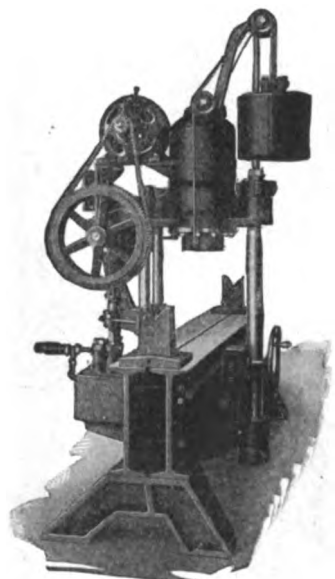
Service.

This company maintains an engineering department which is always at the service of its customers, and will gladly furnish any information desired.

Hydraulic Straightening Presses.

These machines are carefully designed along the lines of advanced engineering practice and are constructed of high grade material throughout.

The bed is made of two extra heavy steel I-beams supported by two heavily flanged cast legs. Adjustable V-block centers are provided for the support of shaft.



HYDRAULIC STRAIGHTENING PRESS

Made in capacities of 35, 50, 65 and 125 tons for straightening 3-in. to 6-in. bars and shafts, including No. 191 crank shaft press designed especially for crank shaft straightening.

Press is built for accumulator drive; belt drive from line shaft; and direct motor drive as a self-contained removable unit.



Hydro-pneumatic Quick Operating Presses.

Manufactured in capacities of 10, 15, 20, 30 and 40 tons for light straightening, broaching, forcing and assembly operations.

Hydraulic Presses.

Designed for vulcanizing and forming in rubber manufacture; leather and coin embossing; metal and plastic material forming presses.

Hydraulic Arbor Presses.

For industrial and railroad shop work, made in capacities of 35, 60 and 100 tons.

Hydraulic Broaching Presses.

For use in accumulator or belt driven types.

Hydraulic Forcing and Assembly Presses.

Horizontal style, quick operating types, for rear axle housing and brake drum work.



FORCING AND ASSEMBLY PRESS

Hydraulic Accumulators.

Made in four types and a wide range of capacities for various requirements.

Hydraulic High Duty Pumps.

These pumps are manufactured in horizontal and vertical types and in capacities of 2½ to 20 gals.

Pipe and Fittings for Hydraulic Lines.

Consist of flanges, pipe, valves, etc., including "Metalwood" quick operating type valve; alleviators and intensifiers.



HYDRAULIC VALVE

Drop Forged Steel Hydraulic Fittings.

Ells, tees, stop and check valves, flange unions, couplings, bushings, etc.

Cast Steel Flanged Fittings.

Ells, tees, crosses and flanges in cast steel for maximum 3000 lbs. hydraulic working pressure and in semi-steel for steam and maximum 1500 lbs. hydraulic working pressures.

The facilities of an excellent plant equipment combined with control of foundry sources of supply, assure a first quality product and prompt shipments.

Bulletins.

Furnished on application.

SOUTHWARK FOUNDRY AND MACHINE CO.

Manufacturers of Hydraulic Machinery and Power Tools

PHILADELPHIA, PA.

NEW YORK, N. Y.

BRANCH OFFICES

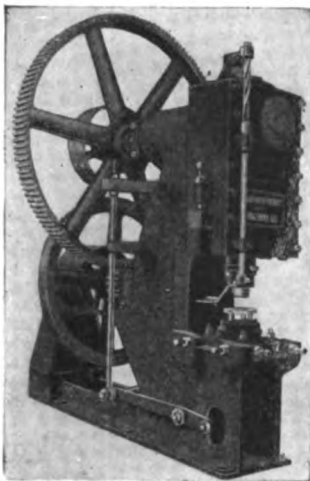
BIRMINGHAM, ALA.

Products.

HYDRAULIC MACHINERY and POWER TOOLS:

Gate Shears; Angle Shears; Multiple Punches; Forcing Presses; Drawing Presses; Flanging Presses; Plate Planers; Tile and Die Presses; Bending Rolls; Push Benches; Pull Benches; Riveters; Plate Bending Presses; Wheel Presses; Jogging Presses; Stamping

and Drawing Presses; Heater Presses; Forging Presses; Intensifiers; Dishing Presses; Washer Presses; Accumulators; Bending and Straightening Machines; Punching and Shearing Presses; Powder Presses; Flue Welders; Locomotive Repair Machinery; Scrap Reclaiming Equipment; Shipyard Machinery.



MASON WASHER PRESS

May be equipped to feed washer stock in hand or bars.
May also be arranged for belt or motor drive



BENDING ROLLS

Made in many sizes, varying in capacity from rolling of small sheets up to large ship plates, which are at times as long as 34 ft.

General construction consists of 3 rolls, arranged in a pyramidal setting. Two bottom rolls driven by suitable gear trains and electric motor, while top roll is an idler arranged for vertical adjustment through suitable screw down mechanism, which is generally driven by independent electric motor.

On all but large ship rolls, top roll is provided with an extension for balancing weight of roll; while outer bearing, which is removable, can be dropped for the purpose of taking out completed shells. This roll can also be thrown out of parallel in a vertical plane with 2 lower rolls for handling conical sections.

Housings and gear bearings mounted on continuous cast iron bed plate, which in turn is set on suitable concrete foundation



ACCUMULATOR

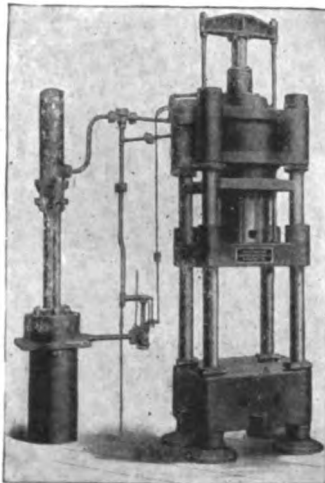
60-in. ram, 20-ft. stroke, 2940 gals., 600 lbs. per sq. in.
Furnished either moving cylinder or moving ram type of any capacity or pressure



HORIZONTAL DRAWING PRESS

300-ton press having a stroke of 14 ft.

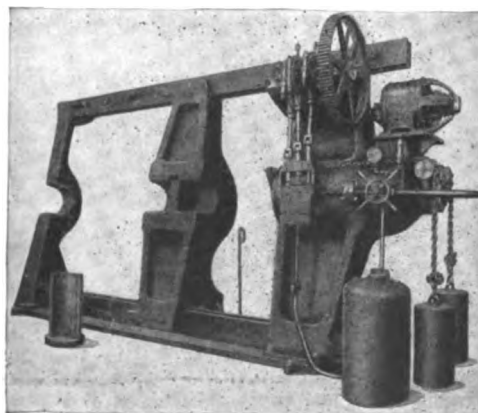
Arranged with double die-bed; 1 die-bed arranged in front of resistance platen and another arranged back of resistance platen, so that for short draws, only sufficient stroke is utilized to finish the material, thus economizing on pressure water



VERTICAL PRESS AND INTENSIFIER

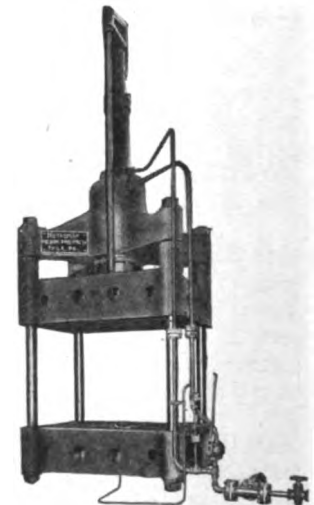
1500 ton hydraulic forging press complete with intensifier.

Low pressure admitted to main cylinder through check valve and tee by operating main valve. This brings moving platen down to ram and fills high pressure intensifier cylinder. Maximum capacity obtained by operating 3-way valve on low pressure intensifier cylinder. Raising intensifier ram admits intensified pressure water through check valve into main cylinder of press



600-TON MOTOR DRIVEN WHEEL PRESS

Motor driven inclined type. Pump body of forged steel. Mounted on heavy cast iron base plate. Equipped with axle bushing and stop plate. Capacities from 100 to 600 tons



FLANGING PRESS

4-column 350-ton press adapted for general use in car and boiler shops for flanging steel shapes.

Platens made of open hearth steel casting with tee slots planed from solid, or of special close grained cast iron.

This company has built presses of this design with clearances from 4 by 6 ft. to 12 by 14 ft. between columns, and up to 2500 tons capacity.

All presses equipped with operating valves and piping between valve and press

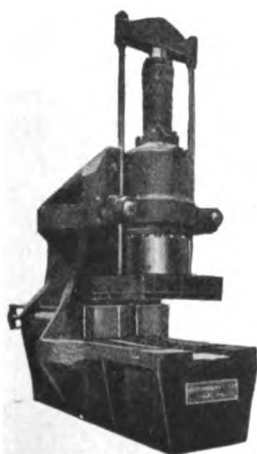
Plate Planers.

For edge planing, plates are clamped down to bed of machine either by hand, hydraulic or pneumatic jacks. Jacks are mounted on a structural steel girder, which is connected to bed plate through housings at each end of machine. Carriage is equipped with 2 tools, 1 for planing in each direction. Travel of carriage is obtained through means of a long bronze nut fastened to underside of it, and a screw which is supported in a half-round groove running the full length of the bed.

At the end of the machine are tight and loose driving pulleys which operate the screw through a single reduction of cut gears. Driving belts are shifted by hand or automatically from the carriage which operates adjustable dogs on belt shifter shaft.

For ordinary belt drive, pulleys are belted to an overhead countershaft. The most common type of drive is the belted motor type, in which motor is mounted directly above reversing pulleys on a structural stand. Direct connected reversing type motor can also be used, and in this case is usually under manual control of operator who travels with the carriage.

Made to take plates in lengths from 16 to 40 ft.

**JOGGLING PRESS**

Capacities, 350 and 500 tons. For use in offsetting plates, beams and bulb angles.

Equipped with 1 vertical and 1 horizontal ram.

Gap to center of vertical ram 33 ins. Table 5 ft. 3 ins. by 4 ft. 8 ins. Vertical clearance between highest position of moving platen and table 3 ft. 9 ins.

**PORTABLE RIVETER**

100-ton special riveter with 15-in. gap and 7-in. stroke. Distance from center of removable forged steel riveter horn to face of top die, 3 ft. Stroke of ram, 7 ins. Designed of all cast steel and provided with adjustable hanger

**HEATER PRESS**

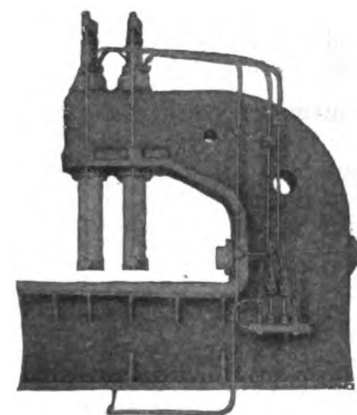
Capacity, 1000 tons. Ram, 30 ins. diameter; 3000 lbs. pressure. Full stroke of ram, 14 ft. Inside diameter of shell, 4 ft. 8 ins.

**STAMPING AND DRAWING PRESS**

4-column type having 2 moving platens. Designed with capacities from 100 to 1000 tons. Working pressure, 1500 lbs.

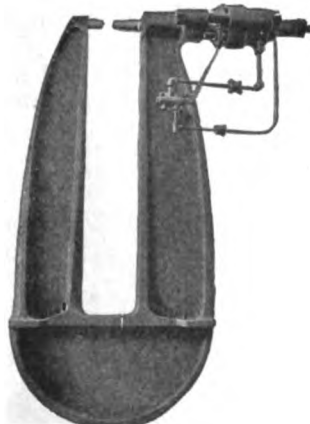
Two standard bronze body 3-way valves furnished with this press.

Small stripper cylinder, single or double-acting type, can be arranged in center of bottom of platen if desired

**200-TON SECTIONAL FLANGING PRESS**

Furnished complete with operating valves. Designed for 1500 lbs. pressure. Equipped with 2 vertical rams, 1 horizontal ram and 1 supplementary ram.

Housing of semi-steel. Cylinders of steel castings cast separately. Rams of special close grained cast iron mixture

**STATIONARY RIVETER**

Single power. All rams outside packed, stuffing boxes easily accessible. Pull-back operated by constant pressure, while main ram is controlled by standard piston type 3-way operating valve.

Built in capacities from 15 to 60 tons with gaps from 6 ins. to 12 ft. 6 ins. Standard opening between stakes 24 ins.

Triple and six power. Solid, split stake type. Capacities up to 200 tons with gaps to 25 ft.

**PUSH BENCH WITH EXTENSION DIE BED**

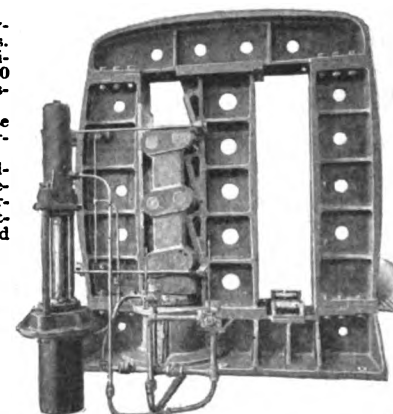
Used for reducing pipes by pushing over a mandrel. Also used for drawing cups and cartridge cases.

Special device for stripping tubes from mandrel is arranged at end of front head.

Operated by standard 4-way operating valve.

Presses built with cylinders ranging from 5 ins. in diameter up to 26 ins. for 1500 lbs. working pressure, with strokes of from 18 ins. to 26 ft.

Hydraulic draw benches for tube mills also built

**VERTICAL PLATE BENDING PRESS**

Vertical opening, 12 ft. 4 ins. Stroke of bending beam, 6 ins. Operates with 1000 lbs. line pressure.

To get maximum capacity of 1000 tons in horizontal direction, a hydraulic intensifier is provided, which will intensify pressure water in press cylinder and give a stroke of approximately 1 in.

Can also be arranged with flexible top member so as to facilitate bending of shells to complete circle

THE WATSON-STILLMAN CO.

Engineers and Builders of Hydraulic Machinery

MAIN SALES OFFICE

50 Church Street

NEW YORK, N. Y.

CHICAGO OFFICE, McCormick Building

WORKS: ALDENE, UNION CO., N. J.

Products.

HYDRAULIC JACKS; HYDRAULIC SHEARS; IRON and WIRE ROPE SHEARS; CONCRETE TESTING PRESSES; PAXTITE LEATHER PACKINGS.

Also manufacturers of Benders, Tunneling Shields and Equipment, Heating and Chilling Presses, Forcing Presses and Special Machinery.

Universal Hydraulic Jack.

This jack is designed to fill the requirements of a universal purpose jack for work where the old style jacks have not filled the requirements. In its construction, no detail has been omitted which is necessary to render it capable of handling the work for which it is designed.

On account of the form of this jack it is easy to handle; and being made entirely of steel renders it light in weight.

It has a horizontal head which enables the jack to work at any angle from vertical to horizontal, and when laid flat upon the side the ram will push out its entire lifting length. To the bottom of the head is attached a cylinder, which passes over the outside for the purpose of excluding sand and dirt, from between the ram and cylinder, which would cut them and disable the tool as in case of some other styles of jacks.

It is provided with a large round steel bottom which gives it a firm foundation.

An independent claw can be used when a low lift is required, and removed when the jack is used for other purposes, thus relieving the tool of the additional weight.

This jack will be found durable, plain in construction, and reliable in service; and on account of its special design, will facilitate the handling of heavy equipment, bridges, etc.

These jacks are built in capacities to 60 tons.

Independent Pump Hydraulic Jack.

This jack will work where any other can be used, and it will work where conditions make the use of other jacks impossible. Being connected to its pump by a flexible copper pipe 8 or 12 ft. long, the jack can be placed in recesses out of reach of the operator or in

locations where another jack would be dangerous. The pump can be set at a distance determined by the length of the pipe, with a safe and firm footing for the operator.

Since the jack is merely a plain cylinder and ram, it has a maximum raise with a minimum over all height; and the pump being a separate unit, the weight is distributed, making the outfit more portable.

The pump shown coupled to the jack is our standard single plunger type. It is simple and serviceable and all parts are accessible for repair and lubrication.

The reservoir is cast iron, the pump body of bronze and the plunger of hardened tool steel. The reservoir capacity is ample for the total displacement of the jack with which it is furnished.

A double plunger pump, which provides two pressures and two speeds, will be furnished if desired.

This pump is particularly valuable when rapidity of operation is important.

Any type of hand or power driven pump can be used in connection with these jacks.

The flexible connection between the pump and the jack is a $\frac{1}{4}$ -in. annealed copper pipe, 8 ft. long, tested to 10,000 lbs. per sq. in.

Outside Pump Hydraulic Jack.

The outside pump hydraulic jack, vertical type, is built with double plunger pump. The features of these jacks are the simplicity of design, accessibility of working parts, and large bases.

Compactness is not attained at the expense of simplicity, or lightness at the expense of strength; they are made to work.

They are used extensively by contractors, builders, dry dock and wrecking companies for underpinning and foundation work, in machineries, and for hauling out oil well pipes. These are built in capacities from 60 to 200 tons and lifts of 9, 12 and 18 in.



UNIVERSAL HYDRAULIC JACK



INDEPENDENT PUMP HYDRAULIC JACK



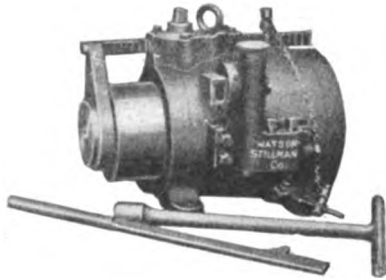
HYDRAULIC JACK WITH DOUBLE PLUNGER PUMP

Outside Pump Hydraulic Jack, Horizontal Type.

This is another type of the outside pump jack. It is used in horizontal pressing; for pushing crank pins; for moving bridges, boilers, machinery, etc. The ram is pulled back by a rack and pinion device.

Single or double plunger pumps can be supplied with this jack at no additional cost.

The capacities of standard sizes are 60 to 200 tons, with 12-in. movement.



OUTSIDE PUMP HYDRAULIC JACK, HORIZONTAL TYPE

Horizontal Claw Hydraulic Jack.

The horizontal claw hydraulic jack is a very handy tool.

It will push horizontally its entire lifting stroke, and is so constructed that grit or dirt can not get between cylinder and ram.

It is built in capacities from 4 to 40 tons and 12-in. to 18-in. movements.



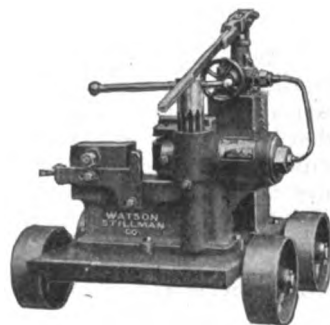
HORIZONTAL CLAW HYDRAULIC JACK

Hydraulic Shear for Cutting Reinforcing Bars, etc.

This shear is especially adapted for cutting reinforcing bars, flats, rounds, ovals or very high carbon or tough material. The cutting blades are square and so designed as to give 8 available cutting edges before resharpening. It is portable and can be operated by one man. Tool shown is No. 3 size with a 4½-in. ram, exerting a pressure of 75 tons, and will cut material up to 1¼-in. square.



IRON AND WIRE ROPE SHEAR

HYDRAULIC SHEAR
For cutting steel reinforcing bars**Flat and Round Bar Iron and Wire Rope Shear.**

This lever shear is adaptable for cutting flat iron, round iron or wire rope, by merely changing the shear blades. Its construction is powerful throughout; and considering its weight and size, its capacity is high. Made in a number of sizes and capacities.

Hydraulic Testing Press.

This press was designed originally for making compression tests on specimen blocks of concrete, etc. Its handy size makes it adaptable to many uses in laboratory or machinshop, such as press fitting small parts, and for an unlimited number of uses in bending, straightening, etc. It is only 27 in. high, but is capable of a maximum pressure of 30 tons. Other sizes on demand.



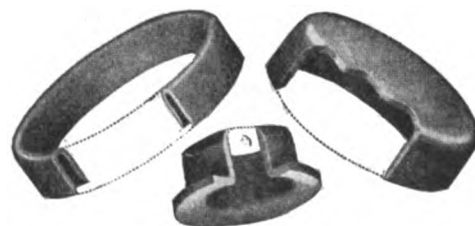
TESTING PRESS

Pax-tite Packings.

Pax-tite packings are guaranteed to outlast under similar conditions of service any competitive packings on the market. As large users of packings in our own line of hydraulic machinery, we have been able to prove this claim.

Pax-tite packings are made from the best leather obtainable, prepared by a special process which gives them every quality necessary to the successful operation of hydraulic machinery.

They are made in all standard sizes. Special designs and sizes can be built to specifications.



PAX-TITE LEATHER PACKINGS

BUFFALO FOUNDRY & MACHINE CO.

Chemical Apparatus, Vacuum Dryers

28 Winchester Avenue
BUFFALO, N. Y.

CABLE ADDRESS:
"BUFOUNDRY"

NEW YORK OFFICE, 17 Battery Place

Products.

"BUFLOVAK" VACUUM DRYING APPARATUS:

Vacuum Drum Dryers	Dry Vacuum Pumps
Vacuum Shelf Dryers	Condensers
Vacuum Rotary Dryers	Expansion Tanks
Impregnating Apparatus	Solvent Recovery Apparatus
Special Vacuum Apparatus	

"BUFLOVAK" EVAPORATORS:

Horizontal Tube	Causticizing Apparatus
Vertical Tube	Caustic Recovery Apparatus
Rapid Circulation	Extraction Plants
Crystallizing	Salt Filters
High Concentrators	Preheaters

Special Evaporating Equipment in steel, copper, bronze, aluminum, all cast iron, and other special metals.

"BUFLOVAK" SUGAR APPARATUS:

Diffusion Batteries	Catchalls
Pulp Catchers	Condensers
Vacuum Pans	Coolers
Vacuum Dryers	Bag Filters
Vacuum Pumps	Filter Presses
Steam Separators	Granulators
Sand Filters	Crystallizers
Bone Black Filters	Kilns
Bone Black Dryers	Retorts
Heaters	Mixers

Evaporators
Hydraulic Sugar Cane Mills and Crushers
Sulphurous Acid Generators and Coolers

"BUFLOKAST" CHEMICAL APPARATUS:

Nitrators	Aniline Stills
Reducers	Beta Naphthol Stills
Reflux Condensers	Phenol Stills
Sulphonators	Hydrochloric Acid Pans
Vacuum Stills	Vacuum Ovens
Drum Dryers	Nitric Retorts
Nitric Acid Plants	Denitrators
Autoclaves	Acid Eggs
Caustic Pots	Crystallizers
Caustic Flakers	Jacketed Kettles

Fusion Kettles

Concentrating Apparatus for Nitric and Sulphuric Acids
Recovery Systems for Nitric and Sulphuric Acids
Special Chemical Castings.

Also manufacturers of Steam Hammers: Standard Guide Single Frame, Steel Frame Combined Type, Open Frame, Double Frame, Drop.

Research Laboratories.

By means of these laboratories, opportunities are afforded for making practical tests in each type of dryer and evaporator, and in various types of chemical and other apparatus. This experimental work is con-

ducted without charge or obligation, except for furnishing the necessary materials and paying transportation expenses.

Engineering and Consultation.

Our organization includes a corps of mechanical, metallurgical, chemical, vacuum, and sugar engineers, whose services for advice and consultation are placed at your disposal.

Some of the fields covered are:

Drying and Evaporating.
Heavy chemicals, acids, and high explosives.
Organic chemicals, dyestuffs, coal-tar intermediates, etc.
Caustic soda, potash and other alkalis.
Sugar apparatus, mills and refineries.
Special castings for chemical, heat resisting and other purposes.

"Buflovak" Vacuum Drying Apparatus.

For drying all materials—liquids, semiliquids and solids—at low temperature and low cost, without danger of overheating, contamination or other injury.

Vacuum Drum Dryer.



VACUUM DRUM DRYER

The ideal apparatus for drying solutions such as dyewood, tannin and other extracts, pharmaceuticals, glues, white lead, colors, milk, eggs, serums, liquid foods, coffee, chemical solutions, and other liquids containing solids.

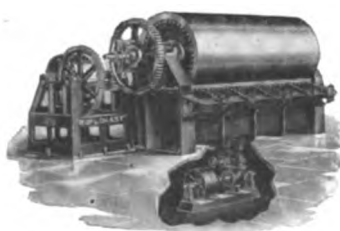
No danger of overheating or other injury to delicate materials. Operation continuous and practically automatic.

While the vacuum drum dryer has in theory been considered the ideal apparatus for drying liquids, satisfactory commercial results were not attained until the development of the "Buflovak" vacuum drum dryer containing our patented devices and methods for applying the liquid to the drum.

Built in sizes to meet any capacity.

Atmospheric Drum Dryer.

For drying liquids that do not require a vacuum our atmospheric type, which embodies the patented principles and devices

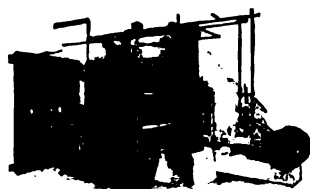


ATMOSPHERIC DRUM DRYER

of the vacuum type, is recommended. Only a small part of the drum surface comes in contact with the wet material, which means greater drying area and low cost of drying.

Vacuum Shelf Dryer.

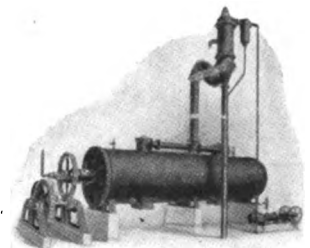
Adapted to drying materials that are best handled in pans or trays. A distinctive feature of the "Buflovak" dryer is the construction of the chamber, which in all sizes is made in one piece, thus eliminating many joints which would otherwise be necessary. This feature, combined with the special dense metal used, insures a high vacuum and consequent low temperature in the apparatus. Built in many sizes.



VACUUM SHELF DRYER

Vacuum Rotary Dryer.

This apparatus is used for drying materials that permit agitation or mixing. The material is kept in constant motion by means of revolving arms, attached to the center heating tube, so that the material comes in contact with the heating surfaces, either the steam jacket or the center tube, at frequent intervals until the desired degree of dryness is reached. The high vacuum and consequent low temperature prevent all danger of overheating or other injury to sensitive materials.



VACUUM ROTARY DRYER

Impregnating Apparatus.

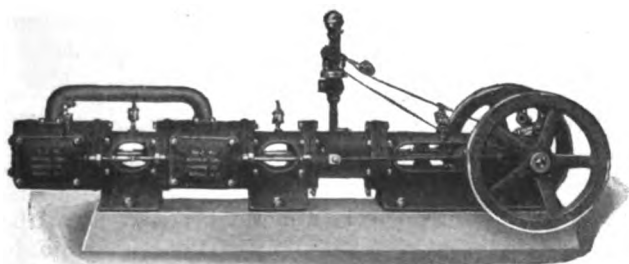
For drying various materials and impregnating them with insulating, waterproofing, fireproofing, coloring and other compounds. Used for insulating electric coils, cables, transformers, etc.; impregnating wood with stain or color for producing imitations of other woods.



IMPREGNATING APPARATUS

Dry Vacuum Pumps.

The success of "Buflovak" Vacuum Apparatus is partly due to the efficiency of "Buflovak" dry vacuum pumps which are designed for the most exacting service. After their experience with other makes, our customers invariably express astonishment at the high vacuum produced and maintained with these pumps. Built in many sizes single- or two-stage—steam, belt or motor driven.



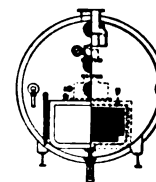
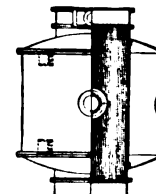
"BUFLOVAK" DRY VACUUM PUMP

"Buflovak" Horizontal Tube Evaporator.

Especially adapted for distilling or concentrating common solutions (without salt separation) which have no tendency to foam or produce scale. Instead of the rectangular or vertical cylindrical shell commonly used, we use a horizontal cylindrical shell, which can be made in one piece up to 12 ft. long, thereby reducing to a minimum the number of joints and the chances of leakage. The large downtakes permit a rapid and uniform circulation through all parts of the heating surfaces. The large cross-sectional area above the liquor level reduces the speed of the vapor to such an extent that losses by entrainment are reduced to a minimum. These evaporators are built in a wide range of sizes.

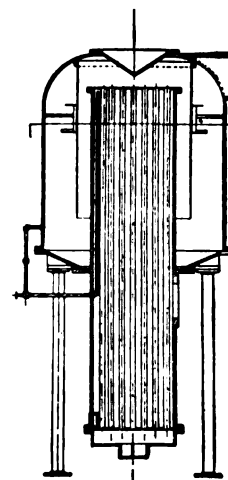


"BUFLOVAK" HORIZONTAL TUBE EVAPORATOR



Vertical Type Rapid Circulation Evaporator.

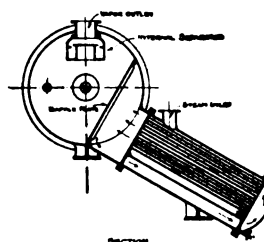
This evaporator is designed for evaporating solutions (without salt separation) which tend to foam or produce scale. It is especially adapted to delicate liquors and organic solutions which must not be exposed to heat except for the shortest time possible. The rapid circulation of the liquid prevents overheating, and the baffle and tube arrangement eliminates foaming and entrainment. This evaporator occupies very little floor space, and the erection and operation are extremely simple.



VERTICAL RAPID CIRCULATION EVAPORATOR

Inclined Rapid Circulation Evaporator.

The special advantage of this type is the accessibility of the tubes and the interior of the vapor body. The tubes are easily reached for cleaning by simply opening the door at the bottom of the evaporator. However, the high speed of the liquor tends to scour the tubes thereby reducing the frequency of mechanical cleaning.



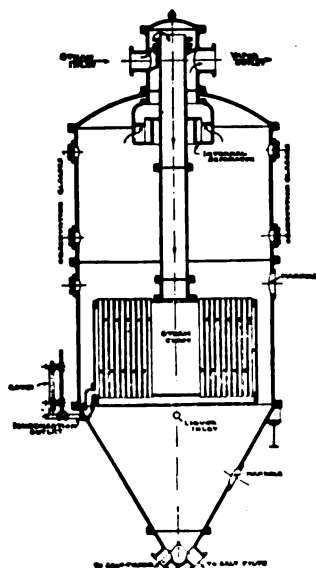
INCLINED RAPID CIRCULATION EVAPORATOR



Vertical Tube Evaporator.

This evaporator is of the crystallizing type and is used with salt filters for evaporating and crystallizing solutions containing salts which become insoluble during concentration.

The steam chest is of the floating type, forming a separate unit instead of being an integral part of the evaporator body. The floating type steam chest with the annular downtake, affords a rapid re-circulation of the solution which is a necessary aid in depositing the salt in the filters.



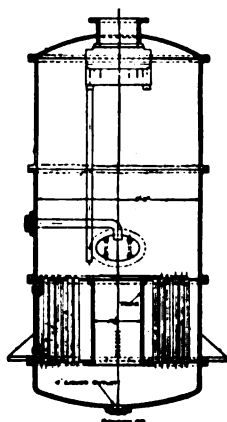
VERTICAL TUBE EVAPORATOR

Vertical Tube Finishing Pan for Malt Extracts and Other Syrups.

This evaporator is designed for heavy concentration of malt extracts and similar syrups to 80° Balling.

The construction of the pan is such that the actual contents is small and the liquor is not in contact with the heating surface longer than is absolutely necessary.

The tubes are kept clean and sanitary by the rapid circulation of the liquor, which eliminates overheating and prevents coating of the tubes.



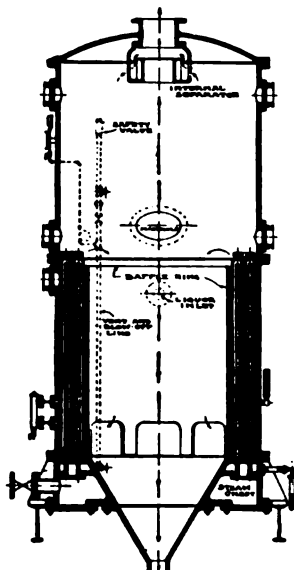
INTERIOR ELEVATION
VERTICAL TUBE FINISHING PAN

High Concentrators.

Especially adapted to the high concentration of caustic soda, potash, ammonium nitrate and electrolytic caustic solutions above 36 Be. This evaporator produces a very rapid circulation of the liquor, and is designed for concentrating liquors to higher densities than are practicable in other types.

The tubes are made of alkali-resisting or acid-resisting iron, copper, or special bronze, depending on the nature of the liquor to be concentrated.

Furnished in single or multiple effects, with or without salt separation.



"BUFLOVAK" HIGH CONCENTRATOR

"Buflovak" Sugar Apparatus.

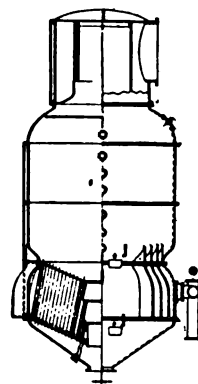
Our Sugar Machinery Department is under the supervision of engineers who have had many years' experience in designing, constructing and operating sugar machinery, including complete manufacturing plants, in the production of brown, white and refined sugars in the cane and beet sugar fields. This experience, coupled with a broad manufacturing experience in building similar and more complex apparatus, is assurance of receiving sugar machinery based on the soundest principles of engineering and manufacturing practice.

Only a few types of sugar apparatus are shown. Full information pertaining to any of the items listed on the second page preceding will be furnished on request.

"Buflovak" Calandria Vacuum Pans.

These are built in several types including the Engel calandria, flat calandria, and coil types. The Engel type calandria pan is designed for evaporating at low temperature and low steam pressure, liquids of various densities, including highly concentrated juices. The heating element is placed at a low point in the pan in order to control the size of the crystal, and finish the crystallization in the same apparatus, instead of distributing the nucleus into several pans to obtain the required size of the crystals. For supersaturated and highly concentrated liquids a propeller is provided at the bottom.

Special calandria and coil types are built to order.



CALANDRIA VACUUM PAN
Engle Type; Patent Pending

Rotary Dryer, Engel Type.

Designed for drying sugar and a variety of other materials that do not require a vacuum. A special feature of this dryer is our patented disseminating screen which is concentric with the drum. The material falling on this screen as the shell revolves becomes disseminated and allows for the free action of the drying air. The screen also breaks the fall of crystals, thereby reducing the breakage of crystals into small particles and the consequent formation of dust.



ROTARY DRYER, ENGEL TYPE

Rotary Filter (Patent Pending).

The purpose of this filter is mainly to decolorize the syrup and remove suspended matter and impurities from the same, preparatory to final filtration in our vertical filter described on the following page.

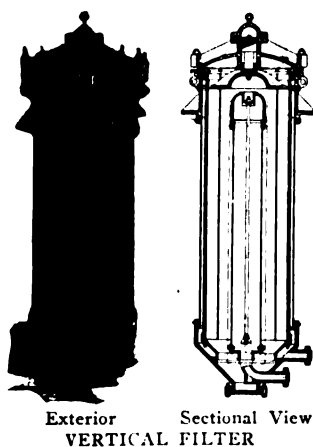


ROTARY FILTER

Vertical Filter (Patent Pending).

Filtration takes place by passing through the filtering medium which is inserted between two concentric screens.

Impurities are easily removed by simply blowing steam through the filtering medium in the opposite direction.



Exterior Sectional View
VERTICAL FILTER

Bag Filter.

Constructed in rectangular and cylindrical types, and arranged to permit removal and replacement of heads and bags with the least amount of interruption to operation. Provision is also made so as to prevent a falling bag from closing entirely the discharge opening.



REMOVABLE HEAD FOR
RECTANGULAR BAG
FILTER

"Buflokast" Chemical Apparatus.

This line includes apparatus for producing heavy chemicals, acids, caustic soda and other alkalis, organic chemicals, high explosives, coal tar intermediates, etc. Apparatus furnished for all standard chemical operations, such as nitration, denitration, reduction, sulphonation, chlorination, distillation, crystallization, caustic fusion, etc. Complete plants furnished for manufacturing many chemical products.



NITRATOR

Provided with cooling jacket, tubes, or both. Temperature of each tube individually controlled.



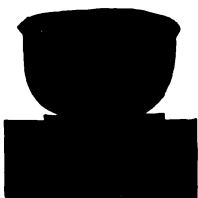
REDUCER

Noted for large output, and for ease and cleanliness of operation. Furnished with or without jacket.



SULPHONATOR

Construction especially heavy and durable. Designed for effective agitation.



CAUSTIC POT

Caustic pots and fusion kettles are constructed of special metal noted for its success in withstanding combined action of caustic and high temperature.

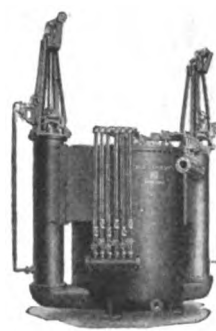


FUSION KETTLE



ACID EGG

Vertical and horizontal types. Sizes, 25 to 1000 gals. capacity.

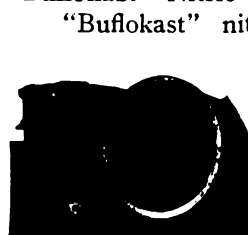
"Buflokast" Nitrator, Hough Type.

"BUFLOKAST"
NITRATOR

For nitrating hydrocarbons and other compounds. Especially designed for rapid reactions, safe operation, large output, and high yield.

Can be used for nitrating, reducing, sulphonating, chlorinating and other chemical operations. Also adaptable to other purposes, especially for mixing, blending and washing oils.

Special type furnished for nitrating glycerine.

"Buflokast" Nitric Retorts.

"BUFLOKAST" NITRIC
ACID RETORT

"Buflokast" nitric retorts have long since become a standard unit with most of the high explosive companies and other manufacturers of nitric acid. Especially noted for durability. Designed of such proportions as to give maximum yield per charge with low cost for furnace setting and operation.

Vacuum Nitric Acid Plant, Hough Type.

Furnished complete with vacuum still, condensing system, pump, bleacher, hydrometer pot, acid receivers, tanks and scrubber. Designed for producing nitric acid of great strength and purity at low cost of production and upkeep. The vacuum operation insures distillation at low temperature and increases the safety and ease of operation.

Nitric and Sulphuric Acid Recovery and Concentrating Apparatus.

Complete equipment furnished for recovering nitric and sulphuric acids at a high degree of concentration from mixed nitrating acids. A special feature of this apparatus is its compactness, thereby requiring small space as compared with other systems, and a lower capital investment. Other distinguishing features are high operating efficiency and low upkeep cost.

Crystallizers.

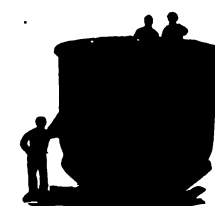
Furnished in the vacuum and atmospheric types. Adapted for concentrating and crystallizing many products, including ammonium nitrate and TNT. The vacuum type is especially adapted for delicate materials requiring low temperatures.



VACUUM
CRYSTALLIZER
When furnished in the atmospheric type, the dome is omitted.

Special Chemical Castings.

"Buflokast" service also includes the manufacture of special castings for chemical, heat resisting and other requirements. The materials for these castings are carefully analyzed and metal compositions produced with laboratory exactness. The result is a finished casting of known quality with physical and chemical properties suited to the conditions it is to meet.



JACKETED KETTLE

J. P. DEVINE CO.

Manufacturers of Apparatus for the Chemical and Allied Industries

1375 Clinton Street
BUFFALO, N. Y.

BRANCH OFFICES
NEW YORK, N. Y., 50 East 42nd Street

HAVANA, CUBA

LONDON, ENG., JAS. LIVINGSTON, LTD.

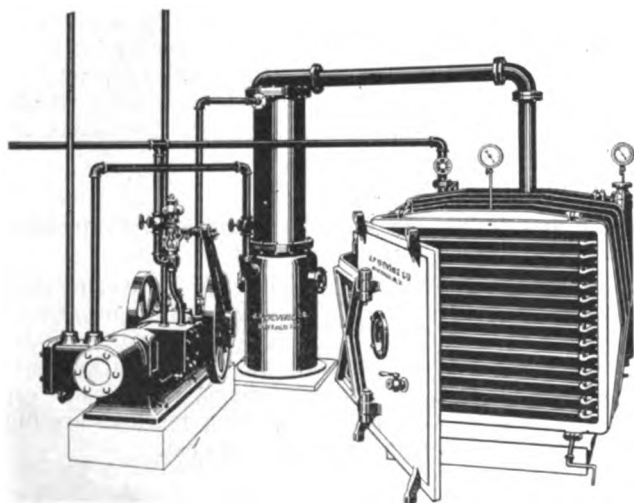
Products.

VACUUM CHAMBER DRYERS; VACUUM DRUM DRYERS; VACUUM ROTARY DRYERS; IMPREGNATING APPARATUS; NITRATING, REDUCTION, SULPHONATING and FUSION KETTLES; AUTOCLAVES; EVAPORATORS; VACUUM PANS; VACUUM PUMPS; ROTARY VACUUM PUMPS.

Also, Solvent Recovery Apparatus, Acid Eggs, Acid Retorts, Beta Naphthol Stills, Caustic Pots, Columns, Crystallizing Pans, Digestors, Distilling Apparatus, Extractors, Logwood Extract Plants, Wood Distilling Plants, Sand Dryers, Fertilizer Apparatus, Steam Jacketed Pipes and Valves, Percolators, Vulcanizers, Washers, Defecators, Crystallizers, Filter Presses and other Apparatus for the Sugar Industry, Special Apparatus.

Vacuum Chamber Dryers.

This chamber dryer is designed for handling all materials that can be handled on trays or pans.



DEVINE VACUUM CHAMBER DRYER WITH SURFACE CONDENSER AND VACUUM PUMP

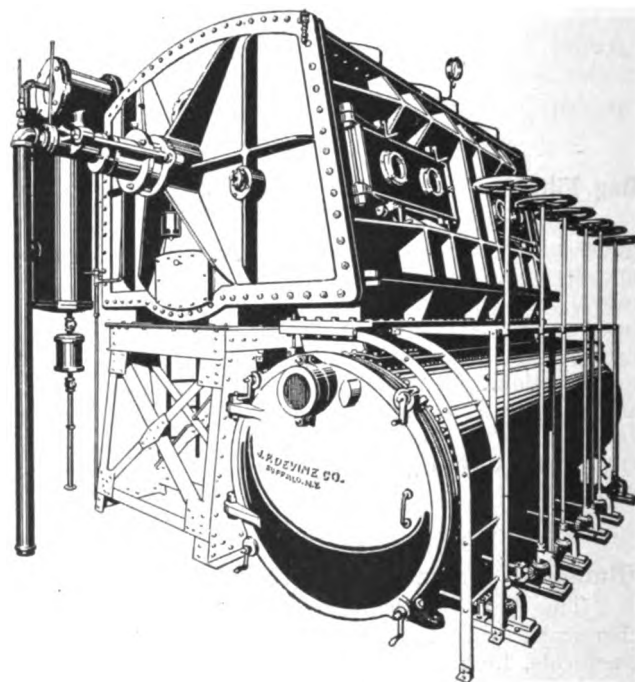
For colors, dyes, extracts, salts, rubber, smokeless powder and high explosives and other chemicals and food products. Materials which are difficult to dry in the atmosphere without decomposition can be handled rapidly and efficiently in this type of dryer without any danger of impairing their qualities. Vacuum drying chamber is designed to remove water rapidly and at a low temperature, assuring uniform drying and low operating cost.

Ask for Bulletin 101 on this subject.

Vacuum Drum Dryers.

This drum dryer is designed for handling all solutions containing solids, drying same to a powder.

For dyewood and tanning extracts, milk and food products, pastes, etc. This type of machine affords a rapid and uniform drying, because the drum takes up but a very thin film of wet material. Water is then evaporated from material, leaving dried substance on



DEVINE VACUUM DRUM DRYER

drum to be taken off by our improved method. Drying process is continuous and independent of climatic conditions, free from dust, and is uniform.

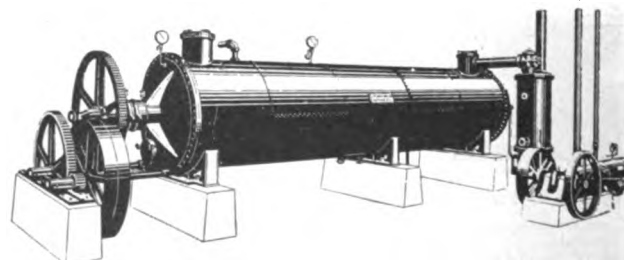
Fully described in Bulletin 102.

Vacuum Rotary Dryers.

For materials that can be mixed or tumbled in the drying.

For starch, granular substances and chemical products. Moist material is charged into dryer and by means of a high efficiency dry vacuum pump and condenser, furnished as part of the unit, a high vacuum is produced, the vapor being pulled over into the producer and condensed. Concentric with steam jacketed outside cylinder, is a revolving drum, heated by live exhaust steam, to which the stirring blades are attached. Material to be dried is between outside drum and inside cylinder, kept in constant motion by stirring blades.

Ask for Bulletin 103.



DEVINE ROTARY VACUUM DRYING APPARATUS

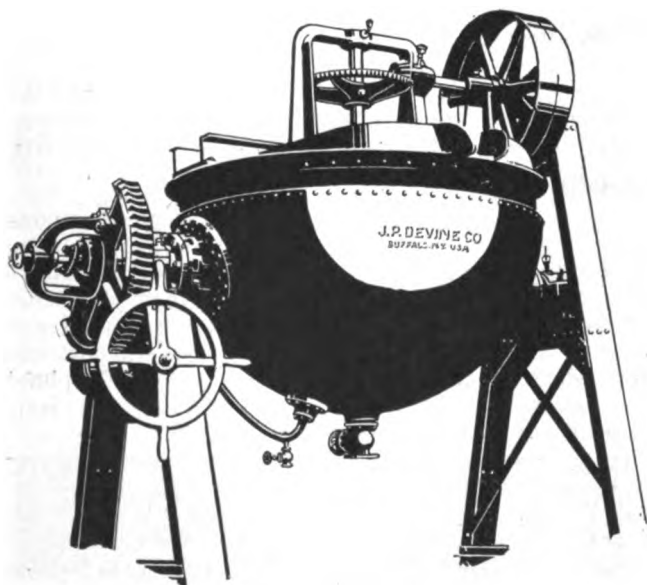
Impregnating Apparatus.

For armature, field, magnet and transformer coils, power and telephone cables, piano sharps, pencil slats and other wood products, leather fabrics, cotton or cord tire fabrics with rubber compound, etc. This is a combination vacuum drying and impregnating apparatus, the coils or material to be handled first being dried under vacuum, thereby removing both air and moisture from interior as rapidly as from surface. Compound is then drawn into impregnating tank and penetrates to innermost recesses of material; and to render this penetration more thorough, air at artificial pressure is admitted into impregnation tank above surface of compound.

Ask for Bulletin 104.

Nitrating, Reduction, Sulphonating and Fusion Kettles.

All sizes and capacities for every requirement. Built with or without stirring device, and supplied with or without reflux condensers. Also arranged for heating with fuel oil, gas, steam or water jacketed.



DEVINE CHEMICAL KETTLE

Nitrating kettles built with large cooling surface, powerful stirring device. Reduction kettles, combination rake stirring device, internal renewable cast iron slabs.

Ask for Bulletin 105A.

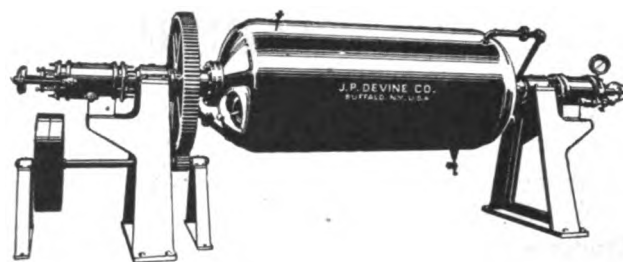
Autoclaves.

Sizes range from 1/4-gal. to 300-gal. capacities; for working pressures up to 1000 lbs. per sq. in., with or without stirring device. High pressure autoclaves are made of cast steel, and low pressure autoclaves of cast iron, copper or bronze. Provision made for heating. Every autoclave is fitted with cover with all necessary openings, pressure gage, safety valve, thermometer tube, etc.

Carbonators.

The rotary carbonator is constructed of sheet steel with all joints welded, and it is designed to work satisfactorily both under high pressure and high vacuum. Hollow trunnions permit steam, air, or gas being introduced or removed from the interior.

This apparatus is very versatile and can be adapted to five distinct operations: mixing, concentrating, drying, grinding and carbonating.



DEVINE ROTARY CARBONATOR

Evaporators and Vacuum Pans.

Single and multiple effect units of all sizes and capacities of cast iron, sheet steel, copper, etc. These vacuum evaporators and pans are designed to insure maximum efficiency at a minimum cost of operation. In their design and construction the rule of thumb has been discarded, and for each requirement the size and type of apparatus is carefully selected, based upon the best results obtained in actual practice, combined with such improvements as experience demonstrates.



DEVINE QUADRUPE EFFECT VACUUM EVAPORATOR

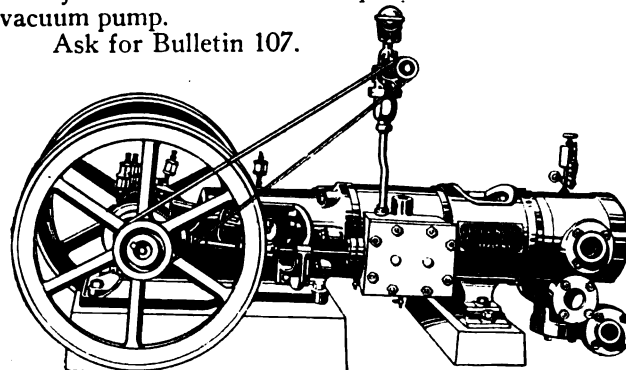
In the construction of Devine evaporators great stress is laid on securing the most rapid and intense circulation of the liquors, as only by such a circulation can all particles of the liquid come in contact with the heating surface, thus securing the quickest concentration without overheating the material. Special care is likewise given to metal of which the heating tubes are to be constructed, as well as to the lining, to resist acids and to prevent incrustation.

Ask for Bulletin 106.

Vacuum Pumps.

The vacuum pumps which are furnished with the vacuum apparatus, are constructed in two principal types, the dry vacuum type and the wet vacuum type. The dry vacuum type is built with either rotary valve or slide valve, and also in single- or two-phase. The rotary valve type is recommended where large capacity of air is required. The wet vacuum pump is furnished with jet condenser. This company also builds a rotary vacuum pump.

Ask for Bulletin 107.



DEVINE VACUUM PUMP

ALBERENE STONE COMPANY

Manufacturers of Laboratory Equipment

223 East 23rd Street
NEW YORK, N. Y.

BOSTON, MASS., 51 Bristol St.
NEWARK, N. J., 43 Halsey St.

PITTSBURGH, PA.

CHICAGO, ILL., 214-222 N. Clinton St.
PHILADELPHIA, PA., Pennsylvania Building

Products.

LABORATORY FIXTURES: Table Tops, Backs, Shelves, Supports, Sinks, Hood Bases, Superstructure for Hoods, Tanks and Gutters.

Flooring, Window Sills, Steam Baths, Sand Baths, Flues, Strainers and Linings for Smelting Furnaces.

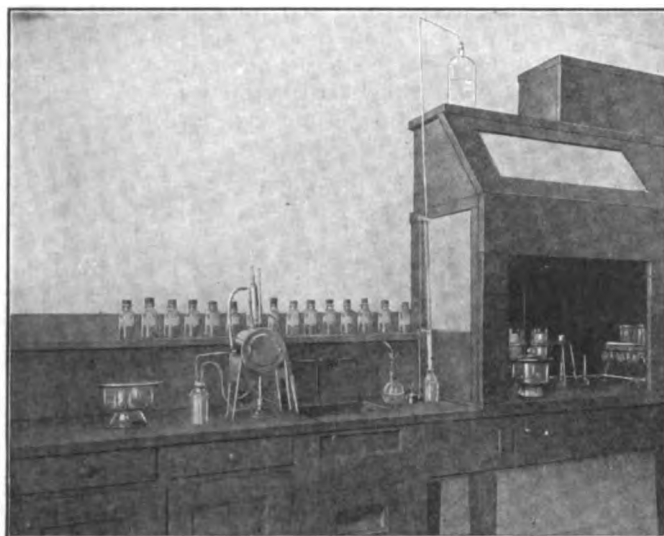


TRADE-MARK

Sinks, gutters and tanks are made up with a tongued and grooved joint, similar to that shown in illustration, which renders these fixtures perfectly watertight. By the use of proper cement, long service can be secured.



SLIP TONGUE JOINT



FUME HOOD, TABLE TOP, BACK, REAGENT SHELF, AND SINK OF ALBERENE STONE

Fume Hoods.

The non-absorbent quality of ALBERENE STONE together with its density renders it a splendid resistant to the action of fumes and makes possible a permanent superstructure with practically no maintenance charge.

Installation.

The ALBERENE STONE COMPANY assumes responsibility for the delivery of the material to the building and its erection in position on foundations to be provided by this company, or by the owners or other contractors. The company is, therefore, in a position to complete the interior equipment of a laboratory consisting of table tops, shelving, sinks, gutters and hoods, excluding plumbing connections and fittings, but including pipe frame supports or cabinet work where required.

General.

ALBERENE STONE is the trade-name applied exclusively to the output of the quarries of the ALBERENE STONE COMPANY and serves both as an identification and a guarantee of quality and service. ALBERENE STONE is a natural quarried stone, gray in color, close grained, non-porous and of uniform density and hardness. The non-absorbent quality of ALBERENE STONE renders it acid and alkali resistant for table tops, sinks, gutters, and shelving for laboratory use. Acids and alkali have very slight action upon the stone. Samples furnished for test prior to installation.

Fixtures.

Table tops for industrial and research laboratories of ALBERENE STONE are proving most satisfactory. The construction is similar to that shown in the accompanying illustrations. The slip tongue joint makes possible the erection of table tops of any length required, with joints that are almost imperceptible. TONGUED, GROOVED AND BOLTED JOINT



ALBERENE TABLE TOP, SHELF, SUPPORTS, FLOORING AND BASE

Co-operation and Responsibility.

Based on over 30 years' experience the ALBERENE STONE COMPANY will gladly furnish information concerning equipment and prepare details.

The ALBERENE STONE COMPANY guarantees its products against defective material and workmanship.

THE DURIRON COMPANY, INC.

Manufacturers of Acid Resistant Castings and Apparatus

DAYTON, OHIO

NEW YORK, N. Y.
ATLANTA, GA.

PITTSBURGH, PA.
DENVER, COLO.

SALES OFFICES
CLEVELAND, OHIO
MONTREAL, QUE.

CHICAGO, ILL.

SAN FRANCISCO, CAL.
SALT LAKE CITY, UTAH

Products.

ACID RESISTANT COCKS and VALVES; PIPE and FITTINGS (Sanitary and Commercial); CENTRIFUGAL and RECIPROCATING PUMPS; EXHAUST FANS; KETTLES (Jacketed and Plain); LABORATORY EQUIPMENT and UTENSILS.

Also manufacturers of a complete line of apparatus for chemical processes involving corrosives and adapted for Nitric, Sulphuric and Arsenic Acid Plants, etc., including: Steam Siphons, Acid Eggs, Autoclaves, Stirrers, Condensers, Radiation Coils, Concentrators, Tanks, Stills, Jets, Nozzles, Manifolds, Tank Connections, Sinks, Traps, Drains, etc. Special Castings for handling virtually all corrosive conditions.

Field of Service.

Industry is more and more adopting and adapting chemical processes in every line of production. Duriron is the vital link between commercial operation involving the handling of acid fluids and vapors, and successful, economical performance.

Properties and Values.

Duriron is an extremely hard cast metal, possessing the proper silicon content to render it most highly resistant to corrosion, and yet rugged enough to be commercially practical. It can not be machined—but is finished by grinding, and so complete is our machine equipment for this work that every operation except threading is performed. The development of Duriron equipment required years of experiment, and the establishment of a foundry technique peculiar to it. For this reason it will be appreciated that apparatus must be produced by this company, and that ingots or pigs can not be furnished for production purposes.

The five outstanding points of superiority of Duriron over other acid resisting materials are:

(1) **Wide Range of Resistance**—Duriron is justly termed "The Universal Acid Resistant," as its physical properties are such that it has a much more comprehensive range of resistance to corrosives than any other material.

(2) **Strength**—Duriron is far stronger than other materials produced for acid resistance.

(3) **Size**—The possibility of producing considerably larger units in Duriron permits of commercial production on greater scale.

(4) **Homogeneous Structure**—Duriron is thoroughly homogeneous in structure—equally acid resisting inside, outside and all through the wall, and so is superior to coated or lined materials.

(5) **Hardness**—Duriron's intense hardness—its resistance to erosion—makes it doubly valuable when solids carried in suspension are encountered, as is often the case in commercial chemical processes.

The physical properties of Duriron are:

Specific gravity, 7.00

Weight per cu. in., 0.253 lbs.

Melting point, 2300° Fahr.

Coefficient of expansion, .00001565 per degree Fahr.

Electrical conductivity, 1/40 that of standard annealed copper

Thermal conductivity, 10 times stoneware or quartz

Contraction allowance in casting, $\frac{1}{8}$ in per ft.



Standard Apparatus.

It is impossible here to more than touch upon the various standard types of apparatus produced in Duriron. Being a highly specialized product, all equipment must conform within certain limits to the peculiarities of this material.

For this reason, also, we issue all of our literature in bulletin form, and these bulletins are available now as follows:

Acid Equipment	Cocks
Denitration Equipment	Valves
Laboratory Apparatus	Ejectors
Centrifugal Pumps	Kettles and Tanks
Reciprocating Pumps	Exhaust Fans
General Descriptive	Condensers
Sanitary Pipe and Fittings	Standard Pipe and Fittings

Besides these, bulletins are issued to special crafts and industries. For example; to photo-engravers, fertilizer manufacturers and sanitary engineers.

Cocks and Valves.

A complete and comprehensive line is produced, including gate valves, globe valves, check valves, angle valves, safety valves, plug cocks, straightway and three-way, and bibcocks. These ranging in sizes from $\frac{3}{8}$ to 6 in.

Pumps.

Centrifugal and reciprocating pumps of various sizes and capacities. In addition to their resistance to corrosion these pumps embody sound engineering design, and are highly efficient.

Pipe and Fittings.

Our standard line includes flanged pipe for pressure lines, bell pipe for drainage and sanitary work, and pipe is also furnished for compression coupling joint. A full line of fittings are produced and carried for all of these types.

Exhaust Fans.

Standard exhaust fans for the handling of corrosive fumes and vapors are built in 3, 4, 8 and 12 in. sizes. Larger units to special order.

Kettles.

Kettles in capacities ranging from 1 to 1000 gals. are built according to our standard patterns. These are furnished either jacketed or plain, and with covers, agitators, and full equipment for all commercial purposes.

Laboratory Equipment and Utensils.

The possibility of laboratory processes in Duriron being carried out in commercial quantities in the same material and under exactly similar conditions, makes Duriron apparatus peculiarly valuable for experimental purposes.

This line includes laboratory kettles, condensers, exhaust fan and sinks, besides crucibles, casseroles, evaporating dishes, cascade basins, ladles, etc.

Duriron Engineering Service.

This company maintains a staff of mechanical and chemical engineers to assist in or take entire charge of the design of new apparatus for any specific purpose where Duriron is feasible or advisable. This service is at all times open to those who require aid and experience in the development of equipment for corrosive processes.

GRAND RAPIDS VENEER WORKS

Grand Rapids Vapor Kilns

800-1000 Front Avenue, N. W.
GRAND RAPIDS, MICH.

WESTERN BUILDERS OF GRAND RAPIDS VAPOR KILNS
SEATTLE, WASH., WESTERN VAPOR KILN CO.

BRANCH OFFICES

SEATTLE, WASH., WESTERN VAPOR KILN CO., 580 First
Avenue, So.

MANCHESTER, ENGLAND, OLIVER MACHINERY CO.
ST. JOHNS, N. B., A. R. WILLIAMS MACHINERY CO.
SYDNEY, AUSTRALIA, BOORMAN & BOORMAN

Products.

Designers and manufacturers of GRAND RAPIDS VAPOR KILNS, KILN TESTING INSTRUMENTS, GRAND RAPIDS LUMBER TESTERS, LINNODEIKS (wet and dry bulb thermometers), RECORDING THERMOMETERS, PANELS and VENEERS.

Also, "Tiemann" Humidity Regulated Kilns, Forest Products Laboratory Kilns, Ebonoid Waterproofing Paint, "Kilntite" Kiln Lining, "Plastico" (plastic cement), and "Hussey" Door Carrier.

Services.

Complete engineering and contract service, consultation, designing, installation, equipment, operation and remodeling.

In Pacific coast territory, the affiliated company, the Western Vapor Kiln Co., takes complete contracts for kiln buildings, equipment, yards, etc. In other territory co-operation with local contractors is given.

Grand Rapids Vapor Process.

A cooking process which dissolves and evaporates sap coagulations (which are not elements of strength but of decay), leaving intact the fibrous structure of the wood with its essential oils and gums, thus maintaining its strength, expanding instead of contracting the lumber and making it practically independent of changes of temperature or climate.

Lumber Dry Kilns.

Made in box, single charge and progressive types. Preliminary conference on kiln layouts solicited. Partial service through architects and engineers will be rendered, or complete service, making all building plans and specifications, supplying and installing all equipment, demonstrating and training operator, all under definite guarantee as to cost and output.

Kilns designed, remodeled and equipped to meet the exacting government requirements of *airplanes, gunstocks, shipbuilding, vehicles*, etc.

Testing Instruments, Kiln Records.

Grand Rapids lumber tester for determining moisture content of lumber. Linnodeiks for determining relative humidity in kiln atmosphere by means of maximum reading wet and dry bulb thermometers. Recording thermometers, decimal rules, metric scales, etc.

Consultation solicited on kiln operations by means of submitting the operation records. A full line of kiln record blanks, recording thermometer dials and graphic charts constantly in stock. Samples on request.

Veneers and Panels.

Manufacturers (on approved list of United States Government) of waterproof plywood for army and navy airplane construction; also of a full line of foreign and domestic veneers, together with a complete line of

thin lumber, panels and heavy built up stock for furniture, desk, phonograph and piano manufacturers.

Leaflets.

Uniform loose leaf style, 4 by 10 ins. with cover, cheerfully sent on request without charge.

- | | |
|--|---|
| 13. "Why" (drying questions answered) | 63. †Efficient Kiln Methods and Locations |
| 29. Scientific Lumber Drying | 70. Kiln Drying Pine (Western) |
| 30. Cooking Lumber Dry | 71. Kiln Drying Fir, Spruce, Hemlock, Cedar |
| 31. Correct Methods of Drying | 72. †How to Prevent Lumber Drying Degradation |
| 32. Economical Arrangement of Kilns | 73. †Efficient Kiln Building Service |
| 33. Modern Lumber Drying Plant | 80A. Kiln Instruments |
| 34. Dry Kilns, Government Service | 83. Maps, Showing Vapor Kilns |
| 35. *Gov't Spec. Drying Airplane Woods | 84. Trucks, Transfers, Lifts, etc. |
| 36. Efficient Dry Kiln Layouts | 85. †Vapor Kilns in Transportation Trades |
| 37. Costs of Kiln Drying Lumber | 86. Natco Hollow Tile for Kilns |
| 38. Lumber Drying Tests | 88. Record Booklets and Blanks |
| 60. Kiln Drying Common Dimensions | 89. Export Kilns |
| 61. Airplane Demand and Kiln Drying | *Edition exhausted |
| | †In course of preparation |

References.

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|---|---|
| FURNITURE | RAILROAD CARS |
| Berkey & Gay Furniture Co., Grand Rapids, Mich. | American Car & Fdry Co., St. Louis, Mo. |
| Imperial Furniture Co., Kroehler Mfg. Co., 5 plants | Haskell & Barker Car Co., Michigan City, Ind. |
| Crocker Chair Co., Sheboygan, Wis. | Pressed Steel Car Co., 2 plants |
| Breece Manufacturing Co., Portsmouth, Ohio | Canadian Car & Fdry Co., 2 plants |
| AIRPLANES | Eastern Car & Fdry Co., New Glasgow, N. S. |
| Standard Aero Corp., Plainfield, N. J. | MUSICAL INSTRUMENTS |
| Thomas-Morse Corp., Ithaca, N. Y. | Sohmer & Co., Astoria, N. Y. |
| U. S. A., McCooks Field, Dayton, Ohio | Baldwin & Co., 2 plants |
| SAWMILLS | Lyon & Healy, Chicago, Ill. |
| Shevlin-Hixon Lumber Co., Bend, Ore. | Heintzman & Co., Toronto |
| Booth-Kelly Lumber Co., 3 plants | Simplex Player Action Co., Worcester, Mass. |
| Bloedell-Donovan Mills, Bellingham, Wash. | Adler Manufacturing Co., Louisville, Ky. |
| Miller-Link Lumber Co., Orange, Tex. | AUTOMOBILE BODIES |
| Meadow River Lumber Co., Rainelle, W. Va. | Packard Fisher Nash |
| MARINE | Franklin Cadillac Reo |
| Cramp Ship & Eng. Bldg. Co., Philadelphia, Pa. | Pierce-Peerless Dodge |
| Detroit Shipbuilding Co., Detroit, Mich. | Arrow |
| Toledo Shipbuilding Co., Toledo, Ohio | INTERIOR TRIM |
| American Balsa Corp., New York, N. Y. | Morgan Co., Oshkosh, Wis. |
| VEHICLES | Farley & Loetscher Mfg. Co., 2 plants |
| Republic Truck Co., Alma, Mich. | Curtis & Bros., 4 plants |
| Thornhill Wagon Co., Lynchburg, Va. | J. B. Smith & Sons, Ltd., Toronto, Can. |
| Massey-Harris Co., Toronto | GENERAL |
| Savers & Scovill, Cincinnati, Ohio | Eastman Kodak Co., Rochester, N. Y. |
| | Remington Arms & Ammunition Co., Ilion, N. Y. |
| | Seth Thomas Clock Co., Thomaston, Conn. |
| | Michigan Maple Block Co., Petoskey, Mich. |
| | Kellogg Switchboard & Supply Co., Cassopolis, Mich. |
| | Conlon Electric Washer Co., Chicago, Ill. |

2600 installations in service

AMERICAN PROCESS COMPANY

Manufacturers of Drying, Pressing and Cooking Machinery

68 William Street
NEW YORK, N. Y.

Products and Services.

DRYERS; PRESSES; DIGESTERS and COOKERS.

Complete drawings and directions are always furnished for the erection and operation of dryers and, generally, no outside assistance is required. Recommendations made and, if desired, an engineer will be placed in charge of the installation.

American Process Machinery.

Distinguishing Features—The distinguishing features of AMERICAN PROCESS COMPANY's machinery are its automatic, continuous and uniform action.

Advantages—(1) Product is uniform; (2) labor is reduced to a minimum; (3) wear and tear of starting, stopping and reversing or otherwise changing the load are eliminated, thus prolonging life of machine far beyond that of similar types; (4) economy in fuel consumption, heat being applied direct; (5) saving in power and increase in capacity by continuous action.

Dryers.

The dryers manufactured by AMERICAN PROCESS COMPANY will handle any kind of animal, vegetable and mineral materials, organic or inorganic matter, solid or liquid. They are operated either by direct heat or steam heated air.



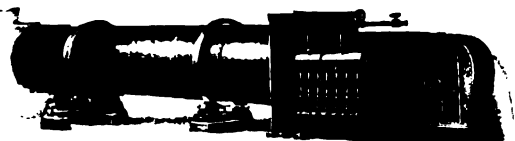
SAND, ORE AND FERTILIZER DRYER

Direct heat rotary dryer, with gear ring. Materials and gases travel in same direction. Wet material and furnace gases enter shell together at higher end. Wet material falls to bottom of shell, is caught by an interior shelf, elevated to almost highest point of rotation, and then falls again through furnace gases. This operation, with highest temperature in contact with wettest material, continuous until dried material is discharged through lower end of dryer. Dryer with furnace can be erected by any competent mechanic.

DRYER CAPACITIES AND DIMENSIONS

No.	Capacity (lbs.), sand, ore, etc., per hour, when 5% moisture	Capacity (lbs.), of fertilizer, etc., when 50% moisture	Horse- power	Shipping weight, lbs.	Floor space
C II	10,000	1,000	5-8	10,000	27' 6"x6'x6' 6"
C III	20,000	2,000	8-12	12,000	32' 6"x6'x6' 7"
C IV	30,000	3,000	10-15	15,000	37' 6"x6'x6' 7"
C V	40,000	5,000	15-20	28,000	42' 6"x9'x8' 9"
C VI	50,000	8,000	20-25	30,000	50' 6"x9'x9'

Counter current dryers and brick lined roasters are also manufactured.



STEAM HEATED AIR DRYER

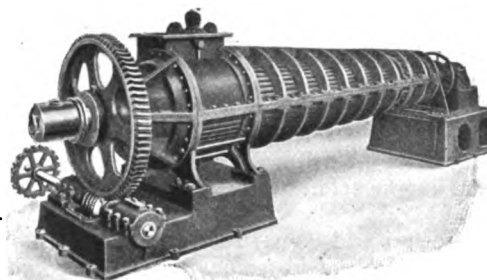
For drying borax, baking powder, nitrate of ammonia, etc.

SWEET'S CATALOGUE

Automatic Continuous Screw Presses.

Automatic continuous screw presses of different construction, used for separating any solid matter from its liquid, can be adapted for slaughter house tankage (residuum of fats) as well as for pressing fish and reclaimed rubber.

The press illustrated below is self-contained and of continuous screw type, consisting of a horizontal tapered screw built up on a hollow perforated shaft and arranged to allow admission of steam, if desired. Screw fits closely inside of a similarly tapered slatted curb, and rotates. Material, forced into conveyor portion of screw, then into curb, must move towards small end of press as screw turns. Size of discharge opening is regulated. Drainage is both internal and external. To regulate supply of material, a patented feeder is furnished.



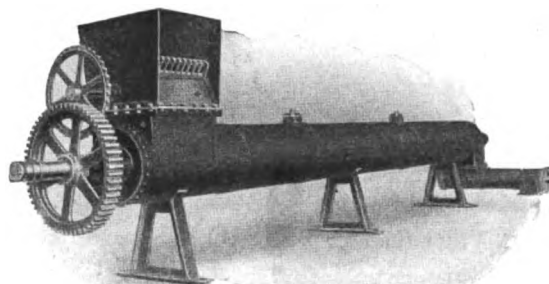
CONTINUOUS SCREW PRESS

Material fed in at one end and discharged at the other; liquids forced out between slats and into drainage holes of shaft, thence to a tank. Built in all sizes.

Automatic Continuous Digesters and Cookers.

These are of the direct steam, self-contained type and are operated continuously. A screw conveyor (inside a cylindrical shell) rotates, cuts up, digests and thoroughly agitates material and carries it forward. Steam admitted through perforations in hollow shaft of conveyor. Note forced rotary feed at admission end. Liquid and solid matter are discharged together, thence to a tank. Drainage tank can be built at small expense.

Digesters and cookers to meet all conditions.



AUTOMATIC CONTINUOUS DIGESTER AND COOKER

Feed, digester proper and discharge all driven by sprockets and chain belting. Very little vibration, and digester can be erected in upper stories of building. Built in all sizes.

Information Required for Estimates on Dryers.

Kind and nature of material to be dried; preliminary treatment which material has undergone, if any; average moisture; size of pieces; amount of wet material to be dried per hour; limit of moisture desired in dried material; kind of fuel to be used; where dryer is to be located; present method of drying.

THE BIGGS BOILER WORKS COMPANY

Vulcanizers, Devulcanizers and Bleaching Boilers

East Market Street and Case Avenue
AKRON, OHIO

Products.

VULCANIZERS and DEVULCANIZERS having the "SIMPLEX" BOLTLESS QUICK CLOSING DOORS.

GLOBE and CYLINDER ROTARY BLEACHING BOILERS.

Also manufacturers of Transfer Cars, Creosoting Cylinders, Rotary Dryers, Incinerators, Sugar Plantation Equipment.

For tanks, see page 1108.

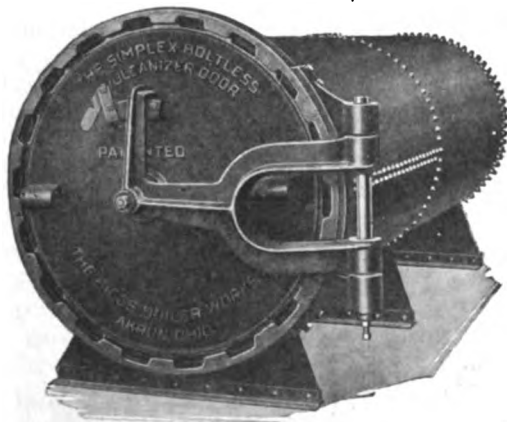
"Simplex" Boltless Quick Closing Vulcanizer Door.

Made throughout of high grade cast steel, accurately machined and is entirely self-contained. Overhead chain blocks, counterweights or trolleys are eliminated, and parts subject to wear are extremely heavy. It will operate satisfactorily when attached to vertical or horizontal vulcanizers, or similar equipment. Door is tight when used at specified operating pressure *without using fastening bolts* of any description.

Even the larger sizes can be opened or closed in 30 seconds without using any mechanical leverage other than short bar inserted in lugs provided. Practically no upkeep.

The design and construction of the "Simplex" *has been accepted by the insurance companies, and will be accepted by them for insurance.* Certificate of inspection furnished, if desired.

THE BIGGS BOILER WORKS COMPANY guarantees the "Simplex" to do all that is claimed for it. Workmanship and material guaranteed for one year.



"SIMPLEX" BOLTLESS HEAD ON A STANDARD HORIZONTAL VULCANIZER

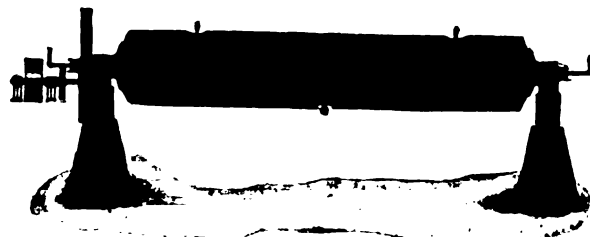
Jacketed Vulcanizers.

Used very largely for special work where a dry heat is desired, and steam is not permitted to come in contact with material to be treated. These vulcanizers are rigidly constructed. On sizes larger than 42 in. in diameter, the entire collapsing strain of inner shell is thrown on to the staybolts. Steam jacket extends around entire shell and rear head, and in standard practice the front head is not jacketed. If necessary, this can be done.

Furnished in all sizes and for all pressures.

Jacketed Rotary Devulcanizers.

With the jacketed rotary devulcanizer, material to be devulcanized is placed in inner chamber containing the liquid, steam is admitted to jacket, and the entire devulcanizer is revolved continuously, and agitation assisted by stationary angles.



ROTARY DEVULCANIZER

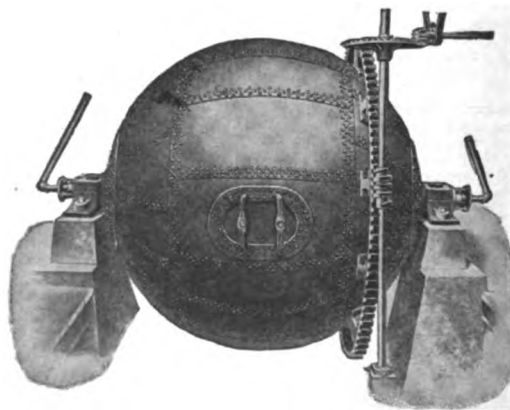
Machines are ordinarily constructed for 125 to 150 lbs. steam working pressure on the jacket, which should produce a temperature of approximately 350° to 365° Fahr. Made in all sizes and for any pressure. Furnished with inspection certificate issued by the insurance companies, which will be accepted by them for insurance.

This company also furnishes stationary horizontal or vertical devulcanizers, having a central shaft containing paddles, which do the agitating.

Rotary Bleaching Boilers for the Paper Trade.

This company has manufactured globe and cylinder rotary bleaching boilers for the paper trade since 1887, and has installed its products in the majority of the leading paper mills in the United States, Canada and foreign countries. An assortment of standard drives can be furnished for either type of bleaching boiler.

Biggs rotaries are made in all sizes, for all requirements and are guaranteed absolutely.



GLOBE ROTARY BLEACHING BOILER

Experience.

The experience of this company, together with special equipment and facilities, places them in position to furnish specially designed vulcanizers and devulcanizers at attractive prices.

L. R. CHRISTIE COMPANY

Manufacturers of Dryers, Calciners, Roasters and Coolers

501 Peoples Bank Building
PITTSBURGH, PA.

Products.

ROTARY DRYERS, CALCINERS, ROASTERS and COOLERS.

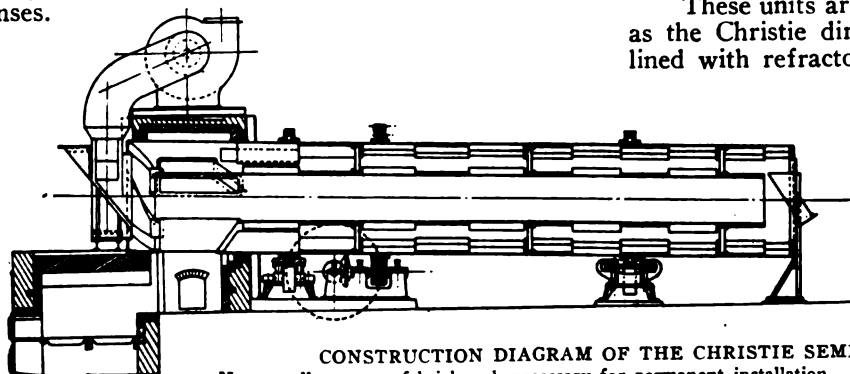
Also manufacturers of Continuous Retorts.

Types of Dryers.

The L. R. CHRISTIE COMPANY manufactures every type of rotary dryer. Certain types have been improved and perfected to the very highest degree of efficiency. Chief among these are the semidirect heat dryer, the indirect heat dryer, the indirect steam heat dryer and the direct heat dryer.

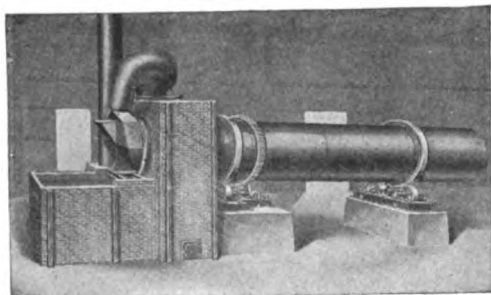
Semidirect Heat Dryer.

An internal heat flue type having a central flue through which the gases first pass, giving up their heat to the surrounding material and later passing directly through material in counter direction, effecting great economy of fuel, as well as installation and operating expenses.



CONSTRUCTION DIAGRAM OF THE CHRISTIE SEMIDIRECT HEAT DRYER

Note small amount of brickwork necessary for permanent installation. A continuous dryer perfected by Christie



SEMIDIRECT HEAT DRYER

Indirect Heat Dryer.

In this dryer, the hot gases are not permitted to come in contact with the material being dried. The heat is applied directly to the outer cylinder as it rotates, and returns through a flue in center of drying compartment.

The gases give up practically their full quota of heat.

The true economy of this drying unit is evidenced by the remarkably low temperatures at exhaust.

Direct Heat Dryer.

A single shell, direct fired cylinder for rough work. Furnace at feed or discharge according to materials being dried.

CHRISTIE
DRYERS · CALCINERS · COOLERS

TRADE-MARK

Steam Heated Dryer.

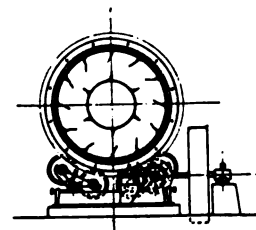
Frequently in drying certain materials, a high temperature has been found injurious. To offset such a possibility and maintain an even low heat, steam may be used as a heat medium, applied either through an internal coil or by air heated in an external coil.



DRYER USING INDIRECT STEAM HEAT

Calciners and Roasters.

These units are of practically the same construction as the Christie direct heat dryers. A rotary cylinder lined with refractory brick is heated by gases directly



applied to material. Exceedingly high temperatures are secured, moisture driven off, foreign matter burned out and chemical reactions obtained.

Services.

In order that the L. R. CHRISTIE COMPANY may be of maximum service in the solution of drying problems, the following details should be kept in mind when writing for information:

- Character of material to be dried.
- Capacity in dry tons of 2000 lbs. per hour.
- Initial and final percentage of moisture. Is moisture free or combined? If combined, at what temperature is it driven off?
- Temperature which material will stand without injury.
- Fineness (mesh) of materials.
- Are materials injured by direct contact with furnace gases?
- Is waste heat available? Temperature. Quantity.
- Fuel to be used: coal, oil, gas or waste heat.

Twenty-one years of specialized effort in designing and operating drying and cooling machinery have been responsible for these advanced models. They are not untried experiments. Their marked economy, made possible through many improvements over old types of dryers, recommends them immediately to the discriminating buyer.

ESTABLISHED 1893

RUGGLES-COLES ENGINEERING COMPANY

Designers and Builders of Dryers for all Materials

120 Broadway
NEW YORK, N. Y.

BRANCH OFFICES
SALT LAKE CITY, UTAH SPOKANE, WASH.
WORKS: YORK, PA.

Products.

RUGGLES-COLES DRYERS—Apparatus for driving off moisture from materials by the application of heat or by absorption of the moisture by heated air.

Scope of Use.

The following is a list of a few of the many materials which are now being successfully and economically dried in Ruggles-Coles Dryers:

Asbestos rock	Marl
Barium sulphate	Match splints
Bauxite	Metal chips
Bichromate of potash	Nitrate of ammonia
Carbonate of lime	Nitrate of potash
Carbonate of potash	Nitrate of soda
Carborundum	Peanut hulls
Chalk	Peat
Charcoal	Phosphate, pebble
Chrome ore	Phosphate rock
Clays	Pineapple waste
Clinker	Pitch
Coal	Potash salts
Coke	Pumicestone
Concentrates	Pyrites
Copper ore	Quartz
Cotton seed	Radium ore
Feldspar	Rock
Fish scrap	Salt
Fuller's earth	Sand
Glass sand	Sewage sludge
Grains	Shale
Graphite	Silica
Gravel	Slurry
Gypsum	Soapstone
Iron ore	Talc rock
Kaolin	Tobacco stems
Leather scrap	Vanadium ore
Lignite	Whiting
Limestone	Wood chips
Litharge	Wood pulp
Manganese ore	Zinc ore

Class "A" Dryer.

This is a patented double shell, direct heat type of dryer, the gases of combustion passing directly from the furnace through the inner shell and back between the two shells in intimate contact with the material being dried. This type of dryer is exceptionally economical in fuel consumption, using 30% to 40% less fuel for the same capacity than any other type of dryer. Class "A" is made in 8 standard sizes.

Class "B" Dryer.

This is an indirect heat type of dryer, similar to the Class "A" machine, except that the gases, after leaving inner flue, pass through ducts attached to the inside of the outer shell, *the gases not coming in contact with the material being dried.*



Services.

Ruggles-Coles dryers are made in 8 distinct types, double or single shell, for use with direct heat, indirect heat or steam. Where no one of the standard types or sizes will meet the requirements, we are exceedingly well prepared to build special dryers that will exactly suit the conditions.

The Engineering Department of the company will gladly consult with any person in regard to any drying problem; but under no conditions will Ruggles-Coles dryers be recommended unless we are absolutely certain they are best adapted to the material to be dried.

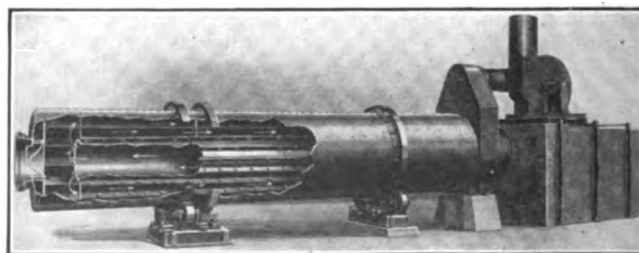
Particulars regarding any of the dryers will be gladly sent on request.

When Writing About Drying Problems.

To aid in the selection of proper type and size of machine, prospective purchasers are requested to send the following facts:

- (1) Initial amount of moisture in material.
- (2) Amount of moisture to remain in dried material.
- (3) Capacity of dried material required per hour.
- (4) Whether free or combined moisture is to be driven off.
- (5) To what temperature material can be heated without injury.
- (6) Whether or not furnace gases would be injurious to the material.
- (7) Size of material, and any other special physical or chemical characteristics.

If possible, a 2-lb. sample of the material to be dried should be sent us in a sealed container in the condition that it will be fed to the dryer. This will be analyzed for moisture without charge.



SECTIONAL VIEW OF RUGGLES-COLES CLASS "A" DRYER
Showing flow of gases

STEACY-SCHMIDT MFG. CO.

Designers and Manufacturers of Sugar Machinery

Queen Street, Hay Street, Arch Street, Mill Road and Pennsylvania Railroad
YORK, PA.

CABLE ADDRESS: "BROOMELL"—Codes used: ABC 5th Edition and Western Union

Products.

MACHINERY for CANE and BEET SUGAR PLANTS and REFINERIES.

For Lime Kilns and Hydrating Plants, see page 1097.

Experience.

The STEACY-SCHMIDT MFG. CO. has been building sugar machinery for over 25 years. Engineers who are specialists in this line have perfected the designs. The experience thus gained enables this company to furnish any machinery for cane and beet sugar plants or sugar refineries.

Steacy-Schmidt products can be found in any of the up-to-date refineries in the United States and Cuba, or in the cane plants of the latter country and the beet plants of the former.

Service.

Co-operation with the engineer is the desire and aim of the STEACY-SCHMIDT MFG. CO. whose extended experience and technical knowledge are at all times available for consultation.

Much of the machinery has been sold in accordance with the requirements, specifications and blue prints of engineers, as well as direct to the owner.

Sugar Machinery.

Mechanical equipment to fulfil the many and varied wants of the sugar machinery trade is designed and built at the Steacy-Schmidt shops: char dryers, char coolers,

char kilns, blow-ups, defecators, juice heaters, double, triple and quadruple effect evaporators, vacuum pans, lime tanks, retorts, coolers, jacketed, open and closed type crystallizers, etc.

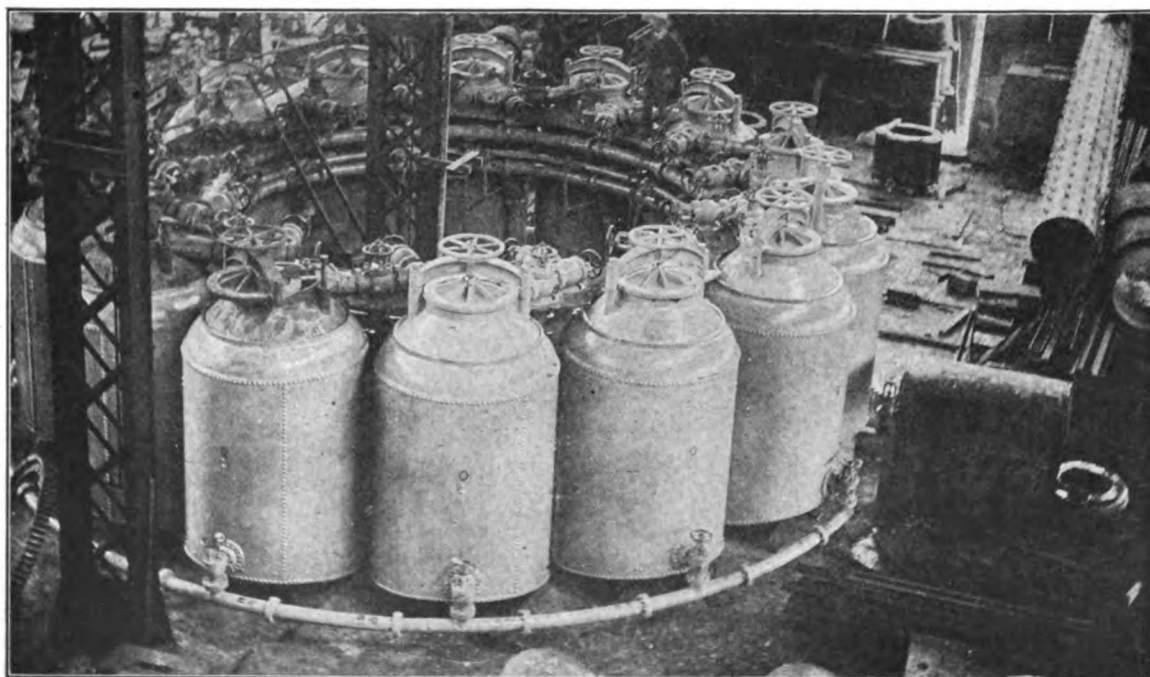
Quotations.

This company solicits the opportunity to quote on the requirements of either engineers or owners for any or all of the special machinery needed in the manufacture and refining of sugar.

References.

Following are a few of the installations of sugar machinery made by the STEACY-SCHMIDT MFG. CO.:

American Sugar Refining Co., Brooklyn, N. Y.
Arbuckle Brothers, Brooklyn, N. Y.
Atlantic Sugar Refineries, St. John, N. B.
Federal Sugar Refining Co., Yonkers, N. Y.
National Sugar Refining Co., Yonkers, N. Y.
Warner Sugar Refining Co., Edgewater, N. J.
Pennsylvania Sugar Refinery, Philadelphia, Pa.
Revere Sugar Refinery, Boston, Mass.
Cuban-American Sugar Co., Cuba
E. Antonio Vazquez, Havana, Cuba
American Beet Sugar Co., Grand Island, Nebr.
Utah-Idaho Sugar Co., Shelly, Idaho
The Dyer Co., Cleveland, Ohio
Honolulu Sugar Co., Honolulu
Honolulu Iron Works, New York, N. Y.
Joubert & Goslin Foundry & Machine Works, Birmingham, Ala.
Reserve Plantation, Louisiana
Robert Sayre Kent, Inc., Brooklyn, N. Y.
S. S. Hepworth Co., New York, N. Y.
United Filters Co., New York, N. Y.



STEACY-SCHMIDT 14-CELL DIFFUSION BATTERY

TOLEDO GLUE APPLIANCE CO.

Glue Heaters and Mixers

611 Jefferson Avenue
TOLEDO, OHIO

Products.

GLUE HEATERS and MIXERS.

Also manufacturers of Appliances for Heating and Mixing Dextrine, Sealing Wax, Pastes, Cements and every known adhesive.

Service.

The scope of this company's activities is that of offering service to the user of glue and other adhesives. This service is characterized as follows:

The company's experts on glue and all that pertains to it will aid the users of glue by suggesting the correct methods of preparing it and by recommending the appliances best adapted to their particular needs. This service is at the disposal of all glue users, without obligation.

The appliances sold by this company and described herein, are sold solely for the purpose of delivering good glue—*glue service*.

Into Toledo appliances are built a degree of mechanical reliability and an appreciation of high manufacturing ideals, which is the finest and surest guarantee of service to the user.

Glue Waste Versus Glue Efficiency.

Enormous waste due to improper preparation and use of adhesives is a fact well known to all who are familiar with the subject. Some authorities have shown that two-thirds of the adhesives used are improperly handled and that the actual waste exceeds one-third of the amount used. These figures do not cover the loss due to imperfection of finished products.

The TOLEDO GLUE APPLIANCE CO., recognizing the inherent disadvantages of the old methods of preparing and using glue, has developed and placed upon the market the Toledo appliances, which give *glue economy* and *glue efficiency* their full meaning for the first time.

Manufacture of Glue and its Preparation for Use.

Glue is produced by boiling certain animal substances and drying the resulting liquor. Its final form is in strips, sheets or flakes, or ground.

When glue jelly is drawn from the manufacturer's boilers, it is ready for use, but ease in handling and economy of shipping necessitates the drying process.

The problem of the glue user is to *return to the glue the exact properties that it had before the glue manufacturer dried it*.

This is accomplished by the soaking and melting processes. The first consideration is that safe and uniform glue can only be obtained by using definite proportions of glue and water.

After glue is soaked, the most important part of the process is undertaken—the melting. Heat should never be applied directly, as this method results in burning or scalding the glue, greatly reducing its efficiency.

The proper methods of soaking, melting, etc., have been definitely established by this company and the principles involved in Toledo appliances not only saves

glue, but enables better work to be done, saves the time of workmen and increases greatly the general efficiency of glue room operations.

Mechanical Features of Toledo Glue Heaters and Mixers.

Construction—Parts with which glue and steam come in contact are constructed throughout of copper and its alloys, the only metal which will successfully resist the destructive action of chemicals present in the glue and steam. All joints are double lapped and soldered, reinforcing the entire heater and making it proof against springing or leaking.

All parts subjected to strain are reinforced to withstand five times the maximum load to which they may be subjected.

Cone Bottom—The special design and construction of the cone shaped bottom make it capable of standing many times the greatest strain to which it may be subjected in ordinary use.

Pure Water Reservoir—For thinning glue after it has been withdrawn from the heater. It provides water that has not been contaminated by acids in boiler compounds nor by dirt or sediments in pipes.

Lion Glue Gate—Provides a means by which glue is quickly and easily drawn from the heater without dripping or sputtering. There is no possibility of binding effect found in other faucets and it can be easily reground when worn. Glue chamber can be entirely emptied by means of this gate because it is attached to the lowest point of the cone bottom.

Agitator—The construction of the agitator is such that there is a gradual and constant mixing motion which insures an even distribution of consistency.

Thermometer—Provides accurate reading of temperature of the contents of the inner jacket and provides a constant check on the thermostat.

Stem of the thermometer is brought in contact with the contents of the inner jacket only, because of the thorough insulation from the water jacket.

Thermostat—Automatically and constantly keeps the glue at the proper temperature, shutting off the heat at 140° Fahr., and permitting heat to enter again when temperature falls below that point. All thermostats on these heaters are set to operate on any pressure up to 40 lbs. If necessary to operate on higher pressures, heaters should be provided with a pressure reducing valve. Thermostats are easily adjusted and practically foolproof.

By means of a cross valve, steam may be used independently of the thermostat when desired, thus glue may be quickly melted when operations start, and then by closing the cross valve, the thermostat is set in action to maintain the proper temperature throughout the day.

Water Gage—Provides a means of ascertaining the amount of water in the outer jacket. The proper level

of water insures against the scalding or burning of the contents of the inner jacket.

Steam Injector—By means of a simple steam injector, steam enters the water jacket through a jet; the water in the jacket of the heater constantly flows through the apertures in the injector, mixing with the steam, overcoming knocking, pounding and sputtering.

Non-steam Contact—The dissolvers of Toledo machines have non-steam contacts and melt glue instantly. This feature prevents steam from coming in contact with the glue, which otherwise would result in burning or scalding; it also prevents the glue from absorbing dirt sediment, acids, and boiler compounds carried by steam.

Steam coming in contact with the glue causes the certain ruin of the properties that must be retained to produce glue that will stick tenaciously.

Glue Retaining Chamber—This chamber is practically airtight; thus evaporation, a serious source of deterioration, is prevented. In addition, this chamber eliminates other sources of loss through deterioration of quality, such as: formation of scum and crust; dirty, sour, rotten glue; dust and dirt; escape of steam and odors.

Operation of Toledo Glue Heaters and Mixers.

Dry glue and pure, cold water are weighed and placed into the melter and allowed to soak the allotted time (ground glue should soak $\frac{1}{2}$ to 3 hours; flake or strip glue, 3 to 6 hours).

After glue is soaked, the melter is placed into the heater and steam turned on. The glue melts instantaneously, flowing through a copper filtering partition to the retainer below. *The rate at which the glue melts is limited only by the pressure of the steam.*

While the soaked "mix" is melting, one melter or more can be kept available with soaking glue so that the capacity of Model 3 is limited only by the number of melters purchased.

Toledo appliances are made to mix glue cold or to heat it by steam, gas, electricity or kerosene, according to the specific needs of the individual buyer.

Standard Equipment.

Toledo glue heaters and mixers are furnished complete with 2 melters, 2 soakers, pure water reservoir, agitator, hinged lids, tapered bottom, steam injectors, and Lion glue gates.

Capacity.

The tables below indicate the possible daily capacities of the Model 3 Toledo glue heater, showing how additional melters increase the daily output. These figures are based on an 8-hour day and on soaking average of 1 hour for ground glue and 4 hours for flake or strip glue.

While a comparison of prices would indicate that a smaller size heater with extra melters would be cheaper, the element of labor required to attend to a heater enters into this proposition to such an extent

as to make it advisable to use no more than 6 melters to a machine, if possible.

Where daily requirements are uncertain, small quantities can be melted as needed.

*CAPACITIES OF MODEL 3 TOLEDO GLUE HEATER AND MIXER

**Number of melters	GROUND GLUE				
	No. 1	No. 2	No. 3	No. 4	No. 5
2	40	80	200	400	800
3	60	120	300	600	1200
4	80	160	400	800	1600
5	100	200	500	1000	2000
6	120	240	600	1200	2400
7	140	280	700	1400	2800
8	160	320	800	1600	3200

**Number of melters	FLAKE OR STRIP GLUE				
	No. 1	No. 2	No. 3	No. 4	No. 5
2	10	20	50	100	200
3	15	30	75	150	300
4	20	40	100	200	400
5	25	50	125	250	500
6	30	60	150	300	600
7	35	70	175	350	700
8	40	80	200	400	800
9	45	90	225	450	900
10	50	100	250	500	1000
11	55	110	275	550	1100
12	60	120	300	600	1200

*The possible capacity is limited only by the number of melters. The pressure of the steam determines the rate at which the glue will melt and the capacity of the heater is smaller when flake or strip glue is used, because of the length of time required for soaking over other kinds of glue.

**Two melters are regularly furnished with each heater.

In addition to the Model 3, this company manufactures 45 other types of appliances. These serve for the treatment of animal glue, vegetable glue, casein glue, dextrine, sealing wax, pastes, or cements; in fact for every known type of adhesive.

Guarantee.

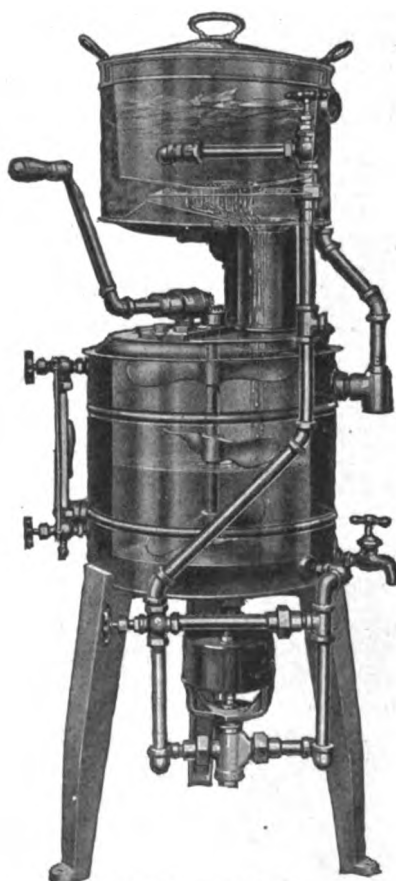
Purchasers of Toledo glue room equipment are protected by a positive guarantee.

All heaters are guaranteed to be free from defects in workmanship and material. When complete with all attachments and when properly connected, Toledo appliances are guaranteed to melt glue and maintain it at a working temperature without boiling in one-half to one-fourth the time required by the old fashioned open types of glue pots. They are guaranteed to prevent overheating, evaporation, scum; dirty, sour or rotten glue; waste, loss of quality and time; to prepare glue properly at less expense and labor than any other type and to pay for themselves at least once every year they are used.

Taggart "Glue Book."

This company publishes the greatest American authority on glue and all that applies to it—the Taggart "Glue Book," which will be sent to interested persons on request.

This book is a veritable treatise on the subject of glue and will be found of practical importance to the glue user. It deals exhaustively with the sources from which glue is derived, the processes of manufacture and the proper preparation of glue for use.



MODEL 3 TOLEDO
GLUE HEATER AND MIXER

WHITING CORPORATION

FORMERLY WHITING FOUNDRY EQUIPMENT CO.

HARVEY, ILL.

BRANCH OFFICES AND SALES AGENTS

ATLANTA, SEEGER MACHINE TOOL Co., 34 South Forsythe St.
BIRMINGHAM, MANUFACTURER'S SELLING AGENCY, Brown-Marx Bldg.

BOSTON, WONHAM, BATES & GOODE, INC., 141 Milk St.

BUFFALO, GEO. F. CRIVEL & Co., 430 Ellicott Square

CHICAGO, WHITING CORPORATION (Branch Office) 1245 Marquette Bldg.

CLEVELAND, WHITING CORPORATION (Branch Office) Leader-News Bldg.

DENVER, S. G. ELBE, 211 Tramway Bldg.

DETROIT, WHITING CORPORATION (Branch Office) 570 Penobscot Bldg.

LOS ANGELES, ECCLES & SMITH Co., 241 South Los Angeles St.

MONTREAL, DOMINION FOUNDRY SUPPLY Co., 183 Wellington St.

NEW ORLEANS

NEW YORK, WONHAM, BATES & GOODE TRADING CORP., 17 Battery Place

PHILADELPHIA, S. R. VANDERBECK, 20 South 15th St.

PITTSBURGH, WHITING CORPORATION (Branch Office) Fulton Bldg.

PORTLAND, ECCLES & SMITH Co., 46 Front St.

ST. LOUIS, H. B. WILSON Co., Syndicate Trust Bldg.

ST. PAUL, ROBINSON CARY & SANDS Co., Fourth and Wacouta Sts.

SAN FRANCISCO, ECCLES & SMITH Co., 71 First St.

SALT LAKE CITY, F. E. ARNOLD, 706 Kearns Bldg.

SEATTLE, W. R. HENDREY & Co., Hoge Bldg.

SPOKANE, UNITED SUPPLY Co., Box 2173

TORONTO, DOMINION FOUNDRY SUPPLY Co., Spadina and Richmond Sts.

VANCOUVER, B. C. EQUIPMENT Co., 602 Hastings St., West

WASHINGTON, H. A. GILLIS, 210 Albee Bldg.

WINNIPEG, MOORE, CAMERON & HILL, LTD., McIntyre Block

Products.

Designers and manufacturers of FOUNDRY EQUIPMENT and RAILWAY SPECIALTIES.

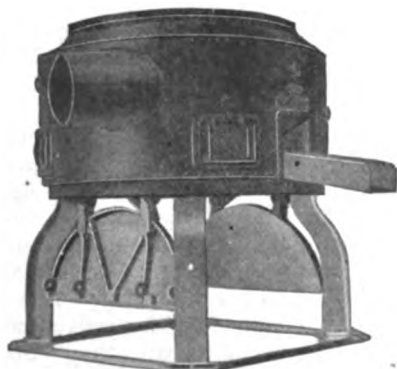
For Cranes, see page 655.

Foundry Equipment.

We design, equip and start into operation complete foundry plants for various classes of work: gray iron, car wheel, malleable iron, converter steel and brass. Typical layouts, lists of equipment recommended, specifications, etc., furnished on request. Send for our illustrated booklet "Foundries: Their Complete Equipment."

Whiting Cupola.

The standard iron melter. Heavy substantial construction throughout. Efficient blast distribution. When properly operated we guarantee hot fluid iron at rated capacity. Special design for continuous melting. Over 3800 sold.



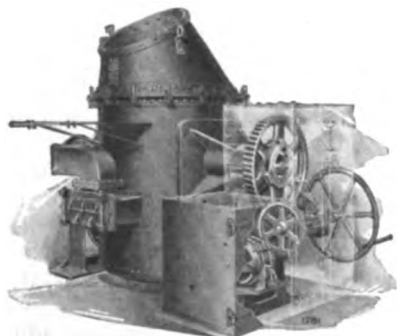
BODY SECTION OF STANDARD CUPOLA

DATA, CUPOLAS

No.	Capacity per hour, tons	Diam. of shell "A", in.	Diam. inside lining, in.
0	$\frac{1}{4}$ to $\frac{1}{2}$	27	18
1	$\frac{1}{2}$ to 1	32	23
2	1 to 2	36	27
2 $\frac{1}{2}$ A	1 to 2	41	27
2 $\frac{1}{2}$ B	3 to 5	41	32
3	3 to 5	46	32
3 $\frac{1}{2}$	5 to 6	51	37
4	6 to 7	56	42
5	7 to 9	63	45
6	9 to 10	66	48
7	10 to 12	72	54
8	12 to 14	78	60
9	14 to 18	84	66
9 $\frac{1}{2}$	18 to 21	90	72
10	21 to 24	96	78
11	24 to 27	102	84
12	27 to 30	108	87

Whiting Side Blow Converter.

Ideal for small steel castings and intermittent work, although castings of 2 tons or more can be poured by accumulating several heats. Adapted for special mixtures and alloy steels. 1- and 2-ton capacities.



CONVERTER

SWEET'S CATALOGUE

Malleable Furnaces.

The Whiting air furnace for making malleable iron castings is inexpensive to install and maintain, compared with other processes. Can be started up or closed down with small loss. Standard designs for 6-, 10- and 15-ton capacity per heat. Complete equipment furnished, including annealing ovens, ladles, tumblers, cranes, etc.



BRASS FURNACE

Brass Furnaces.

Stationary type for use with natural or forced draft. Four standard sizes: 90-, 150-, 270- and 600-lb. capacity. Also crucible tongs, pick-up tongs, and wet or dry tumblers for brass work.

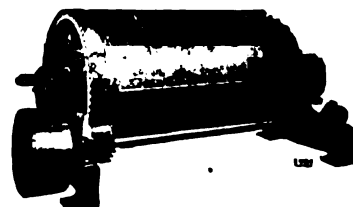
Tumbling Mills.

Class A—Round, steel plate barrel arranged for exhaust. Low standards permit loading from either side. All parts extra heavy and durable; removable trunnions. For heavy duty. Belt or direct motor drive.

Class B—Square barrel, extra heavy steel plate reinforced by angles. For stove plate and frail work. Arranged for exhaust.

Class C—Round barrel with removable cast iron staves. Not suitable for exhaust.

Special—Wet or dry, for brass and light work.



CLASS "A" TUMBLER

DATA, TUMBLERS—CLASSES A, B AND C

Diam. Classes A and C; Square Class B	Length, in.	Approximate floor space including pulley			Size of pulley, in.		Belt	Speed of pulley, r. p. m.
		A	B	C	A and C	B		
24"	36	3'6"x 7'0"	4'5"x 7'6"	3'6"x 6'9"	20x 3 $\frac{1}{2}$	24x4 $\frac{1}{2}$	Single	150
24"	48	3'0"x 8'0"	4'5"x 8'6"	3'6"x 7'9"	20x 3 $\frac{1}{2}$	24x4 $\frac{1}{2}$	Single	150
30"	36	4'5"x 7'6"	5'1"x 8'0"	4'5"x 7'0"	24x 4 $\frac{1}{2}$	24x5 $\frac{1}{2}$	Single	150
30"	48	4'5"x 8'6"	5'1"x 9'0"	4'5"x 8'0"	24x 4 $\frac{1}{2}$	24x5 $\frac{1}{2}$	Single	150
30"	60	4'5"x 9'6"	5'1"x10'0"		24x 4 $\frac{1}{2}$	24x5 $\frac{1}{2}$	Single	150
36"	48	5'1"x 9'0"	6'3"x 9'7"	5'1"x 8'3"	24x 5 $\frac{1}{2}$	30x5 $\frac{1}{2}$	Double	150
36"	60	5'1"x10'0"	6'3"x10'7"	5'1"x 9'3"	24x 5 $\frac{1}{2}$	30x5 $\frac{1}{2}$	Double	150
36"	72	5'1"x11'0"	6'3"x11'7"		24x 5 $\frac{1}{2}$	30x5 $\frac{1}{2}$	Double	150
42"	48	6'3"x 9'7"	7'3"x 9'3"		30x 6 $\frac{1}{2}$	32x7 $\frac{1}{2}$	Double	120
42"	60	6'3"x10'7"	7'3"x10'3"	6'3"x 9'9"	30x 6 $\frac{1}{2}$	32x7 $\frac{1}{2}$	Double	120
42"	72	6'3"x11'7"	7'3"x11'3"	6'3"x10'9"	30x 6 $\frac{1}{2}$	32x7 $\frac{1}{2}$	Double	120
48"	60	6'6"x10'7"	7'7"x10'7"		32x 7 $\frac{1}{2}$	40x8 $\frac{1}{2}$	Double	120
48"	72	6'6"x11'7"	7'7"x11'7"		32x 7 $\frac{1}{2}$	40x8 $\frac{1}{2}$	Double	120
60"	60	7'3"x10'3"	8'0"x14'8"		40x10 $\frac{1}{2}$	30x6 $\frac{1}{2}$	Double	100*
60"	72	7'3"x11'3"	8'0"x15'8"		40x10 $\frac{1}{2}$	30x6 $\frac{1}{2}$	Double	100*

* 325 r. p. m. for Type "B".

Continued on next page



CRANE LADLE

Ladles.

Crane Ladles—Steel plates, tank steel; bottom, best flange steel. Unless specified, open gearing supplied. Capacities up to 30 tons.

Crane Truck Ladles—Geared, in capacities from 1 to 6 tons; plain, from 1000 to 3000 lbs.

Standard Truck Ladles—Plain and geared in capacities

1000 to 3000 lbs.; heavy type, geared, from 4000 to 8000 lbs. capacity.

Shank Ladles—Capacities 100 to 3000 lbs.

Hand Ladles—Capacities 30 to 60 lbs.

Also bottom tap, teapot spout, car wheel and reservoir ladles.

Core Ovens.

Drawer Type—Drawers have rigid, braced frame, supported on three flanged wheels with roller bearings. Drawers may be pulled separately or together as desired.



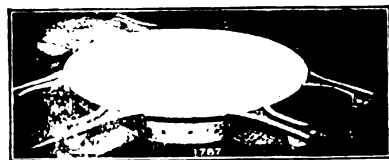
DRAWER TYPE CORE OVEN

Car Type—Arrangement of flues, dampers, etc., insures uniform heating and highest fuel efficiency. Give size required (width, length and height), number of shelves and location.

STANDARD ARRANGEMENT OF DRAWER OVEN FRONTS OR SECTIONS

Number of drawer		5	5	5	5	5	5	5	5	5	4	3	3
Height of drawer, in.	5th.....	4	4	5	7	7	8	6	14	5	11	9	
	4th.....	4	5	5	7	7	8	8	8	5	11		
	3rd.....	4	5	5	7	7	8	12	8	5	11	12	11
	2nd.....	5	5	5	9	10	8	5	8	5	15	12	11
	1st or bottom.....	15	13	10	9	10	9	5	10	11	5	12	11
Approximate total height from floor to bottom of top drawer, in.		71	71	71	75	77	76	73	77	69	63	73	51

Special arrangement of drawers at additional price.



STANDARD TURNTABLE

Turntables.

Rigid, self-contained construction. No tipping, no getting out of line, no journal friction. Entire load carried on chilled rollers, held rigidly apart

by spacing frame. Flat top standard. Furnished also with track rail cast on top or with grooves for wheel flanges, to suit any gauge.

Air Hoists.

For hoists 3 1/4 to 6 in. diameter, cylinders are seamless, drawn brass tubing, polished inside. Standard parts carried in stock. Hoists 7 to 24 in. are cast iron, carefully moulded and accurately bored and reamed. Valve is disk type of improved design. Stem does not pass through air chamber, eliminating leakage. Automatic cut-off.

Horizontal Hoists for locations where headroom is insufficient for vertical hoists or where more easily supported.



AIR HOIST

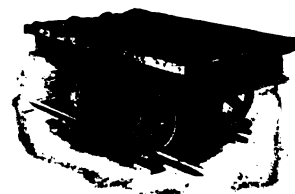
Cars and Trucks.

For severe service in foundry, shop or yard. Heavy steel frames; full line of core oven cars and trucks, with and without shelves; chilled wheels, roller bearings.

DATA. STANDARD TRUCKS

No.	Capacity, tons	Gauge, in.	Platform		Diam. of wheels, in.
			Wide	Long	
2	2	18 to 24	3'-0"	4'-0"	16
3	3	18 to 24	3'-0"	4'-0"	16
5	5	18 to 24	3'-0"	4'-0"	16
12	2	24 to 30	3'-6"	5'-0"	16
13	3	24 to 30	3'-6"	5'-0"	16
15	5	24 to 30	3'-6"	5'-0"	16
140	10	30 to 36	4'-6"	6'-0"	20
141	10	36 1/2	6'-0"	8'-0"	20

Special sizes made to order.



STANDARD SHOP TRUCK

Elevators.

For 1-story lifts only. Designed specially for foundry service in lifting charges to charging floor. Compressed air and hydro-pneumatic.

Overhead Tramrail Systems.

Consist of standard I-beams suspended from roof beams or trusses by hangers. Curves, switches or turntables introduced as required. Extensions readily made. Save time, floor space and labor in handling light loads.

Railway Specialties.

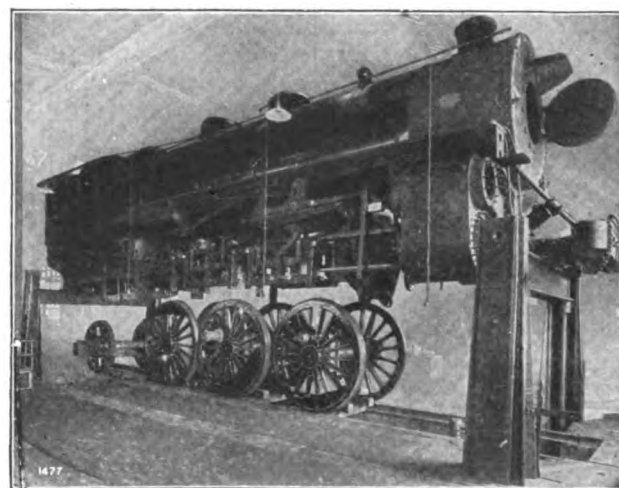
Locomotive Hoist—For unwheeling and wheeling locomotives of any type or size. Special six-jack design for handling Mallet compounds.

A recent test showed a saving of \$45.53 per locomotive as compared with a drop pit. All drivers can be removed at one time or only one pair, as desired. Wheels remain at floor level during all operations—absolutely safe. A big time and labor saver at division points and repair shops. Over 75 installations. Write for Railway Catalogue.

Coach Hoist—For removing trucks from passenger coaches and interurban street cars with speed and safety. Car or coach kept level while raising or lowering. Similar to locomotive hoist.

Transfer Tables—For locomotives or coaches. Designed for shallow pit. Practically any capacity, length or speed.

Turntable Tractor—New design of simple, rugged construction for turntables of any capacity and pit rail radius.



FOUR-JACK LOCOMOTIVE HOIST

FLINN & DREFFEIN COMPANY

Gas and Fuel Engineers

431 South Dearborn Street

CHICAGO, ILL.

Products.

Designers and builders of INDUSTRIAL FUEL EQUIPMENT including:

Anthracite Producer Gas Plants.

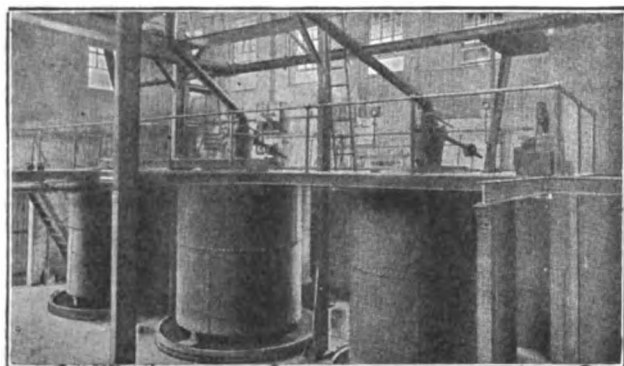
Bituminous Producer Gas Plants for making Raw Gas, or with Gas Washing Apparatus and Tar Extractors for producing Clean Gas.

Raw Producer Gas Burners.

Also manufacturers of Special Gas Apparatus for making Nitrogen, Carbon Monoxide or Carbon Dioxide.

Anthracite Producer Plant.

This type of apparatus is built for soldering tin cans, canning, etc. Also for hardening, tempering, annealing and heat treating of steel.

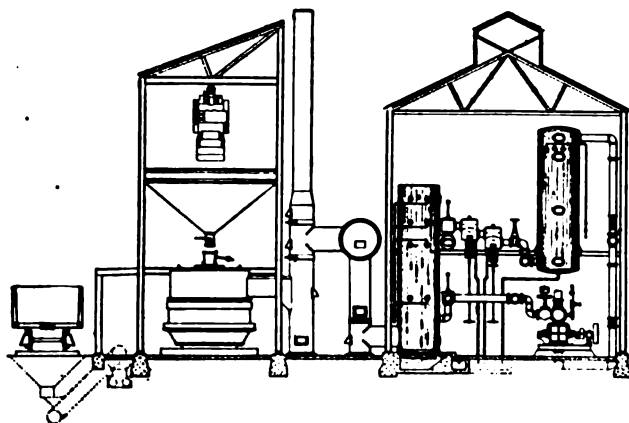


ANTHRACITE PRODUCER PLANT

Furnishing gas for bright annealing cold rolled steel, sherardizing, japanning and various operations formerly using city gas

Clean Bituminous Producer Gas.

This apparatus finds its field in factories where heating operations are widely scattered and at a considerable distance from the gas plant. It is the cheapest industrial fuel gas available, and may be applied to almost every heating operation, as well as for gas engines.



GAS CLEANING PLANT

In connection with large bituminous producer installation

Raw Producer Gas Burner.

These burners can be applied to furnaces using fuel oil, coal or coke with virtually no material alterations.

Combustion is complete within the furnaces and there are no objectionable fumes or smoke emitted. Furnaces are readily adapted to raw producer gas burners.

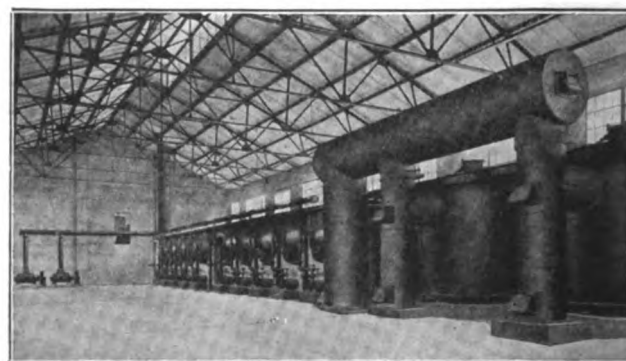


FLINN & DREFFEIN RAW PRODUCER GAS BURNER

For displacing oil, natural gas, coal and coke in a wide range of industrial heating operations

Raw Bituminous Producer Gas Plant.

This apparatus is especially suitable for heating reducing kettles, ovens, etc., as well as in all moderate temperature, direct fired furnaces, such as hardening, tempering, annealing and heat treating of steel.



RAW BITUMINOUS PRODUCER GAS PLANT

In combination with a complete burner system for heating a double battery of asphalt stills

Services.

For more than ten years, the FLINN & DREFFEIN COMPANY has designed and built fuel equipments for industrial and manufacturing purposes, covering the entire range of heating and burner operations, and is in a position to offer only that equipment which is most suitable to the manufacturer's needs. Fuel systems of its design can be seen in successful operation in many leading factories throughout the country.

Information Required.

In the nature of things, nearly every proposition must be specially considered before definite recommendations can be made regarding the apparatus involved. In writing, please describe as fully as possible the requirements, giving kind and quantity of fuel used and nature of heating operations to be performed.

MORGAN CONSTRUCTION CO.

GAS PRODUCER DEPARTMENT

WORCESTER, MASS.

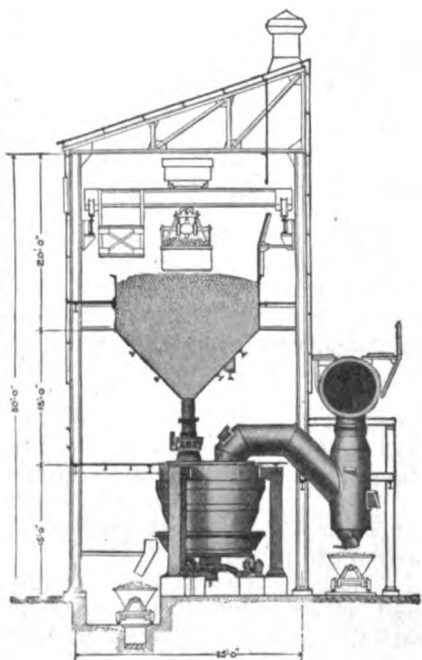
Product.

MORGAN PRODUCER-GAS MACHINE.

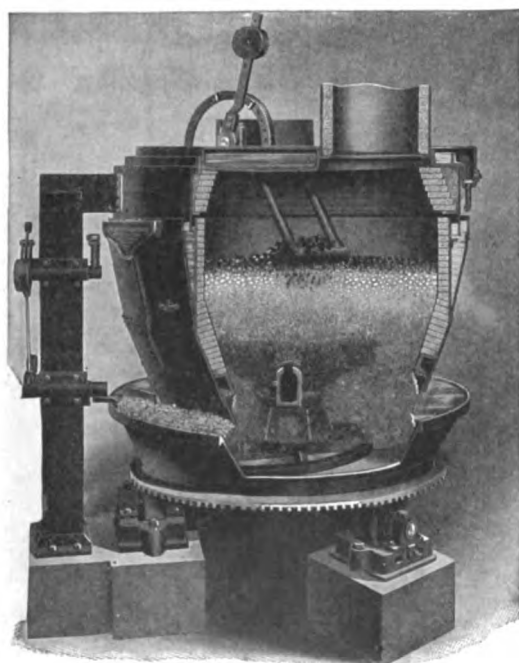
Description.

The Morgan producer-gas machine, without disturbance of the fuel-bed by pokers and without manual labor, converts a larger quantity of coal into gas of the best known quality than is possible with any other type of mechanical gas producer.

A measuring feeder delivers coal of any size up to 4-in. cubes, direct from the overhead bin on to the fuel bed at frequent intervals, without action on the part of the operator, whose work is confined to regulating the speed to correspond with the demand for gas. The coal is properly spread and the surface continuously leveled by the water cooled bar which floats on the fuel, and permits any practicable variation in height of surface or thickness of fuel bed.



INSTALLATION DIAGRAM OF MORGAN GAS PRODUCER

SECTION OF POKERLESS PRODUCER-GAS MACHINE
Feeder not shown

Ash is removed mechanically at one point into a chute by a spiral shaped plow, held stationary during one complete revolution of the ash pan, and then released automatically; no manual labor.

The development of a closed feeder, operating without manual action, together with the other improvements noted, makes it possible for one man to attend to the gasification of 9 tons of coal per hour.

The fire brick lining has been reduced in thickness around the hottest zone, and is surrounded by a water jacket which keeps the inner surface cool enough to prevent adhesion of clinker.

Operating Results.

One prominent customer took continuous 12-hour samples of the gas *day and night for 2 weeks*, with the following average results:

Date	CO ₂	C ₂ H ₄	CO	H ₂	CH ₄	B. t. u. in gas	
						U. S. steel standard	Total at 32° Fahr.
Feb. 2-14, incl., 1914	2.8	0.6	27.4	11.2	3.5	160.5	180.0

Four Morgan producer-gas machines were installed in the above plant to do the work usually requiring 6 mechanical gas producers. During a period of 4 months' test, 3 machines made all the gas required, working at an average rate of over 30 tons of coal per day.

Another customer, operating open hearth furnaces, analyzed an 8-hour continuous sample of the gas practically every day. The *average for 5 months* was 3.5% CO₂, 28.8 CO, and 182 B. t. u.

Further experimenting gave them the following gasifying capacities and disclosed the fact that the quality of gas does not suffer at these high working rates:

Date	Net tons coal per day	Operating hours per day	Pounds coal per hour	B. t. u. of gas	
				U. S. steel standard	Total at 32° Fahr.
September 21-22	32.35	23.70	2730	167.0	188.0
September 22-23	36.00	23.05	3120	168.5	190.0
September 23-24	34.15	22.05	3100	165.0	186.0
September 24-25	37.35	22.90	3260	165.5	186.5

Uniformity.

The experience of users is that the gas from these machines is exceptionally uniform in quality. The president of a well-known iron and steel company recently wrote voluntarily:

"The regularity of the product makes it next to natural gas and we are very much pleased with the results."

Installations.

The leading steel companies in the United States, Great Britain, and France are installing these machines as fast as they can be built. There are 466 in operation, giving results which place them in a class entirely beyond the reach of the ordinary mechanical gas producer. The Cambria Steel Company has 51, the Bethlehem Steel Company has 46, the United Alloy Steel Corporation has 35, and the Youngstown Sheet & Tube Company has 31.

Complete list of installations will be furnished on request.

MILWAUKEE RELIANCE BOILER WORKS

Manufacturers of Gas Producers

32nd and Hadley Streets
MILWAUKEE, WIS.

Products.

"SHARP-BASSETT" GAS PRODUCERS.

Also manufacturers of "Reliance" Steel Tanks, Feed Water Heaters, Vertical Boilers.

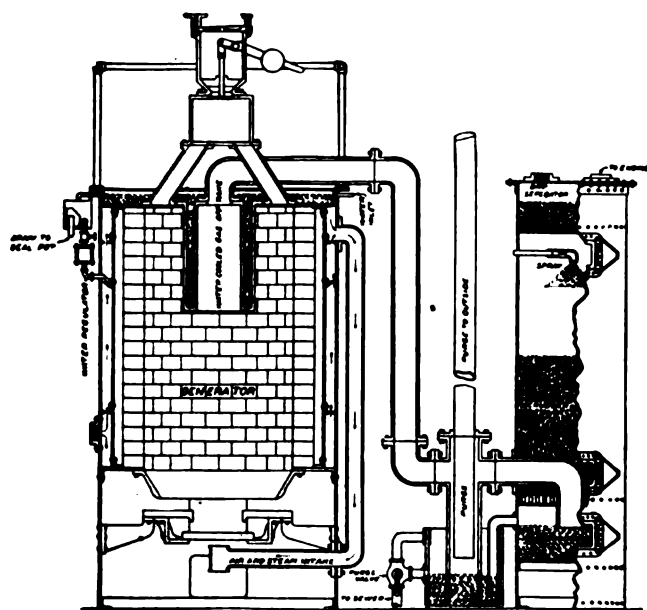
"Sharp-Bassett" Gas Producer.

The "Sharp-Bassett" improved gas producer was designed by A. J. Bassett who has had many years of experience in operating, testing and experimenting with different makes of gas producers and gas engines, under actual working conditions; thereby being in position to know the proper design and construction necessary to produce the most economical, reliable and serviceable gas producer.

In designing this gas producer, it was the designer's aim to place a gas producer on the market that would be simple, economical, convenient to operate and absolutely reliable under all working conditions.

The great number of installations which are now in successful operation, throughout the United States and foreign countries, prove beyond a doubt, that this gas producer furnishes fuel for modern gas engines and refined heating operations cheaper than any other method known.

Exhaustive tests, run on a great number of "Sharp-Bassett" improved gas producers in service show that they will deliver 80% of the total heating value of the fuel as fired, in a clean, cool gas, for use in gas engines and heating furnaces.



CROSS SECTION OF "SHARP-BASSETT" IMPROVED STANDARD GAS PRODUCER

Showing method of firing, cleaning and cooling the gas; double shell arrangement; method by which brick lining and grates are installed

SWEET'S CATALOGUE

"Sharp-Bassett" Combined Steam and Gas Generator.

Designed to meet the demands of power and fuel users who require a quantity of steam and hot water for heating purposes during the winter months, also other heating applications in the manufacturing process of products.

With regular equipment the gas generating efficiency of the "Sharp-Bassett" combined steam and gas generator is the same as the efficiency of the "Sharp-Bassett" improved gas producer.

The steam generating part of the equipment is entirely a recovery process, as through the process of distilling the fuel a certain percentage of the heating value of the fuel is thrown off through radiation, and this is the heat which is used to generate steam, therefore the steam is generated at no cost to the user.

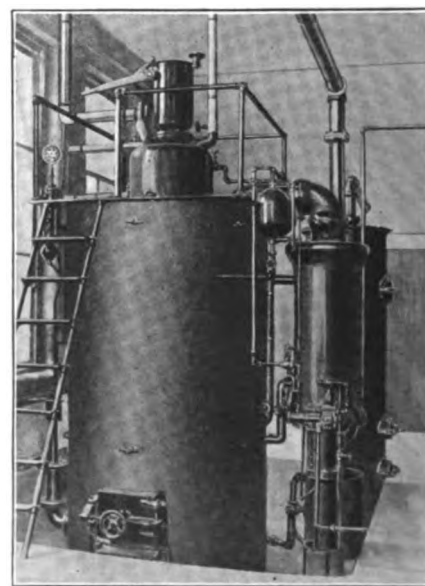
Should the user's steam requirements be larger than the steam thus recovered the volume of steam generated can be increased by simply reducing the thickness of the brick lining, or eliminating the brick lining entirely to obtain the volume of steam required.

The construction of this combined steam and gas generator is of the same general construction as the improved gas producer.

With the improved gas producer the double shell is used as an economizer, vaporizer, and saturator, but with the combined steam and gas generator the double shell is staybolted and in addition has a crown sheet, steam dome, and feed water heater.

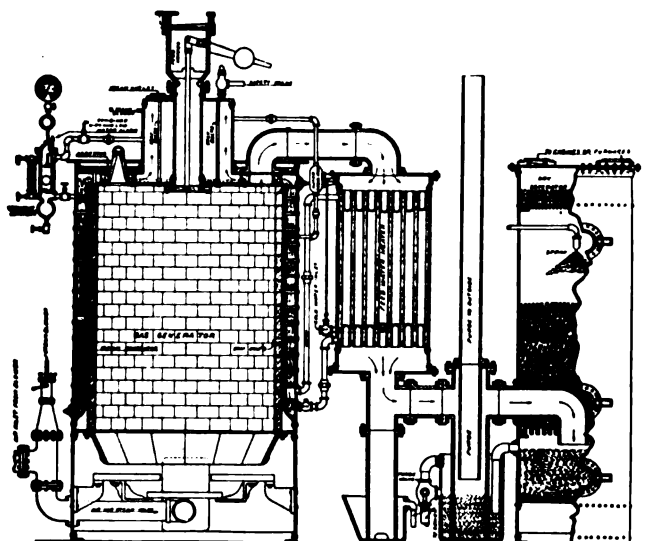
The feed water heater is placed in the gas offtake between the gas generator and the scrubber and recovers the heat which would otherwise enter the scrubber and be carried off by the scrubber water to the sewer.

A scientific test-run made on the "Sharp-Bassett" combined steam and gas generator operating in actual service, showed an over all efficiency of 96%. This being the highest efficiency thus far obtained through any other type of power generating apparatus.



"SHARP-BASSETT" COMBINED STEAM AND GAS GENERATOR

Continued on next page



CROSS SECTION OF "SHARP-BASSETT" COMBINED STEAM AND GAS PRODUCER

Gas generated by this generator supplies the fuel to a modern gas engine, which in turn supplies the power for this factory, and the steam generated is used throughout the factory for heating purposes

Producer Gas for Power.

Producer gas when used for power is cooled and thoroughly cleaned before being delivered to the engine.

The U. S. Government made tests at their plant in St. Louis to determine the commercial value of various fuels and the most perfect system of conversion into power and heat. The producer gas tests made at this time by the government experts proved that power can be developed by the producer gas plant with $\frac{1}{2}$ to $\frac{1}{3}$ the amount of coal used in modern steam plants. The results of these tests will be found in publication, which can be obtained by application to Bureau of Mines, Washington, D. C.

It is now universally acknowledged that producer gas is the coming power, displacing all other methods, because of its greater economy, and its great saving in labor, repairs and increased longevity of plants; its safety and reduction of fire risk; its cleanliness and elim-

ination of smoke nuisance, which is important, especially in cities.

Power can be developed for three-tenths of a cent per horsepower hour, fuel cost, using buckwheat size anthracite coal at \$6.00 per ton. Electricity can be developed for one half cent per kw. hour. Producer gas can be used for power or fuel at less cost than city gas at 20¢ per 1000 cu. ft. or natural gas at 35¢ per 1000 cu. ft.

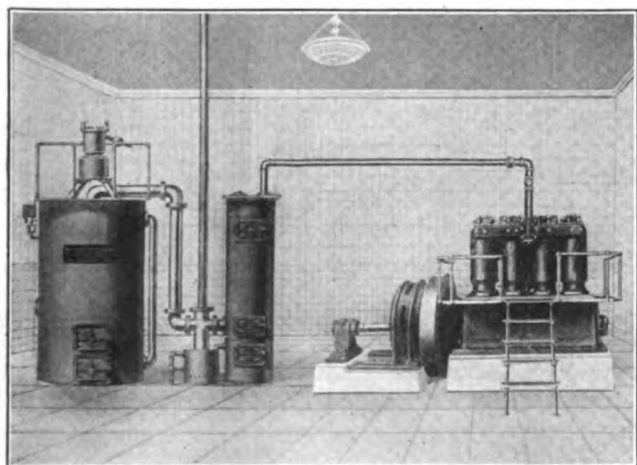
Producer Gas for Fuel.

Producer gas is used for supplying a fuel gas to replace other fuels with a great many advantages, as well as being very much more economical.

The heat or calorific energy of the fuel can be applied in the most direct and economical way. It prevents waste of material and prolongs the life of furnaces. It shortens time of operation, thus increasing production. It produces more uniform and better products. It can readily be applied to almost every form of industry where heat is required.

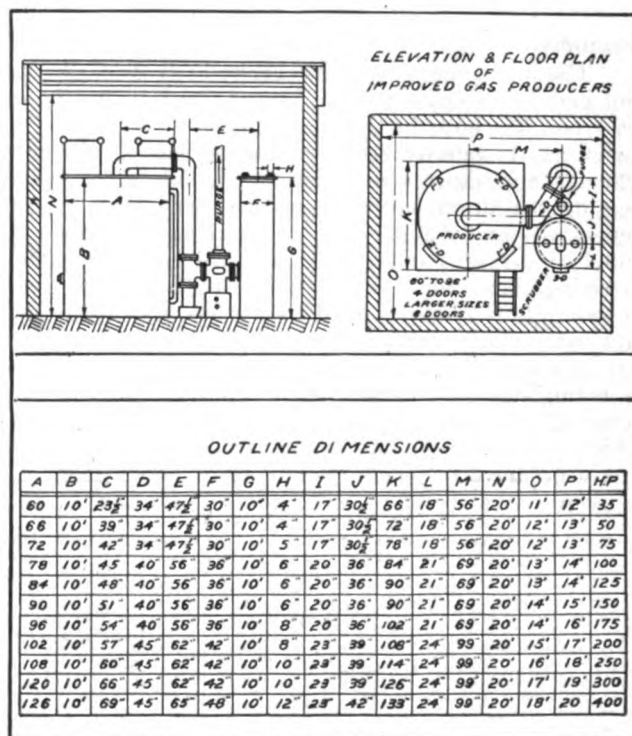
In large plants, centralization of gas producer results in a reduction of labor and increases efficiency over separately fired furnaces. When firing furnaces with producer gas they are under perfect control of the operator and almost any heat can be obtained.

The labor required for firing a gas producer for power or fuel is very small compared to a steam boiler. One man can take care of a large plant and have plenty of time for other duties. He can charge our producer, stoke, inspect and regulate fire, and remove the ash without facing uncomfortable heat. His work is clean. No carelessness or accident can cause an explosion and there is no smoke.



"SHARP-BASSETT" IMPROVED GAS PRODUCER POWER PLANT

Gas engine direct connected to electric generator



ELEVATION, FLOOR PLAN AND OUTLINE DIMENSIONS OF IMPROVED GAS PRODUCER

NOTE—The above illustrations and dimensions will serve for both the "Sharp-Bassett" Improved Standard Gas Producer and the "Sharp-Bassett" Combined Steam and Gas Generator when figuring space requirements for installations, with the exception of dimension (I) which is increased 10 in. on the combined steam and gas generator

THE SMITH GAS ENGINEERING CO.

Cleaned Gas Producer Plants

DAYTON, OHIO

FACTORIES: LEXINGTON AND DAYTON, OHIO

SOLE CANADIAN REPRESENTATIVE: THE CANADIAN ALLIS-CHALMERS, LTD., TORONTO

Products.

Designers and builders of GAS PRODUCER PLANTS for power service and industrial heating, including plants to furnish cleaned gas for melting, annealing, heat treating and re-heating metals and glass, also for enameling ovens, for baking and drying and in foundries.

Special types of PRODUCERS designed for anthracite, bituminous and lignite coals; TAR EXTRACTORS; GAS CLEANING PLANTS.

Also manufacturers of Recording Gas Calorimeter; Gas Valves for hot and cold gas, Tar Extracts for coke oven or producer gas, etc.

Experience.

THE SMITH GAS ENGINEERING CO. is a pioneer in gas producer work, Smith suction gas producers having been in successful commercial operation since 1902. Over 80,000 h.p. have been installed, ranging in size from 25 to 3000 h.p. in single units, operating on a wide range of fuels, and furnishing gas for both power and heating. The company numbers among its customers some of the largest and best known manufacturers in the country, who installed Smith producers after thorough and detailed examinations by their own engineers, which showed the remarkable economies to be obtained by their use.

Economy.

The increasing cost and scarcity of fuel of all kinds and high labor costs make it imperative in every industry to utilize both in the most efficient manner. Producer gas is rapidly becoming recognized as the most efficient and desirable agent to use where power or heating operations are necessary. Because it can be generated simply and easily direct from coal, the most widely distributed and cheapest natural fuel, it furnishes, in connection with the gas engine, the cheapest power known. It is easily applied to the heating of furnaces and ovens with marked economy over other fuels, and requires a remarkably small amount of skilled labor in its manufacture and application. These advantages are being daily demonstrated in numerous plants and in widely diversified industries where Smith suction gas producers have replaced other types of apparatus.

RELATIVE OPERATING COSTS—200 H.P. STEAM AND GAS POWER PLANTS

Type of engine	Fuel	Cost per ton	Fuel consumption per b. h. p. hour, lbs.	Total coal, tons	Total fuel cost per year of 3000 hrs.	Relative fuel costs, per cent
Simple steam.....	Bituminous coal	\$6.00	8	2400	\$14,400.00	640
Compound steam non-condensing.	Bituminous coal	6.00	5	1500	9,000.00	400
Compound steam condensing.....	Bituminous coal	6.00	3	900	5,400.00	240
Producer gas.....	Anthracite coal	10.00	1	300	3,000.00	133
Producer gas.....	Lignite	5.00	1.75	525	2,630.00	117
Producer gas.....	Bituminous coal	6.00	1.25	375	2,250.00	100

Type of Plant.

The general arrangement of the complete plant and the method of operation are shown in the diagrammatic cross section. The essential parts are the saturator (B)

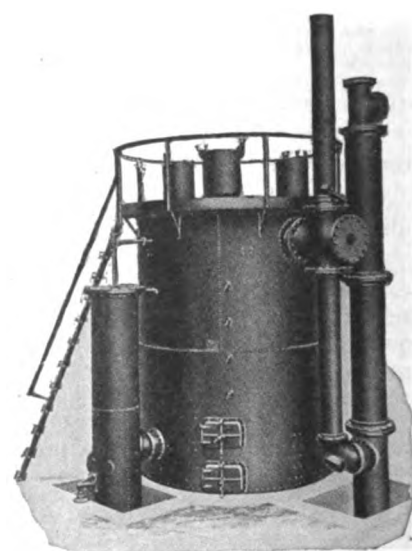
for supplying a fixed proportion of hot air and steam for the gas making; the generator (E) where the gas making occurs; the scrubber (L) for cleaning the gas; the moisture trap (M) for removing any entrained water from the gas; the necessary piping for connecting the various parts; and auxiliary equipment, gauges, valves, and tools necessary for operation. For furnace work, producers are equipped with positive pressure exhausters.

The operation described is the same for all types of Smith gas producers with the exception of type "CF" which is of the down-draft type.

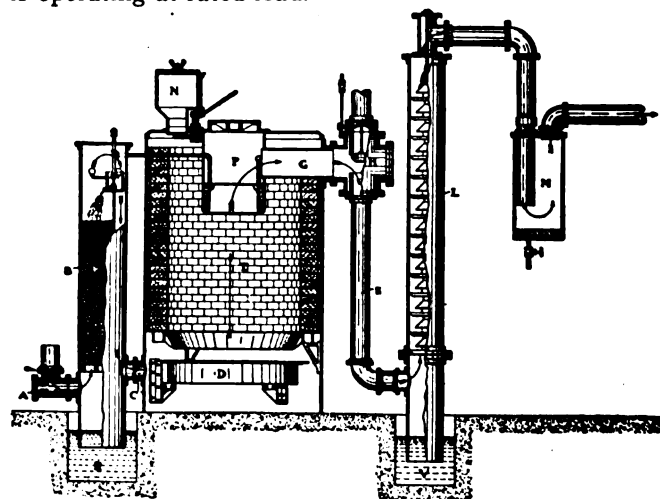
Type "E" Producer.

Type "E" producer is designed for anthracite coal only. It is suited to either fuel or power service. Producers are of the suction type; but when gas is to be delivered under pressure, the plant is equipped with suitable exhauster and pressure regulator for delivering the gas to the mains without the use of a gas holder.

Type "E" producers are built in 11 sizes ranging from 25 to 300 h.p. For fuel service they will burn from 25 to 400 lbs. of coal per hour. They are guaranteed to deliver 75% of the heating value of the coal in gas of at least 135 B.t.u. per cu. ft. when producer is operating at rated load.



TYPE "E" SUCTION PRODUCER, 300 H. P.
Showing scrubber and saturator complete



200 H.P. TYPE "E" PRODUCER

Producer is charged and cleaned once in 24 hours when operating on 10-hour service. It is charged every 6 hours when operating continuously. There are no shutdowns for cleaning or charging.

Gas cleaning equipment consists of a steel pipe filled with cast iron, cone shaped baffles. Gas passes up through the baffles counter to the flow of water. This arrangement gives the best cleaning effect, and is very economical in use of water.

Type "E" producers are equipped with flat grates. The larger units have grates with rocking centers operated by a compressed air cylinder. This type of grate keeps the center of the fire clean without hand labor, and prevents loss of fuel when the fire is cleaned.

Type "EP" Producer.

Type "EP" producer is designed to operate on charcoal or coke, which fuels contain small quantities of tar. This producer is identical with Type "E" machine, except that a mechanical scrubber is added to the gas cleaning equipment.

DIMENSIONS, TYPES "E" AND "EP" PRODUCERS

H. p.	Foundation in ft.		Required minimum height, ft.
	Suction	Pressure	
25	4½ x 4½	4½ x 8½	20
35	5 x 5	5 x 9	20
50	5½ x 5½	5½ x 9½	20
75	6 x 6	6 x 10	20
100	6½ x 6½	6½ x 10½	20
125	7 x 7	7 x 11	22
150	7½ x 7½	7½ x 11½	22
175	8 x 8	8 x 12	22
200	8½ x 8½	8½ x 12½	22
250	9 x 9	9 x 13	22
300	10 x 10	10 x 14	22

Type "BF" Producer.

Type "BF" producer is designed to operate on bituminous and lignite coals. The producer proper is identical with the Type "E" machine. The cleaning equipment consists of the Type "F" tar extractor in addition to usual type of baffle scrubber. Baffle scrubber is used only to cool the gas. Gas is drawn from the scrubber by a positive exhaustor and forced through Type "F" tar extractor, which consists essentially of a housing in which is located a diaphragm of glass wool. The tar enters this diaphragm in the form of fog floating in the gas. During its passage through the diaphragm it is agglomerated into large drops which fall out of the gas current, by gravity, into trap provided for that purpose.

Any desired degree of gas cleanness can be secured by use of this equipment. Engines are operated continuously for periods of several months upon gas cleaned in this way, and no trouble whatever is experienced from accumulation of tar in manifolds or valves.

Type "G" Mechanically Operated Producer.

The Type "G" is a high duty bituminous producer, mechanically operated to meet the present-day demand for large gas capacity with low labor costs. The producer operation is similar to that of the Type "BF" producer, and the Type "F" tar extractor is employed to thoroughly clean the gas. A steam operated poker is incorporated in a rotating tur-

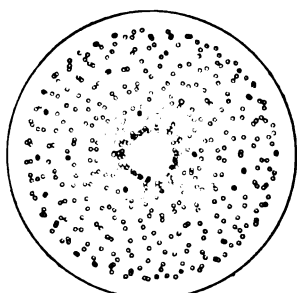
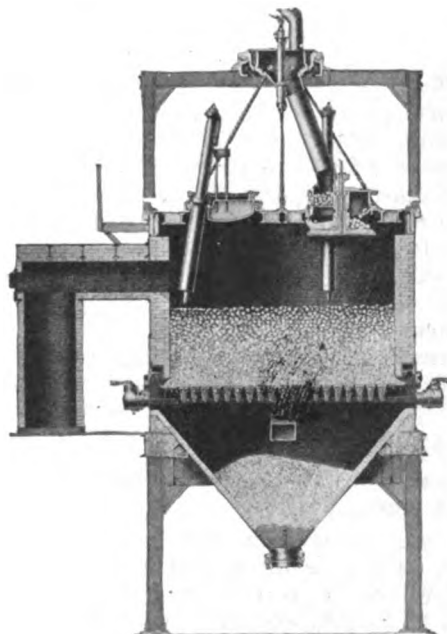


DIAGRAM SHOWING POKER ACTION DURING ONE HOUR OF OPERATION

ret mounted on the producer top, which also revolves. As the turret and top rotate, the poker constantly pierces the fuel bed so that every portion is poked during a complete revolution. The illustration shows the position of the poker when withdrawn and the dotted lines indicate its position when extended. The diagram shows how effectively the mechanical poking device does its work. Mechanical poking permits a higher rate of gasification and insures a more uniform porosity in the fuel bed than is possible with the hand poked type of producer, with the result that distillation is more thorough and efficiency is consequently higher.



CROSS SECTION OF TYPE "G" PRODUCER

Type "G" units are made in sizes of 9- to 16-ft. diameter with capacities of 800 to 3000 lbs. of coal per hour. Cleaned gas produced by a central Type "G" plant may be distributed over a wide area and handled in the same manner as natural or illuminating gas.

Catalogues and Bulletins.

THE SMITH GAS ENGINEERING CO. will be pleased to mail catalogues and bulletins of any of the equipment illustrated or mentioned above, together with any engineering data desired.

References.

Armstrong Cork Co., Beaver Falls, Pa.
U. S. Cast Iron Pipe & Foundry Co., Bessemer, Ala.
National Lamp Works of General Electric Co., Cleveland, Ohio
Timken-Detroit Axle Co., Detroit, Mich.
Ford Motor Co., Detroit, Mich.
Ford Motor Co. of Canada, Ltd., Walkerville, Ont.
J. M. Horton Ice Cream Co., Brooklyn, N. Y.
Staten Island Shipbuilding Co., Port Richmond, N. Y.
American Cotton Oil Co., Guttenberg, N. J.
Reliance Manufacturing Co., Massillon, Ohio
Robbins & Meyers Co., Springfield, Ohio
Jeffrey Manufacturing Co., Columbus, Ohio
Crucible Steel Company of America, Harrison, N. J.
San Antonio Portland Cement Company, San Antonio, Tex.
Halcomb Steel Co., Syracuse, N. Y.
Kellogg Toasted Corn Flake Co., Battle Creek, Mich.

THE SELAS COMPANY

Industrial Gas Utilization System

Widener Building
PHILADELPHIA, PA.

BRANCHES

NEW YORK CITY, N. Y., J. ALEX MAYERS, 11 Cliff Street SAN FRANCISCO, CAL., RALPH R. LANDES, 1508 Hobart Building
NILES, MICH., T. L. HILES, Fort and Hasting Streets

Products.

SELAS INDUSTRIAL GAS HEATING SYSTEM.



Requisites for Efficient Industrial Gas Utilization.

In burning any gas for maximum heating value, air and gas must be mixed in accurate proportions. The application of heat in industrial work may be such as to require maximum heat irrespective of temperature regulation or a specified degree of heat with exact regulation of temperature.

To secure maximum results in either case, gas installations must be capable of burning every particle of gas completely without excess oxygen. This involves a perfect control over mixing of gas and air, an absolute control of flow of mixture and proper placement of burners with respect to combustion zone to obtain maximum thermal value.

How Selas Gas Efficiency System Meets These Demands.

The Selas system not only meets these demands, but serves as a basis for improvements in the application of gas fuel. It is a one-pipe system in which the principles underlying combustion of gas are thoroughly considered. A fixed ratio of a partial mixture of gas and air (which is not explosive) is made at the mixing and compressing apparatus. At each burner, additional air supply is graduated to meet local conditions by inducing air at Selas burners, injector and nozzle. Temperatures up to 2800° Fahr. are secured and if gas mixture should fire back, ignition stops at nozzle, removing all danger of explosion. No air or gas is stored

in tanks and no fire-checks or explosion reliefs are required.

Volume of gas delivered is automatically controlled by pressure governor. Every position of burner valve is followed by a definite flame condition, thus insuring absolute temperature control.

Selas Apparatus.

The Selas apparatus consists of four parts: reducing valve for lowering pressure of gas in supply mains; mixing chamber, where definite volumes of gas and air are thoroughly mixed; compressor, which raises pressure of mixture of the "system pressure" required; governor, controlling delivery pressure and flow.

Selas machines will run continuously for 24 hours a day for years without a breakdown, and require but little attention. Adapted for use in any industry where gas is used as a medium, and will work equally well on city, natural or manufactured gas.

Advantages—Any difficulty in obtaining correct proportions of air and gas with reference to inconstant quality of each can be overcome by resetting adjustments provided in mixing chamber. Combustion does not change with variation of amount of gas burned at any burner. Automatic control of flow is possible through handling of a single valve for a given furnace. Oxidizing or reducing flames may be secured at will by installation of proper burners. These fourfold economies make it possible to heat a given quantity of material with less gas and speed up production. Less material is spoiled and quality is improved. Tests on our installations as compared to other systems prove these economies. This data is at your disposal. Write for it.

Sizes—Selas machines are furnished from regular stock sizes—350 to 10,000 cu. ft. of gas per hour.

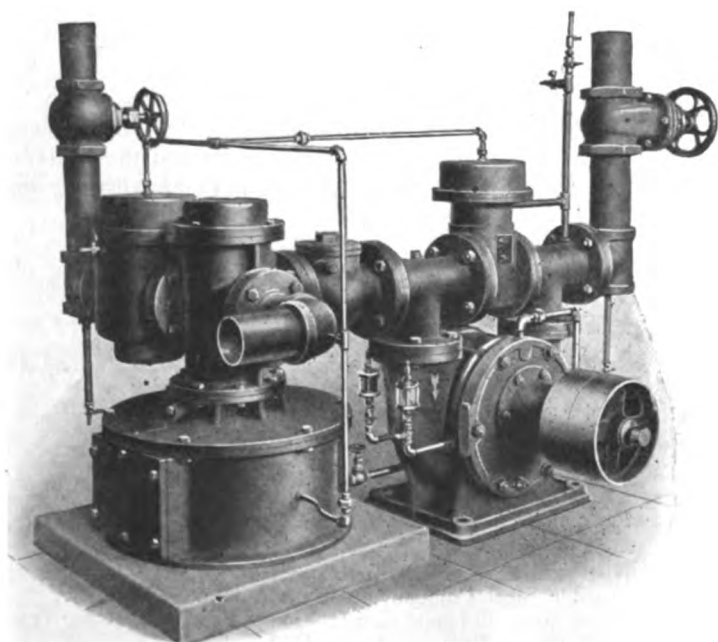
Special units up to 50,000 cu. ft. per hour.

A Few Installations of the Selas System.

Hoover Steel Ball Co., Ann Arbor, Mich.
National Twist Drill & Tool Co., Detroit, Mich.
Motor Products Corp., Detroit, Mich.
Buick Motor Co., Flint, Mich.
Remington Arms & Ammunition Co., Hoboken, N. J.
Willys-Overland Co., Toledo, Ohio
Sun Shipbuilding Co., Chester, Pa.
Borgenicht & Sons Co., Inc., New York, N. Y.
Postum Cereal Co., Battle Creek, Mich.

Engineering Service and Surveys.

Expert engineering service by Gellert Engineering Co. is an integral part of the Selas system. Our experts will make survey and submit estimates. After survey is made, we can show how savings and economies can be effected by using the Selas system. We aim to give high grade service. Inquiries are solicited and will receive prompt and careful attention.



SELAS GAS MACHINE

THE ANTHONY COMPANY

Liquid Fuel Engineers

138, West Avenue
LONG ISLAND CITY, N. Y.

Products.

ANTHONY NEBULYTE OIL BURNERS.

ANTHONY NEBULYTE FORGES and FURNACES.

ANTHONY NEBULYTE OIL SPRAYS for gas plants and SPRAYS for all Liquids.

Also manufacturers of Anthony Nebulyte Gas Burners, Combination Oil and Gas Burners, Torches and Anthony Nebulyte Oil and Gas Burning Equipment for all Industrial Heating Processes.

Engineering Service.

THE ANTHONY COMPANY is prepared to design new equipment, and re-design old equipment of any kind, enabling any one to avail himself of the advantages of oil or gas fuel, or both in combination.

The engineering staff is also prepared to discuss all heating problems, and design special oil or gas fired apparatus for specific needs.

Having designed a great variety of successful industrial heat treating systems, Anthony engineers have wide experience in this field to place at a client's disposal.

They are pioneers in the development of mechanical nebulization as applied to the combustion of liquid fuel, as well as in the application of those combustion principles which effect the accurate control of heat quality.

Employment of their services leads to conservation of fuel, speeding up of production, and better quality of output.

Anthony Nebulyte Burners and Torches.

These devices are applicable wherever forges, furnaces, stills, dryers, boilers, kilns or other apparatus

require heat. Low and high pressure designs to suit every requirement. A trial quickly proves their unequalled operating characteristics.

Anthony Fuel Equipment.

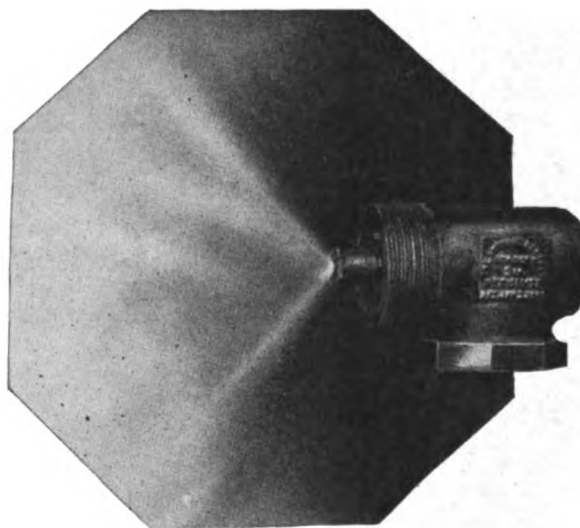
The continuous and successful operation of any fuel system depends on the use of correct equipment, installed and adjusted in accordance with established facts. Special equipment of approved type for every part of liquid and gas fuel systems supplied.

Anthony Nebulyte Forges and Heat Treating Furnaces.

These include rivet forges, crucible furnaces and a general line of heat treating furnaces built to take advantage of the superior operating characteristics of Nebulyte Burners. Simple, compact, sturdy, non-oxidizing. Low operating cost. Portable and stationary.

Anthony Nebulyte Sprays for Gas Plants.

In the operation of gas plants, Nebulyte Sprays give perfect nebulization, positive control and uniform distribution of oil. No steam or compressed air required.



THE ANTHONY NEBULYTE SPRAY
Note the mist of liquid

Anthony Nebulyte Sprays for All Purposes.

Sprays supplied of definite capacity and throw which can be utilized for many purposes, such as: cooling, aerating, atomizing, gasifying, mixing, absorbing gases and vapor, and for all purposes where it is desired to distribute a liquid in finely divided form over a large area, or through a large volume.

HAMMEL OIL BURNING EQUIPMENT CO., INC.

FACTORY AND MAIN OFFICE

PROVIDENCE, R. I.

NEW YORK, N. Y.

BOSTON, MASS.

LOS ANGELES, CAL., HAMMEL OIL BURNER CO.

PITTSBURGH, PA., ROSS MECHANICAL SUPPLY CO.

PHILADELPHIA, PA., JAMES S. MERRITT

Products.

HAMMEL OIL BURNERS; HAMMEL PATENT OIL BURNING FURNACES; OIL PUMPING SETS.

Also manufacturers of Hammel Special Designed Oil Burning Furnaces; Hammel Oil Firing Valves; Automatic Pump Governors; Self-cleaning Oil Strainers; Fuel Oil Heaters; Oil Burner Governors and Draft Gages.

Hammel Oil Burners.

The Hammel oil burner is of the inside mixer type and built upon scientific principles. The features which distinguish the Hammel as an ideal oil burner are that, in normal service, it will not carbonize; parts subject to wear, due to grit in oil, can be renewed in five minutes at a cost of a few cents; heavy Mexican oil is burned with perfect results.

Advantages of Hammel Oil Burners.

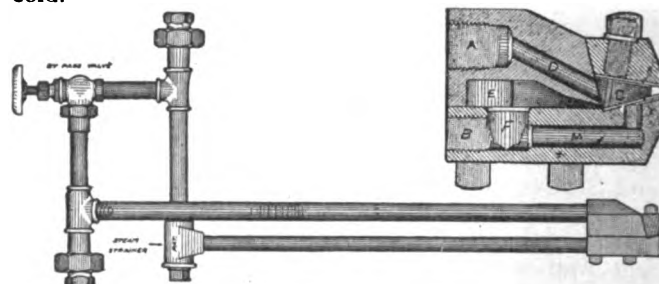
Higher Efficiency—Due to more perfect combustion and better heat distribution.

Reduced Costs of Fuel Handling and Maintenance—No expensive conveying or elevating systems

are necessary. Firing tools and grate bars are eliminated.

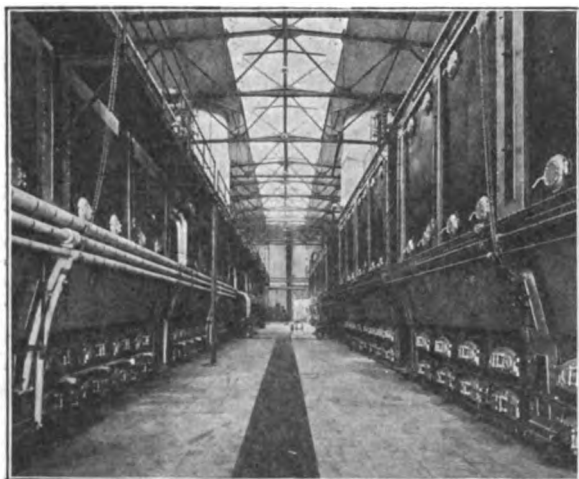
Increased Boiler Capacity—Converting from coal to fuel oil means increased capacity of from 10% to 75%, generally 40% to 60%.

Absence of Smoke—Smoke entirely eliminated except for short periods while burners are started up from cold.



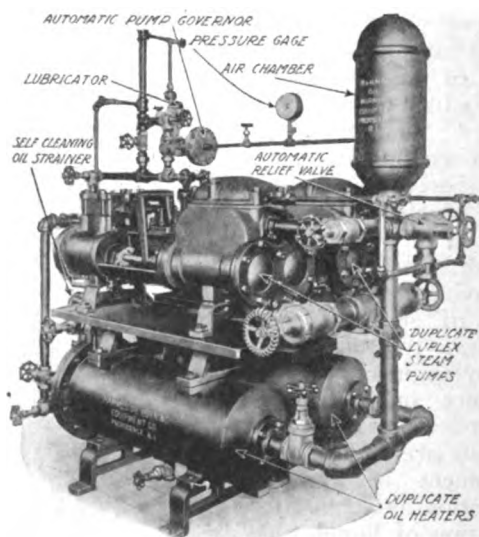
HAMMEL OIL BURNER SHOWING SECTIONAL VIEW OF MIXING CHAMBER

A—oil inlet; B—steam inlet; C—mixing or atomizing chamber; D—oil inlet duct; E—equalizing steam chamber; F—steam entrance; K—removable steel plates; M—outlet for condensation; N—outlet for duct M



BOILER PLANT OF A LARGE PUBLIC SERVICE CORPORATION, EQUIPPED WITH HAMMEL BURNERS AND FURNACES

This is the largest oil-burning plant in the world. Consists of sixteen 707 h. p. and sixteen 808 h. p. Stirling water tube boilers. 300 kw. hours are delivered to switchboard for each barrel of oil burned



HAMMEL DUPLICATE DOUBLE HEATER OIL PUMPING SET

TESTS ON B. & W. BOILER EQUIPPED WITH HAMMEL PATENT FURNACES AND BURNERS
BY A LARGE PUBLIC SERVICE CORPORATION

Date	Duration of test, hours	Steam pressure, lbs.	Steam temperature, deg. Fahr.	Superheat, deg. Fahr.	Factor of evaporation	Feed water temperature, deg. Fahr.	Temperature of flue gases, deg. Fahr.	Draft under damper, in. water	Draft in furnace, in. water	CO ₂ , %	Steam used by burners, %	Kind of oil	Gravity of oil, deg. Be.	Heat value of oil, B.t.u.	Horsepower of boiler	Boiler horsepower developed	Building rating, %	Water evap. per lb. of oil burned—actual	Water evap. per lb. of oil—P. & A., 212° Fahr.	Comb. boiler and furnace efficiency, %
June 22	7	151.9	466.5	99.7	1.105	212	474	.140	.040	13.2	1.83	Okla. fuel	25.9	19322	600	734	122	14.48	16.00	81.8
" 23	9	149.9	467.5	101.7	1.105	212	480	.152	.045	14.4	1.94	"	26.0	19326	600	843	160	14.63	16.19	82.8
" 24	8	147.4	451.8	87.2	1.102	206	431	.055	.030	13.6	1.95	"	25.9	19364	600	624	104	14.46	15.94	81.7
" 25	8	148.5	446.7	81.6	1.113	188	426	.035	.020	14.3	2.03	"	25.9	19276	600	619	103	14.53	16.27	83.6
" 27	9	161.3	496.5	125.7	1.124	209	507	.460	.200	14.4	1.97	"	26.3	19280	600	1076	179	14.04	15.79	80.9
" 29	9	159.6	490.2	119.7	1.116	212	508	.410	.210	13.8	1.99	"	25.9	19270	600	989	165	14.04	15.68	80.5
July 2	9	151.1	452.7	86.3	1.122	188	415	.033	.020	14.4	2.30	"	26.0	19179	600	629	105	14.02	15.75	81.7
" 3	8	154.9	464.5	97.3	1.124	192	477	.157	.070	14.0	1.91	"	26.1	19267	600	796	133	13.59	15.29	78.6
" 22	9	145.4	428.8	65.2	1.114	183	357	.090	.066	13.4	1.97	Okla. crude	30.3	19580	600	550	91	14.73	16.43	81.4
" 23	8	145.4	417.1	45.1	1.108	180	283	.080	.120	12.3	1.96	"	30.1	19380	600	332	55	14.67	16.27	81.5
" 24	8	145.4	417.1	45.1	1.109	183	282	.045	.085	11.8	1.96	"	30.2	19310	600	332	55	14.64	16.23	81.6
" 25	9	145.5	427.5	63.8	1.113	183	374	.070	.090	13.4	1.95	"	30.3	19297	600	474	74	14.60	16.26	81.8
" 27	6	148.0	435.2	70.3	1.119	182	386	.066	.065	14.1	1.95	"	30.1	19360	600	673	112	14.61	16.35	81.9
" 28	6	148.2	434.4	69.3	1.113	185	403	.050	.054	14.4	1.84	"	30.2	19360	600	655	108	14.64	16.31	82.3
" 29	11	149.4	438.5	72.9	1.124	178	412	.057	.064	14.4	1.83	"	30.4	19480	600	637	106	13.88	15.61	77.7
" 31	9	210.0	472.3	80.2	1.128	187	496	.300	.160	14.2	2.00	"	30.3	19479	600	959	160	14.20	16.02	79.8

LANCASTER IRON WORKS, INC.

MIRCS FURNACE DEPARTMENT

Heat Treating Furnaces

MAIN OFFICE AND PLANT
552 South Prince Street
LANCASTER, PA.

NEW YORK SALES OFFICE, 501 Fifth Avenue

Products.

HEAT TREATING FURNACES for various purposes, including Annealing, Billet Heating and Forging, and Plate and Angle Heating; Core Ovens. Furnaces are made in various types: Over, Under, or Side Fired, with Oil, Gas (Natural or Artificial), or Coke Fuel.

FUEL OIL BURNERS.

Services.

Mircs has an unusually efficient engineering corps, devoted exclusively to designing, building, and installing heat treating furnaces for every purpose.

Our engineers are ready to consult with you at any time, submitting recommendations and specifications as to the particular type of furnace and fuel to best serve individual requirements.

Mircs will also handle all foundation and supplementary work, including tanks, pumps, blowers, heating, piping, etc. Mircs will install heat treating furnaces and equipment ready for complete operation.

Mircs Heat Treating Furnaces.

Mircs furnaces installed 10 years ago are still in continuous operation and are still giving absolute satisfaction. This cumulative experience is part of every Mircs design and construction.

Mircs furnaces are either single or double end; single or double chamber. All iron and steel work is heavy and complete. The masonry is of solid construction and of the best materials.

The fuel consumption is low. A controllable uniformity of temperature produces the most desirable results.

The maintenance cost is unusually low. No chimney is required except for coal burning furnaces.

Where materials are adaptable to such a process, automatic and semiautomatic furnaces are built for continuous operation.

Every Mircs furnace:

Will continuously maintain a uniform and definitely controllable temperature whether for hours or for days.

Will afford perfect combustion.

Will give maximum efficiency through long and constant—or intermittent—service.

Will give economy of operation at the least expenditure of labor and fuel.

Is first designed and then built for its particular purpose.

Mircs Universal Burner (Patented Nov. 23, 1915).

Several years ago our engineers perfected a burner so flexible that it can be used for any kind of work. It has equal facility whether it is merely a question of generating large quantities of heat, or whether it must be used under conditions which require an exacting temperature control.

It will handle any grade of commercial fuel oil, with air used as the breaking-up agent, as well as supporting combustion with the air pressure at from 12 or 16 ozs. to as high as 6 lbs. per sq. in.

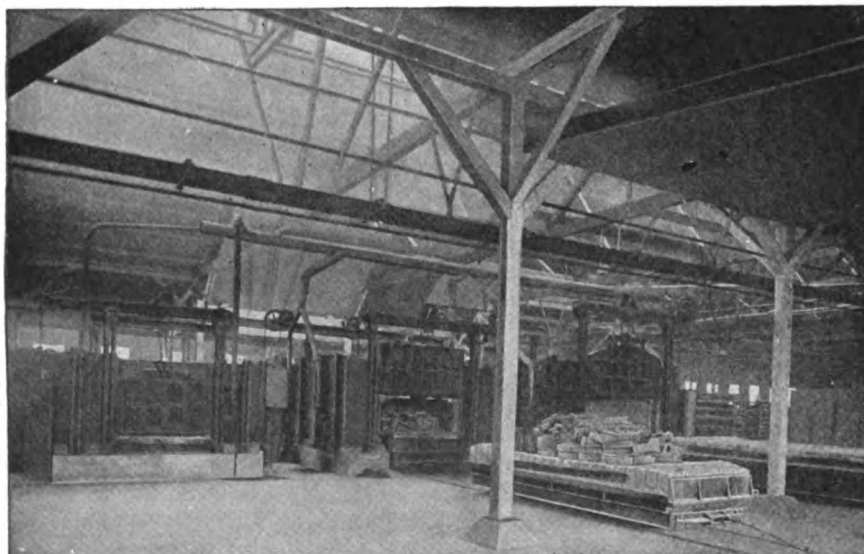
The first Mircs burners made are still in operation and are giving entire satisfaction.

Guarantee.

All Mircs products carry a year's guarantee as regards materials and construction. Properly handled they work with unfailing accuracy.

Bulletins.

Mircs Furnace Bulletin and Mircs Burner Bulletin sent on request.



AN INSTALLATION OF MIRCS FURNACES

AMERICAN GAS FURNACE CO.

Specialists in the Use of Gas for Mechanical Heating Processes

OFFICE AND FACTORIES

ELIZABETH, N. J.

Products and Services.

GAS FURNACES and HEATING MACHINES; BLOW-PIPE BURNERS; AUTOMATIC HEAT CONTROLLERS; CARBONIZING MACHINES; PRESSURE BLOWERS; COMPLETE EQUIPMENT for MECHANICAL HEATING PROCESSES, using Gas as Fuel.

GAS ENGINEERS.

Scope of Use.

These products are applicable to all heat treating processes requiring precision.

Gas as Fuel.

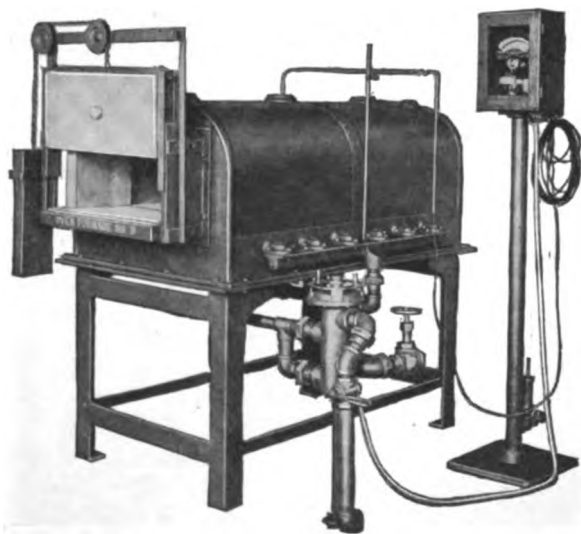
After an experience of over 35 years in utilizing gas in mechanical heating processes and operations, we find no fuel possesses so high a degree of efficiency. A positive air blast inducts the gas which is injected into combustion chamber—a properly proportioned mixture of both, *under absolute control*.

Gas has been proved the best and also the cheapest fuel, when measured by net results.

Automatic Heat Controller.

Gas blast furnaces operated with this heat controller will not vary more than 10° Fahr. from any temperature to which instrument is set.

Controller consists of 2 parts: (1) pyrometer arranged so that dial pointer movement indicates and controls temperature; (2) pneumatic valve attached to furnace, operated by same air pressure as supplied to furnace for combustion and *admitting both gas and air* in correct proportion to maintain temperature required, thus effecting a considerable saving of gas as well as maintenance cost, and assuring uniform results.



HEAT CONTROLLER, CONNECTED TO OVEN FURNACE

A Case Hardening Plant.

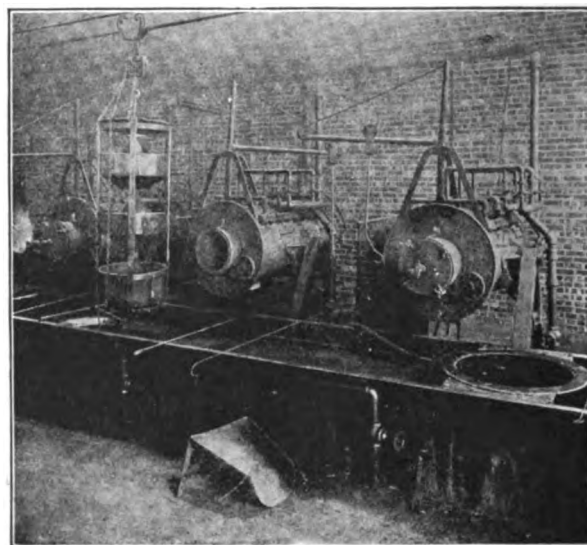
In case hardening, first operation is to *carbonize* exterior of work so it can be hardened; second, the hardening process. Plant consists, therefore, of a carboniz-

ing machine, reheating machine or furnace, placed according to available space, and quenching tank.

New Process Carbonizing—By this new process of carbonizing the surface of wrought iron or low carbon steel is converted into high carbon steel to any practical depth required for case hardening the exterior uniformly and leaving a soft core.

In this machine the work is packed in gaseous instead of solid carbon. With this process, city or natural gas is the carbonizing agent.

The machine is built in different sizes and, when necessary, proper fixtures can be supplied for holding the work firmly in the retort while rotating, to prevent it from becoming marred or bruised. Quotations on request. State conditions and requirements fully.



NEW PROCESS CARBONIZING MACHINES

Carbonizing Process—Work contained in the evenly heated, slowly revolving cylindrical retort is constantly and uniformly exposed to a carbon-charged atmosphere under pressure, and absorption of carbon begins as soon as work is sufficiently heated to attract it *without the use of old style solid carbons or packing in boxes*.

Gas Furnaces and Heating Machines.

Gas Blast Forges—Will develop required heat in a few minutes. Used in machineries for tool dressing and forging, drop forging, etc.

TYPES—Bench forges, for forging and hardening small tools or small pieces of metal; tool room forges, for drop forging, for heating blanks of various lengths, for hardening large lathe tools, for forging cutlery and for special work of many varieties, etc.

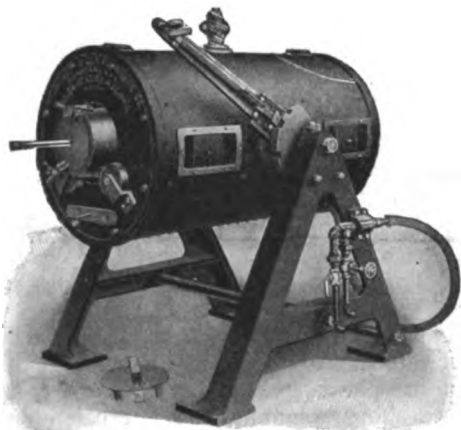
Oven Furnaces—For annealing and hardening; die hardening furnaces; case hardening furnaces.

Cylindrical Furnaces—For annealing, hardening and carbonizing.



FORGE FOR DRESSING TIRES

used to draw "spring temper" and for all work which must show a temper color—air being injected into heating chamber and heated to any required degree, then forced into working space under positive pressure. Where temperature exceeds 600° Fahr., hot air coloring and tempering machines made in various sizes to meet different requirements are recommended; also recommended for "carbonia" (or gun-metal) finish.

HEATING MACHINE NO. 51
For tempering and coloring steelwork

Melting Furnaces—For crucibles and cast iron pots. TYPES—Regular crucible, for melting gold, silver, copper, brass, nickel, also test melts of iron and steel.

LEAD HARDENING FURNACE
For hardening or tempering in lead

adjustable to different sizes.

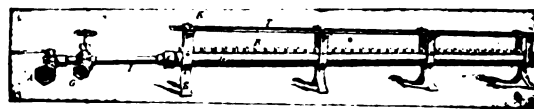
Gas Blast Radiators—For japanning or enameling ovens. Illustration shows burner for japanning ovens, core ovens, drying kilns or heating of any enclosed cubic space which may be specified; radiator used exclusively

TYPES—Round annealers, for wire and light stock, coiled; circular, for heating large rims, rings, disks, dies and other circular steel blocks; for hardening rolls, shafts, long blades, etc. Made in various sizes.

Tempering Machines—For drawing temper after hardening.

TYPES—Oil tempering, designed to heat oil or tallow not exceeding 600° Fahr., and to control temperature so as to draw any desired temper required in dies, cutters, punches, knives, shear blades, and other cutting tools; air tempering,

for work which does not emit fumes or gases liable to be ignited from open burners. Positive pressure of air is necessary. Enclosed burner for indirect heating also manufactured.



GAS BLAST RADIATOR NO. 3

Muffle Furnaces—For enameling and assaying. Muffles necessary only when work is such that products of combustion must be excluded from heating chamber containing the work, or when air draught through heating space is required. Muffles not necessary for metal work. Muffle enclosed by a fire-clay chamber. Burners project into combustion chamber horizontally from opposite sides and force flame into space surrounding muffle, causing its equal distribution.

Assay Cupelling Furnaces—For assaying, cupelling and scorifying—built on plan of our other muffle furnaces, with air draught through muffle.

Annealing Furnaces—For bars, rods, strips and pipe. Made to order, of any desired size.

Brazing Tables and Furnaces—Convenient forges for brazing joints in various positions. Blow-pipes pivoted and hinged so as to be easily adjusted to any desired angle or height. Rim brazing furnace, for brazing tires, rims and similar work.

Heating Machines—Furnaces provided with carrier devices for automatic transmission of work through uniformly heated space, for hardening, annealing, brazing and tempering uniform size work in quantities.

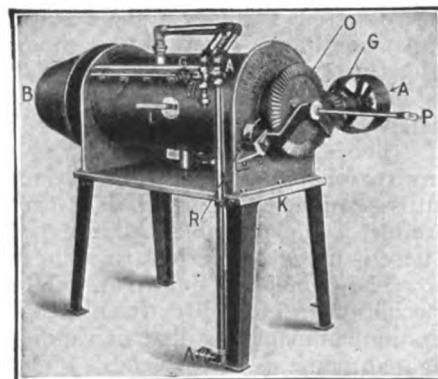
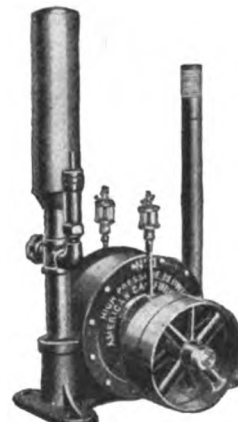
KIND OF WORK TREATED—Lock washers, bolts, springs, pens, cups, cones, ball bearings, etc., for hardening or annealing. Pencil ends, ferules, grease cups, cartridge shells, etc., for annealing.

Positive Pressure Blowers—Made in 7 different sizes. An air blast under an average pressure of 1 lb. to the sq. in. is indispensable for the operation of all American furnaces and heating appliances. Proper blast can best be applied by this type of blower.

Other Furnaces and Heating Machines—The AMERICAN GAS FURNACE CO. manufactures many other kinds of appliances to meet special requirements. Full particulars on application.

Fuel—All appliances can be used with natural, artificial or producer gas. Kind of gas must be specified when ordering.

When Ordering—State fully all conditions and requirements.

CONTINUOUS HEATING MACHINE
For hardening and annealing, work passing through a uniformly heated retort. Discharges automatically. Made in various sizes

POSITIVE PRESSURE BLOWER

PARKS-CRAMER COMPANY

General Agents for the Merrill Process of Industrial Heating

1102 Old South Building
BOSTON, MASS.

WORKS: FITCHBURG, MASS., AND CHARLOTTE, N. C.

Products.

MERRILL PROCESS OF INDUSTRIAL HEATING. (Patented Jan. 1, 1918, Sept. 3, 1918, and other patents pending and applied for.)

For Air Conditioning Equipment, see page 535.

Merrill Process.

This is an apparatus for supplying heat at high temperatures for industrial processes, and conforms to certain general requirements which may be briefly stated as follows:

The temperature range of the heating medium exceeds that of the material being heated, to insure a rapid transfer of heat. In other words, there is ample thermic head.

The apparatus is safe and durable. Damage from excessive pressure and danger from explosions or fire hazard have been avoided.

The temperature and the rate of heat transfer are under quick and positive control at all times.

A special, non-explosive fluid, mechanically circulated, passes through a scientifically constructed heat absorber. Thence it is delivered through pipes to the apparatus to be heated—jacketed kettles, oven coils, stills, tanks, etc. After delivering a certain predetermined portion of its heat, the circulating fluid returns through the pump to the absorber for re-heating. The entire system is under a slight static pressure from an expansion tank, open to the atmosphere. The only added pressure, rarely exceeding 5 lbs., is that required to maintain circulation against internal frictional resistance.

The absorber and fuel supply may be located at any reasonable distance from the manufacturing apparatus—completely isolated in a fireproof room if the product is inflammable. All fire risk is thus avoided. There is no explosion hazard from the circulating fluid.

The circulating fluid is of the first importance. A special mineral fluid free from carbon is used; also free from inflammable distillate or vapor pressure. Its copyrighted name is Meproline. It has a safe working temperature of 600° Fahr. With dry saturated steam, a pressure of 232 lbs. per sq. in. is reached at only 400° Fahr. Superheating may carry this temperature higher, but is of little use for industrial heating on account of its low specific heat and its inefficiency due to the loss of the latent heat of vaporization.

Meproline will stand most severe flash and fire tests. It withstands high temperatures for indefinite periods. It does not carbonize, distill or "crack." It is made especially for the Merrill Process and is sold only for it.

Absorber.

Peculiar requirements for transferring heat, not found in other engineering construction, necessitated long experimenting and careful design. The absorber coil rests on a Dutch oven furnace especially designed for

the type of fuel used. Expansion strains and radiation losses are amply provided for. Insulated clean-out doors provide proper accessibility. The low pressure fuel oil burners prolong the life of furnace linings.

The absorber coil is a series of tube elements expanded into nested return elbow units. Compact in construction, efficient in distribution of heating surface, easy of examination and repair.



A 600,000 B.T.U. PER HOUR ABSORBER COIL

Circulating Plant.

Proper design of the circulating plant is of vital importance. The pump must circulate, without pulsation, a material which when cold is extremely viscous, and when hot is more fluid than water and more difficult to confine. Ample safety devices are installed to protect all parts of the system against unintelligent operation.

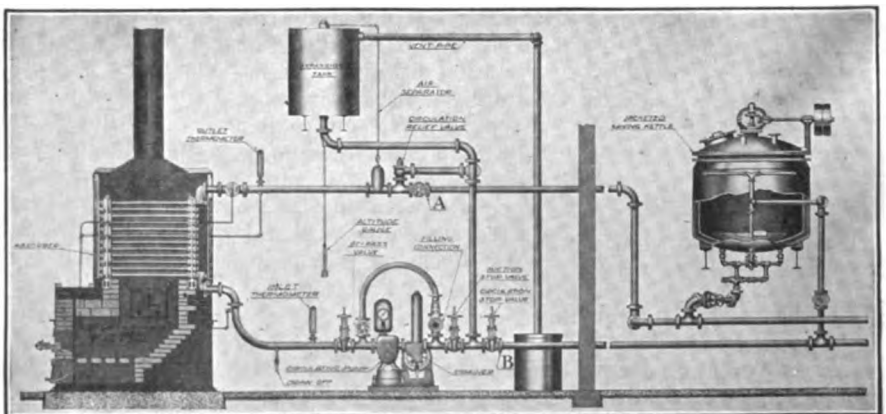
Applications.

The Merrill Process began in the asphalt-using industries six years ago. Its early apparatus, relating to road construction, is still in use. The system as now developed, however, is applicable to the following industries:

Chemical plants, rubber works, asphalt melting and coating plants, melting and refining works, oven heating, japanning plants, paper coating mills, canning factories, shoe shops, plants using hot calender rolls or presses, varnish, paint and shellac works.

Each case is a separate engineering problem. On request, preliminary data sheets will be furnished, from which tentative estimates may often be submitted. These must invariably be checked later by a personal inspection of local conditions before a definite contract price can be quoted. Parks-Cramer engineers are always available for consultation.

Installations require specially trained mechanics, hence must invariably be made by the construction force of this company.



TYPICAL MERRILL PROCESS SYSTEM CONNECTED TO A LARGE JACKETED KETTLE

THE BURTON ENGINEERING & MACHINERY CO.

Manufacturers of Narrow Gauge Locomotives

CINCINNATI, OHIO

SALES REPRESENTATIVES: THE LAKEWOOD ENGINEERING Co., CLEVELAND, OHIO

DISTRICT OFFICES

ATLANTA, GA., 90½ North Forsyth Street
BOSTON, MASS., 453 Washington Street
BUFFALO, N. Y., 256 Main Street
CHICAGO, ILL., Lumber Exchange Building
CLEVELAND, OHIO, Racine Building
DALLAS, TEX., Sumpter Building
DES MOINES, IOWA, Hubbell Building
DETROIT, MICH., David Whitney Building
KANSAS CITY, MO., Railway Exchange Building

MEMPHIS, TENN., Central Bank Building
MILWAUKEE, WIS., Milwaukee Athletic Club Building
MINNEAPOLIS, MINN., 529 Second Avenue, South
NEW YORK, N. Y., 141 Centre Street
PHILADELPHIA, PA., Widener Building
PITTSBURGH, PA., Union Arcade
RICHMOND, VA., Times-Dispatch Building
ST. LOUIS, MO., Railway Exchange Building
SAN FRANCISCO, CAL., Rialto Building

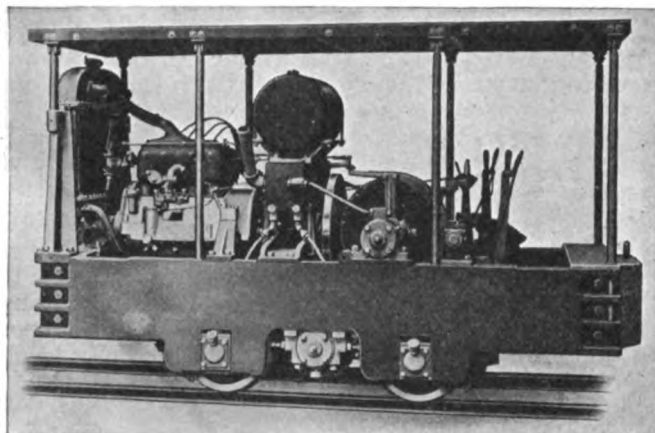
Product.

The BURTON LOCOMOTIVE, for Gasoline or Kerosene.

Application.

For narrow gauge railway haulage in every industry, in highway and general building construction, quarries, plantations, logging, brick and clay plants, sand and gravel pits, and all industrial plants.

The Burton locomotive combines simplicity of construction, flexibility of operation, and economical performance. Briefly, it consists of a power plant mounted on a rigid cast frame, carried on four flanged wheels set to a short wheel base. Power is transmitted to track



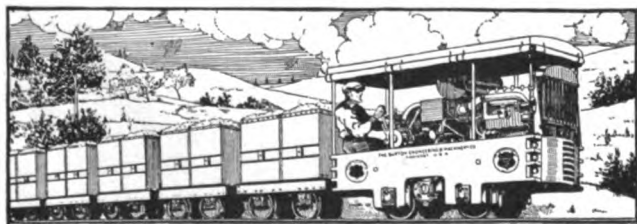
BURTON 3 1/2-TON LOCOMOTIVE

wheels by friction disc and roller chains, eliminating spur and bevelled gears, friction clutches, and other complicated parts. Operates in either direction at equal speeds and with equal efficiency. Speeds 2½ to 10 miles per hour.

Other features are: magneto ignition, radiator cooling system, fuel tanks of ample capacity, sand box, link and pin couplers adjustable to various heights.

Brakes applied to all four wheels, controlled by lever, lock wheels instantly in case of emergency.

Winding drum is furnished, when desired.



BURTON 6-TON LOCOMOTIVE HAULING TRAIN OF BATCH BOX CARS ON ROAD PAVING JOB

Specifications.

Burton 3 1/2-ton Locomotive—

Size of motor—3½ x 5, 4-cylinder.
Horsepower—35.
Magneto—Bosch high tension.
Carburetor—Zenith L 4 automatic.
Generator—Dyneto 6-volt.
Starting motor—Dyneto 6-volt.
Battery—U. S.
Steel wheels—18-in. diam. x 4-in. face x 2½ in. bore.
Sprockets—14T and 34T, ¾-in. roller, 1¼-in. pitch.
Chain—¾-in. roller, 1¼-in. pitch.
Axle bearings—No. 49660 Hyatt standard.
Jack and friction shaft bearings—No. 17132 high duty Hyatt.
Transmission bearings—No. 6452-6420 Timken taper.
Radiator—16-gal. capacity.
Axle diameter—3¼ in.
Jack shaft diameter—3¼ in.
Friction shaft diameter—3¼ in.
Diameter friction disc plates—23 in.
Diameter tarred fiber filler—22 in.
Wheel base—39 in.
Draw bar pull at 5 miles per hour—1400 lbs.
Fuel tank capacity—20 gals.

OVER ALL DIMENSIONS

Gauge	Width	Length	Height
18" and 24"	4' 0"	10' 5"	6' 2"
30"	4' 6"	10' 5"	6' 2"
36" and 42"	5' 6"	10' 5"	6' 2"
4' 8 1/4"	5' 2 1/4"	10' 5"	6' 2"

Burton 6-ton Locomotive—

Size of motor—4½ x 6, 4-cylinder.
Horsepower—54.
Magneto—Bosch high tension.
Carburetor—Zenith L 5 automatic.
Generator—Dyneto 6-volt.
Starting motor—Dyneto 6-volt.
Battery—U. S.
Steel wheels—18-in. diam. x 4-in. face, x 3¼-in. bore.
Sprockets—12T, 22T and 33T, 1-in. roller, 1¼-in. pitch.
Chain—1-in. roller, 1¼-in. pitch.
Axle bearings—No. 49740 Hyatt standard.
Jack and friction shaft bearings—No. 17136 high duty Hyatt.
Transmission bearings—No. 552-559 Timken taper.
Radiator—20-gal. capacity.
Axle diameter—3½-in.
Jack shaft diameter—3½ in.
Friction shaft diameter—3¼ in.
Diameter friction disc plates—28½ in.
Diameter tarred fiber filler—28½ in.
Wheel base—46¼ in.
Draw bar pull at 5 miles per hour—2400 lbs.
Fuel tank capacity—20 gals.

OVER ALL DIMENSIONS

Gauge	Width	Length	Height
18" and 24"	4' 7"	12' 5 1/2"	6' 3 1/2"
30"	4' 7"	12' 5 1/2"	6' 3 1/2"
36" and 42"	5' 7"	12' 5 1/2"	6' 3 1/2"
4' 8 1/4"	5' 2 1/4"	12' 5 1/2"	6' 3 1/2"

THE FATE-ROOT-HEATH CO.

Manufacturers of "Plymouth" Gasoline Locomotives

PLYMOUTH, OHIO

Product.

"PLYMOUTH" GASOLINE LOCOMOTIVES.

Construction.

"Plymouth" locomotives are built in different sizes, of one general type, but with variations suitable for various kinds of work and different conditions, for light or industrial haulage or up to 100 tons, depending upon grades and curves encountered.

They are driven by internal combustion gasoline engines, the power being transmitted to the drive wheels by means of the "Plymouth" friction drive.

They are the simplest, most substantial, practical and economical locomotives for industrial haulage of all kinds.

Splendidly adapted for factory yard haulage; lumber and logging operations; contracting and construction work; road building; concrete placing; stone quarries; sand pits; plantations; surface or underground mining, etc.

They have been demonstrated as a commercial success by the experience of the largest firms in all lines of business.

Special Advantages.

Low purchase, operating and maintenance cost.

Only one man and no licensed engineer required.

No gears, clutch or differential to cause trouble.

Extreme accessibility of parts for cleaning and adjusting.

The same speeds and the same power either backward or forward.

No danger from sparks or trouble from smoke.

All parts standard and interchangeable, and immediate shipment given orders for spare parts or accessories from our own stock.

Special Feature.

Can be furnished for any track gage from 18 to 56½ in.

Equipped with self-starting and lighting system, or carbide gas lights.

The "Plymouth" driving system provides a slower and easier starting speed than any other form of transmission.

Any size can be equipped with a winch or winding drum, operating from the power of the engine, for pulling at right angles to the track, or from pits or holes where it would not be desirable to take the locomotive.

Economy and Satisfaction.

"Plymouth" gasoline locomotives have been found cheaper and more generally satisfactory for use where steam locomotives could be used burning coal found on the property.

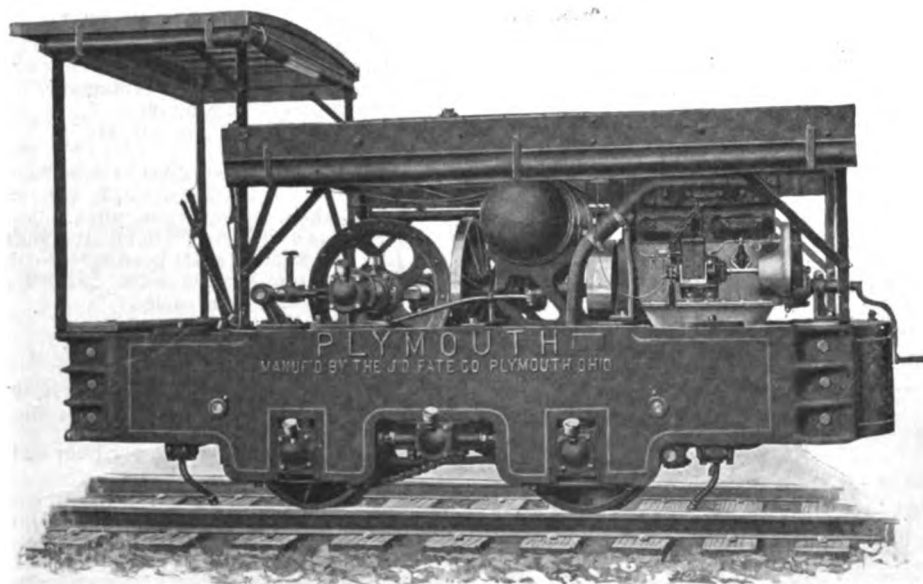
Have been found cheaper and more generally satisfactory by large electric power plants, than electrical outfits using their own current for bringing in coal and taking out ashes.

Have been found cheaper and more generally satisfactory by seasoned contractors and construction men for work that they previously thought could be done only by steam outfits or automobile trucks.

Have been found to replace 8 to 16 men and animals, or 6 to 8 automobile trucks on many jobs, and with a decided saving in first cost and maintenance cost besides.

Literature.

Complete detailed information and interesting literature showing what the largest firms in all lines of business have accomplished with "Plymouths" will be gladly furnished on request.



MODEL AL 3-TON "PLYMOUTH" GASOLINE LOCOMOTIVE WITH CURTAINS ROLLED UP TO SHOW SIMPLE AND OPEN CONSTRUCTION

GOODMAN MANUFACTURING COMPANY

Electric Locomotives for Industrial Service, Switching and General Haulage

48th to 49th Street on Halsted

CHICAGO, ILL.

BRANCH OFFICES

NEW YORK, N. Y., 511 Fifth Avenue
PITTSBURGH, PA., Farmers Bank Building
BIRMINGHAM, ALA., GENERAL MACHINERY Co., Brown-Marx Building
DENVER, COLO., LINDROOTH, SHUBART & Co., Boston Building

CHARLESTON, W. VA., Union Building
CINCINNATI, OHIO, 317-321 Sycamore Street
ST. LOUIS, MO., Boatmen's Bank Building
SEATTLE, WASH., L. W. SHIRLEY, 512 First Avenue, South

Products.

ELECTRIC LOCOMOTIVES: Trolley Locomotives, Rack Rail Locomotives, Third Rail Locomotives, and Storage Battery Locomotives.

Also Combinations of the above, Standard or Narrow Gages.

Uses—A Type and Size for Every Service.

Lumber Yards—Replacing horse drawn wagons.
Creosoting Plants—To and from treatment tanks.
Tile and Terra Cotta Plants—Handling materials and products.

Brickyards—Pushing cars through dryer tunnels.

Clay Pits—Clay from pit to pulverizer.

Stone Quarries—Rock from ledge to crusher.

Logging Camps—Big timber from stump to mill.

Smelters—Ore and fuel to furnaces.

Steel Mills—Coke, hot metal, billets and ingots.

Coke Ovens—Charging lorries and coke cars.

Shipyards—Hauling shapes and forms.

Cement Plants—Materials, fuel and product.

Sugar Plantations—Cane from field to mill.

Powder Mills—Locomotives with enclosed electrical parts.

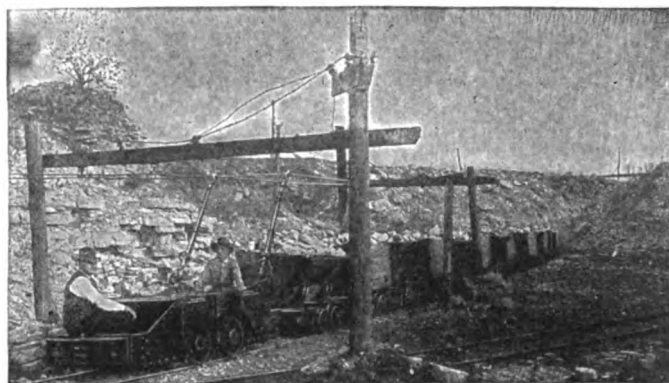
Oil Refineries—Locomotives with enclosed electrical parts.

Industrial Plants—Car handling for all classes of work.

Heavy Grades—Rack Rail "Hill Climbers."

Service and Experience.

As builders of electric locomotives for the past thirty years, the GOODMAN MANUFACTURING COMPANY is well qualified to analyze conditions carefully and recommend for each situation the system and equipment best suited to the service requirements.



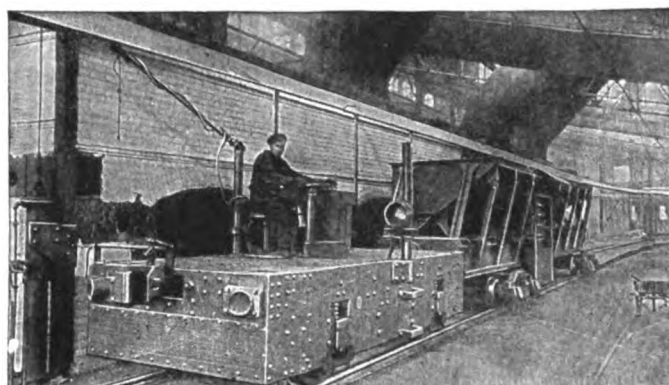
GOODMAN SINGLE-MOTOR LOCOMOTIVE HAULING CEMENT
ROCK FROM QUARRY



GOODMAN TEN-TON, TWO-MOTOR LOCOMOTIVE HAULING
FIRE CLAY



GOODMAN SINGLE-MOTOR LOCOMOTIVE HAULING DUMP
CARS OF ROCK ORE



GOODMAN STANDARD GAGE LOCOMOTIVE IN A NICKEL
SMELTER

THE CLEVELAND TRACTOR COMPANY

20000 Euclid Avenue
CLEVELAND, OHIO

DISTRICT OFFICES

ATLANTA, GA., 105 Luckie Street
OMAHA, NEBR., 2518 Farnam Avenue
MINNEAPOLIS, MINN., 623 Plymouth Building
OKLAHOMA CITY, OKLA., 515 West Main Street
SPOKANE, WASH., 30 East Sprague Avenue

CHICAGO, ILL., 2025 South Michigan Avenue
LOS ANGELES, CAL., 1029 South Grand Avenue
NEW YORK, N. Y., 225-27 West 57th Street
SAN FRANCISCO, CAL., 147 New Montgomery Street
MONTREAL, QUE., THE CLEVELAND TRACTOR CO. OF CANADA, LTD.

Products.

The CLETRAC TANK-TYPE TRACTOR.

Cletrac
TANK-TYPE TRACTOR
TRADE-MARK

Specifications and Rating.

Motor—4-cylinder 4-in. bore; 5½-in. stroke; protected overhead valves; removable cylinder head.

Ratings—Horsepower, 12 at drawbar, 20 at belt pulley; 1285 lbs. pull at 3½ miles per hour.

Speed—Normal, 3½ miles per hour; variable, from 1 to 4 miles per hour.

Dimensions—Length, 96 in.; width, 50 in.; height, 55 in.; clearance, 12 in.; center to center of tracks, 38 in.

Tractive Surface—Two continuous treads joined by hardened pins in rolling steel collars. Length of tractive contact, each side, 50 in.; width, 8 in.; total tractive surface, 800 sq. in.

Weight—Total, with fuel, 3455 lbs., about 4¼ lbs. per sq. in. of tractive surface.

Belt Pulley—Diameter, 8 in.; face, 6 in.

Ignition—High tension magneto with automatic impulse starter.

Gas Control—Fly ball governor to butterfly valve at point of intake, fully automatic.

Motor Lubrication—Splash to cam shaft; 3-way oil equalizer direct from oil pump to main crank shaft bearings.

Bearings—Heavy duty Timkin roller bearings in driving wheel, idler and lower track wheels, fully adjustable with special lock nut attachment.

Transmission—Sliding gears, one speed forward, one reverse, forward direct.

Steering—Accomplished by power of the motor through planetary compensating gears—tractor turns in radius of 6 ft.

Air Clarifier—Continuous type cleaner with auxiliary water air washer of special construction.

ways giving equal or greater power at a reduced cost in first investment, operation and upkeep.

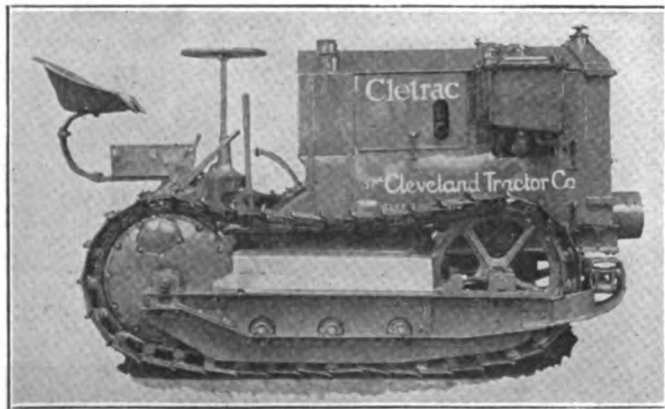
Hundreds of Cletracs are at work in foundries, machinshops, storage yards, warehouses and freight terminals, hauling heavy machinery, castings, loaded transfer buggies, scrap carts, dump wagons and spotting freight cars. The representative firms using them have cut their haulage costs materially.



CLETRAC HANDLES HEAVY LOAD ON GRADE

On Contracting and Engineering Jobs.

The Cletrac constitutes a part of the contractor's equipment of first importance because of its ability to do the work of horses or mules better, cheaper and quicker. And when the footing is rough, sandy or muddy the Cletrac replaces trucks which are so easily stalled or mired under adverse conditions.



CLETRAC TANK-TYPE TRACTOR

In Shops, Yards and Plants.

The Cletrac's value in the shop, yard or plant is the result of its great flexibility and wide working range. It is in a class by itself for rough hauling outside the plant, over loose fills, through mud, snow and slush—anywhere in fact that motive power is required. It will pull a load over footing that is impassable by any other means.

At the same time the Cletrac is just as adaptable to work within the plant. Its ease of control, short turning radius and compactness provide a ready and efficient substitute for electric tractors or small industrial rail-



CLETRAC IN GENERAL CONTRACTING OPERATION

On the basis of a day's work in moving materials the Cletrac will replace 6 to 8 horses or mules. At the same time it costs nothing when not in use, saving the expense of care and feeding during the days when animals would be weatherbound and useless. The savings, therefore, are derived from a greater amount of

work per day, more days of work—for the Cletrac is not stopped by mud, sand or snow—and a greatly reduced upkeep and labor expense.

Many contractors have also found the Cletrac invaluable as a means of keeping their "long-haul" motor truck equipment moving at the work end of the journey which is always rough, soft or muddy.

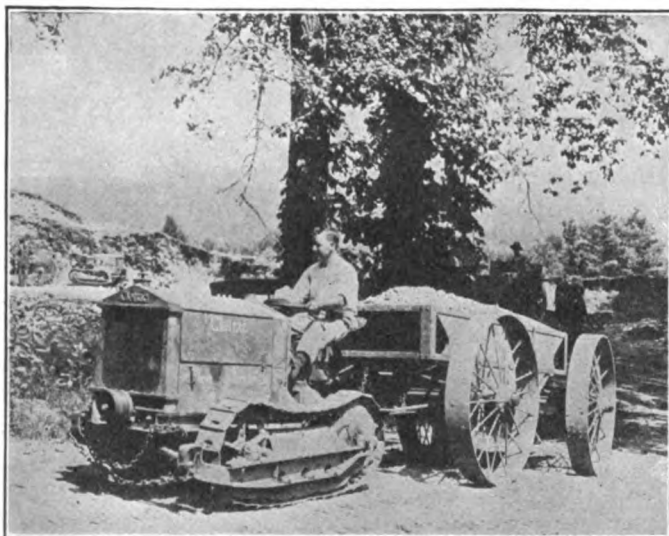
Road Building and Maintenance.

On road work above all other applications the Cletrac justifies its use in fleets of 2 to 6 tractors. It is successfully replacing horses on breaker plows, drags, slip and wheel scrapers, scarifiers and graders and for hauling heavy material and machinery from one place to another along the job.

Because of its broad metal tracks, which reduce the weight per square inch and prevent slipping, the Cletrac can be used over unfinished parts of the roads that horses or trucks could not pull through.

It does as much work with 1 man in a day as is ordinarily done by 3 men and 3 teams. The economies are self-evident—particularly the saving in labor and feed which must be carried as a dead loss when the horses or mules are idle.

Ease of operation, economy and flexibility make the Cletrac equally useful for the maintenance of roads already built. Hundreds are now owned by municipalities, townships and counties for this work.



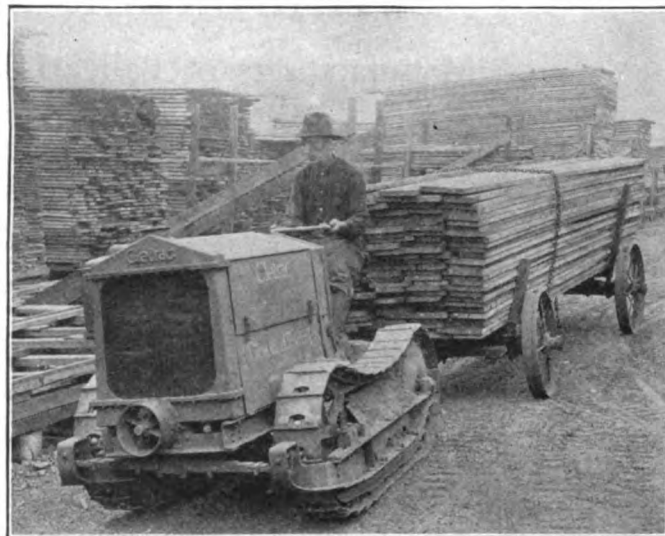
IDEAL POWER FOR ROAD WORK

In the Lumber Industry.

Replacing Teams and Drivers—A Virginia logger reports the Cletrac replacing 6 mules and 3 drivers. For a Mississippi owner it replaces 1 four-yoke ox team. An Ohio user says it does the work of 4 horses in most places. In Wisconsin a lumber company specializing in poles and ties have sold their 6 horses and now use 2 Cletracs instead. A Maine logger estimates the tractor will replace 6 horses. From Nova Scotia comes a statement that the tractor will replace 3 yoke of oxen or 4 1400-lb. horses.

Material Handled in a Day—The quantity of logs or lumber handled in a day by the Cletrac will of course vary greatly according to the operating conditions. In one location the tractor handles logs scaling 6600 ft. on a ¼-mile haul as an average day's work. In another it is moving from 9000 to 10,000 ft. per day. An Ohio furniture manufacturer reports 4000 ft. of logs as a day's work on a ½-mile haul. An eastern lumberman

states his tractor averages about 5000 ft. per day. A North Carolina lumber company states the Cletrac is hauling from 3500 to 9000 ft. of logs per day.



CLETRAC HAULING LUMBER

In the Oil Fields.

The Cletrac's ability to go almost anywhere and take a good big load along with it is its greatest recommendation to oil men everywhere.

Roads are not essential when you have a Cletrac for it carries and lays down its own broad, metal tracks across country, over rough grounds, up mountain trails or through soft, wet stream beds.

The Cletrac supplies a complete haulage service capable of taking heavy machinery from the railway to the lease and from one job to another by the most direct route.



CLETRAC IN OIL FIELD WORK

Transportation Advisory Service.

The Industrial Sales Department of THE CLEVELAND TRACTOR COMPANY has compiled and is constantly adding to a fund of facts and figures on haulage costs. These are taken from actual performance of the Cletrac under a wide range of conditions.

Shop men, yard managers, lumbermen, oil men and contractors are welcome, without cost or obligation, to any information that can be supplied. Address the Industrial Sales Department.

THE BAKER R & L COMPANY

Manufacturers of Baker Industrial Tractors and Trucks

MAIN OFFICE AND FACTORIES

CLEVELAND, OHIO

Products.

ELECTRIC TRACTORS and TRUCKS for inter-department, factory, and other phases of industrial transportation.

Adaptability.

Baker tractors and trucks are in efficient use in most of the factories of the leader-corporations of the country. Baker tractors and trucks wind their way down narrow aisles, turn the sharpest of corners, climb ramps and perform the widest variety of tasks. Whether the nature of the work requires a husky pull or rapid shifting of light loads, a 75% saving of the cost of material handling over the cost of hand truckage is not uncommon. Something like 60% of all sales are repeat orders from satisfied customers.

Design and Construction.

All parts are ruggedly constructed and meet the most severe usage. Every part has been especially developed for its particular service by engineers who have been building battery driven vehicles since the beginning of the industry.

Detailed specifications of the models here illustrated, and of other models gladly furnished on request.

Standardization of Parts.

On all models, 98% of all vital parts are identical and interchangeable. This reduces the cost of production, enabling the manufacturer to produce a superior machine at a comparable price. Maintenance costs are also reduced and the user is assured that repair parts—which are readily obtainable—will fit accurately.

Baker Industrial Tractor.

Rated drawbar pull, 400 lbs., starting drawbar pull, 1500 to 3000 lbs.; 2- or 4-wheel drive, 4-wheel steer. Speed 2 to 6 miles per hour. Will haul a trailing load of from 10 to 20 tons.



BAKER INDUSTRIAL TRACTOR

Baker 3-Wheel Tractor.

Rated drawbar pull, 300 lbs. Starting drawbar pull, 1800 lbs. Speed 1 to 6½ miles per hour. Trailing load from 7½ to 15 tons.



BAKER 3-WHEEL TRACTOR



Baker Swivel Hoist Truck.

Truck capacity, 4000 lbs. hoist capacity, 1000 or 1500 lbs. Both the truck and the hoist are electrically driven by separate motors.



BAKER SWIVEL HOIST TRUCK

Baker Jib Crane.

Capacity, 1500 lbs. Both boom and load hoists are separately controlled from the dash.



BAKER JIB CRANE

Baker Dump Body Truck.

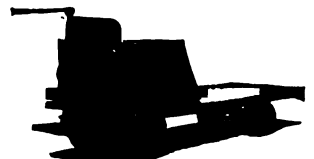
Capacity 27 or 40 cu. ft. Side or end dump. Truck is electrically driven.



BAKER DUMP BODY TRUCK

Baker Low Platform Truck.

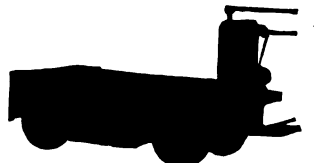
Capacity, 4000 lbs. Load carrying truck, electrically driven; 2-wheel drive, 4-wheel steer.



BAKER LOW PLATFORM TRUCK

Baker Utility Truck.

Capacity, 4000 lbs. Load carrying truck, electrically driven; 2-wheel drive, 4-wheel steer.



BAKER UTILITY TRUCK

Baker Elevating Truck.

Capacity, 4000 lbs. Load carrying truck of elevating platform type. Electrically driven 2-wheel drive, 4-wheel steer. An auxiliary electric motor elevates and lowers the load platform 4½ in. in 10 seconds.



BAKER ELEVATING TRUCK

THE ELWELL-PARKER ELECTRIC CO.

Electric Industrial Trucks and Tractors

4200 St. Clair Avenue

CLEVELAND, OHIO

OFFICES IN PRINCIPAL CITIES

Products.

ELECTRIC STORAGE BATTERY INDUSTRIAL TRUCKS of the Tractor, Elevating Platform or "Self-loading," Carrier, End Dump, Revolving Crane, Rocking Crane, Straight and Drop Frame Types, for rail or floor.

Applications.

Used inside buildings; in yards or across streets; on inclines, elevators, bridges, or through tunnels at steel, tin plate, paper, cotton, textile and lumber mills; clay working, salt, sugar, chemical, automobile, fertilizer, leather, rubber, glass and power plants; foundries, machineries; factories; hospitals; shipyards; warehouses, piers, railroad and marine passenger and freight terminals, for quick, economical inter-department transfer of materials. It matters little what the commodities are, electric trucks can be used to handle them at less expense—first cost, maintenance and adaptability to present manufacturing conditions considered.

Operation and Original Features.

Elwell-Parker trucks and tractors steer on all 4 wheels, and are 2- or 4-wheel drive. Edison or lead battery furnishes power to totally enclosed drum type controller and motor. Motor drives through single reduction free coasting worm gear to large diameter solid rubber tired wheels. Battery assembled in a box, may be charged in the truck or removed and charged, or exchanged for one already charged. Battery capacity sufficient for 15 to 20 miles operation, or the average day's work in a factory. Charge from 40-volt DC line in 7 hours at 40 to 60 amperes.

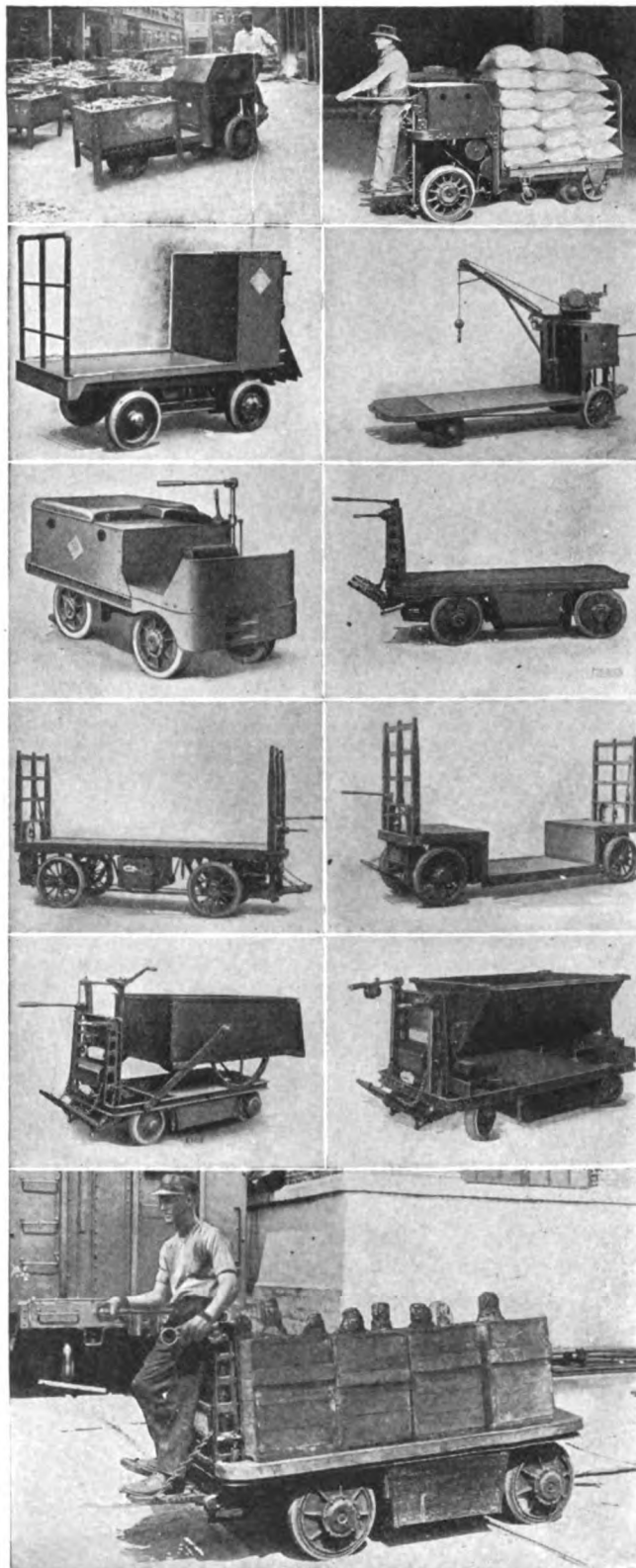
Patent interlocked control is so arranged that truck or tractor can not be started except when operator is standing on pedals or sitting in seat. This control makes a fuse unnecessary. Motor will take entire battery charge. Power may be applied with brakes partially set—important when starting on inclines. When operator steps from truck same will stop within its length.

Speeds 400 to 700 ft. per minute. Carrying capacity of trucks 4000 lbs. Draw bar pull of tractors 6 to 30 tons. Self-loading trucks will pick up 4000 lbs. in 10 seconds. Cranes lift 2000 lbs. at 28 in. over side of truck. Dump trucks with 36 cu. ft. end dump, and 40 cu. ft. side dump bodies. Platform heights range from 11 to 33 in.; lengths from 4 to 11 ft.; widths 2½ to 3½ ft.

Inquiries and Catalogue.

Always state kind and amount of material to be moved per hour, length of haul, percentage and length of inclines, and size and capacity of elevators.

Send for General Catalogue No. 9.



SOME TYPES OF ELWELL-PARKER ELECTRIC STORAGE BATTERY INDUSTRIAL TRUCKS

THE FAIRBANKS COMPANY

Trucks, Wheelbarrows, Cars and Dragscrapers

416 Broome Street
NEW YORK, N. Y.

For Branch Offices see Page 851

Products.

TRUCKS: Hand, Elevating, Platform, Electric Tractor, Load Carrier.

CARS: Coal Charging, Motor Operated Section.

WHEELBARROWS: Wood and steel in all types and sizes.

DRAWSRAPERS: With or without runners.

For Super-Diesel Oil Engines, see page 851; for Steel Factory Equipment, see page 1237.

The "Fairbanks O. K."

The "Fairbanks O. K." tag, a mark of merit, is attached to every Fairbanks product.



TRADE-MARK

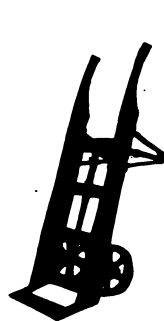
It protects the purchaser against faulty equipment and assures him of standard quality, fair prices and dependable after-service.

Fairbanks Trucks, Wheelbarrows, Cars and Dragscrapers.

This company carries in stock, ready for immediate delivery, a complete line of trucks, wheelbarrows, cars and dragscrapers of all sizes and types for handling almost all classes of material for all industries.

Only a few of the many standard types are illustrated below. Catalogue showing the complete line will be sent on request.

In addition to its line of standard trucks, this company is in a position to furnish special trucks of any design or construction in accordance with purchaser's specifications.



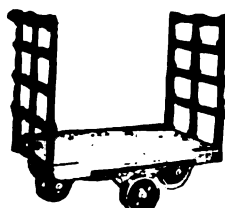
HAND TRUCKS

Adapted for general freight cargo and warehouse service. Made in different sizes and designs for all conditions. All parts are strong, making them fit for severe service. Materials are carefully selected. Handles are steam bent. Large wheels make the truck roll easily.



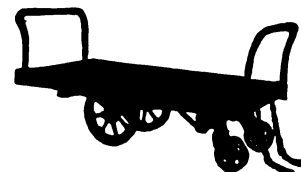
FACTORY TRUCK

Designed for general factory use. Platform supported by three bolsters running lengthwise of truck, making a very strong construction. Stakes are interchangeable. Also furnished with outside stake pockets.



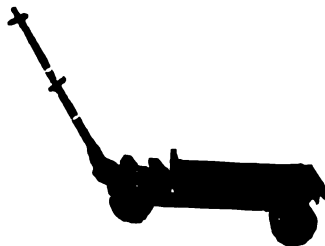
PLATFORM TRUCK WITH RACKS

Handles heavy loads. Construction heavy throughout; platform is reinforced and racks are rigidly secured. Furnished in various sizes and designs for all conditions.



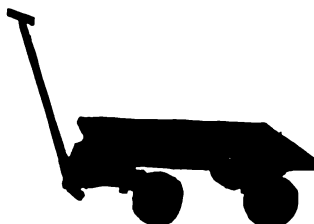
PLATFORM TRUCK

Strong and rugged. Made of white oak. Constructed so that weight falls on large wheels. These wheels have roller bearings. Truck turns in its own length. Ends are mortised into side rails.



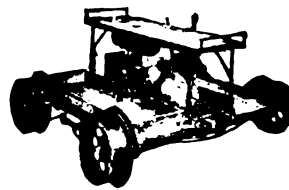
ELEVATING TRUCK

Furnished with wooden platforms or skids. Has ball bearing wheels. Cuts labor and transportation costs to a remarkable degree. Special booklet will be sent to interested persons.



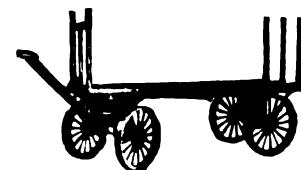
PLATFORM OR WAGON TRUCK

Designed for all-round factory and warehouse use. Will handle heavy loads and withstands severe service. All parts well proportioned. Furnished in various other styles for all classes of service.



MOTOR OPERATED SECTION CAR

Motor and seat in center of track, brake acting on 4 wheels. Magneto ignition. Free engine clutch. Crank starting. Can be removed from track by one man. Motor can run idle while car is standing. Lightest car made, operating at high speeds without danger on curves, switches and crossings.



EXPRESS WAGON

Furnished with Sarven or steel wheels. Straight grained white oak used throughout. End racks are removable. Can be furnished with spring handle attachment and in various other designs.

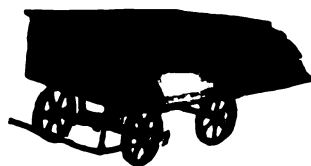


DRAWSRAPER

Made of high carbon steel. Pressed from a single sheet without seams, laps, sharp corners or angles.

Furnished plain or with double bottom, with or without runners, in various sizes.

Fills and dumps easily and carries its load well, either uphill or downhill.



COAL CHARGING WAGON

Made of steel with malleable iron wheels. Hinged drop side. Capacity, 1000 lbs.; other sizes to order.



Steel Wheelbarrow With Hardwood Handles



Tubular Steel Wheelbarrow

WHEELBARROWS

A wide range of types and sizes for all requirements. Furnished with legs of high carbon angle steel of great strength, also with wooden legs. Steel tire wheels, oval steel spokes, pressed steel hub and dustproof and grip-proof iron axle boxes. Trays pressed from a single heavy gauge sheet without seams, welding or rivets.

LAKEWOOD ENGINEERING COMPANY

Industrial Trailers and Trucks

CLEVELAND, OHIO

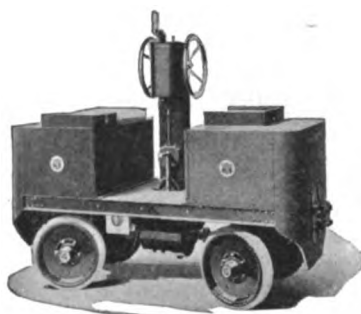
For District Offices, see page 105

Products.

INDUSTRIAL TRAILERS, TRACTORS, and TRUCKS.
For Clamshell Buckets and Industrial Railway Equipment, see page 105.

Storage Battery Tractor.

Patterned after the electric locomotive, both ends the same. Each end has heavy bumper and coupling and will pull or push in either direction. Turns on a radius of 61 in., making possible rapid operation in congested places. The double end control feature eliminates turning around, enabling the operator to run straight into a coupling and pull out by simply reversing his driving position. No backing out required.

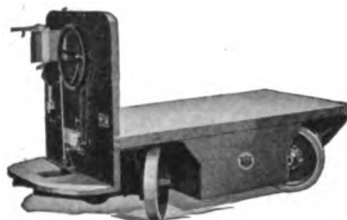


STORAGE BATTERY TRACTOR

The four-wheel drive and steer features give maximum driving power for hauling heavy loads up grades or over slippery floors, straight ahead or on sharp turns.

Storage Battery Truck.

Equipped with V-dump body or flat top, 4-wheel drive gives maximum tractive effort when hauling up grades or over slippery floors. Turns in a radius of 61 in. All parts accessible. Batteries carried in steel compartment underneath deck at each side of the driving motor.



STORAGE BATTERY TRUCK

Lift Truck.

The Lakewood lift truck is of the self-loading type. The load is piled on a skid or on the truck platform. When skids are used, the truck picks up the skid, carries it to some distant part of the plant and quickly returns for another load. The truck with one operator easily performs the work of several men. Positive worm-drive elevating mechanism enables operator to carry loaded platform skid at any elevation from the minimum of 11 in. to the maximum of 42 in., eliminates danger of skid legs dragging in passing over depressions, and enables operator to set skids on benches convenient to machine operators.



LIFT TRUCK

Tier Lift Truck.

The merit of this truck has been proved in such diversified industries as steel mills, cotton mills, printing plants, automotive shops, chemical plants, foundries, warehouses, etc. It will load or unload trucks or cars from the ground level. Places heavy dies on machines in forge shops. It saves 5 to 10 men in tiering and storing materials. Transports material up steep grades. Built in tiering heights of 60, 76, and 96 in.



TIER LIFT TRUCK

Balanced Type Trailer, Model 802.

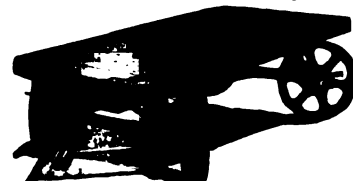
For general factory use where both power and hand haulage is necessary. Load being balanced on two center wheels, minimum effort is required to swing trailer around. May be pulled or pushed by tractor. Capacity 8000 lbs. Hyatt roller bearings on center wheels, plain bearings on caster wheels.



BALANCED TYPE TRAILER,
MODEL 802

Four Wheel Steer Trailer, Model 801.

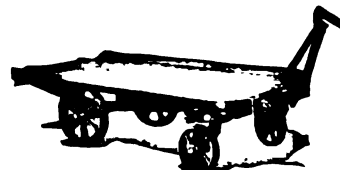
Designed for accurate trailing in trains of from 2 to 10 trailers. The large wheels make the trailers easy rolling over rough floors. Cage roller bearings in all four wheels. Wheels are provided with automobile type steering knuckles. Platform size 3 ft. by 6 ft. Capacity, 6000 lbs.



FOUR WHEEL STEER TRAILER,
MODEL 801

Warehouse Type Trailer, Model 810.

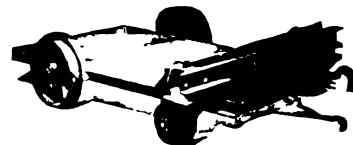
Almost unbreakable construction insured by the use of steel and malleable iron. Platform size 72 by 36 in. Capacity 4000 lbs. Hyatt roller bearings on all wheels; ball thrust bearings on casters.



WAREHOUSE TYPE TRAILER,
MODEL 810

Low Platform Type Trailer, Model 804.

Efficient for handling heavy boxes or bulky material. 9-in. loading height. Adapted for hand or power haulage, over smooth runways or floors. Capacity 5000 lbs. Cage roller bearings on all wheels.



LOW PLATFORM TYPE TRAILER
MODEL 804

EASTON CAR & CONSTRUCTION COMPANY

190 Fulton Street
NEW YORK, N. Y.

WORKS: EASTON, PA.

ATLANTA

BOSTON

CHICAGO

BRANCH OFFICES

DETROIT

PHILADELPHIA

PITTSBURGH

Products.

Complete NARROW GAUGE RAILWAY EQUIPMENT, designed and built for mines, plantations, factories, power plants, docks, quarries, etc., which includes:

Steel Cars of every description, Small Locomotives, Permanent and Portable Track, Switches, Crossings, Rails, Turntables, Track Scales, Cast Iron Track, Floor Plates, Wheels and Axles, etc.

Service.

The specialists of this company, with 31 years' experience in this line, will welcome an opportunity to solve transportation problems. Designs of special and standard cars are to be had for the asking. Genuine sincere service is the foundation on which this business has been built.

General Information.

These pages illustrate, as well as the space permits, the wide and complete variety of narrow gauge railway equipment designed and built by this company. Brief description of standard equipment is possible, but there is room for only a few of the typical variations from these standards, and some special types picked at random from among thousands. Full specifications, drawings and additional illustrations will gladly be sent to supplement the data given here.

There are but few different types of industrial railway cars, viz.: platform, V-body dump, rotary dump, end dump, box, gable bottom, hopper bottom, scoop, skip, etc. Each class may be further divided into *standard*, *variation from standard*, and *special*. The so-called *standards* are merely the types most used. *Variations from standard types*, which are made necessary by working conditions, are very common. It is only when the conditions are very unusual indeed that *special* designs are necessary.

A platform car, for example, without being anything but a slight *variation from standard* might be equipped with automatic or link pin couplings, spring draft rigging or rigid bumpers, spring pedestals or springless pedestals, roller bearings or brass bearings, steel platform or wooden platform, with or without brakes, with or without sides, with or without ends, etc.

Since these slight differences in construction are applicable to practically all other standard cars, it will be obvious that: (1) the purchase of a car which varies somewhat from *standard* does not necessarily involve the added first cost which might be expected; and (2) it is absolutely essential on inquiries and orders that this company be furnished with all the details and data obtainable in order that unnecessary correspondence and delay may be avoided.

Because so much of the equipment built by the EASTON CAR & CONSTRUCTION COMPANY is for such widely different conditions, it can readily be seen that the company is peculiarly well fitted to turn out any kind of *special* equipment to buyer's, or its own, drawings and specifications.



Standard Rocker Dump Cars.

Designed for handling all kinds of loose materials.

Body—Carefully balanced, self-dumping and arranged to dump clear of the wheels.

Automatic Latches—So arranged as to be operated from the sides of the car. A special latch for holding the body in a partially dumped or fully dumped position is supplied on order.

Underframe—Made of channels, well braced and complete with bumper and link and pin coupling.

Wheels—Extra heavy single plate type, made of best charcoal iron, thoroughly annealed, with chilled treads, and hydraulically pressed on steel axles with finished journals.

Standard Easton dustproof roller bearing boxes with flexible yokes are supplied.

Variations from

Standard—Brakes on 2 or 4 wheels, spring draft rigging with rectangular underframes, spring pedestals, brass bearing boxes and other features incorporated as ordered. See other illustrations on these pages and send for Bulletins No. 2 and No. 3.



FIG. 255. STANDARD ROCKER DUMP CAR

DATA. STANDARD ROCKER DUMP CARS

Codeword	Cap., cu. ft.	Gauge, in.	Over all dimensions			Wheel diam., in.	Axle diam., in.	Wheel base, ft. in.	Plates		Wt., lbs.
			Lgth., ft. in.	Wth., ft. in.	Hgt., ft. in.				Side, in.	End, in.	
Ribbenland.	18 24	6	7	4	3	8	12	1 3/4	2	0	900
Ribbestuk.	27 24	7	3	4	5	3 9/16	12	1 3/4	2	0	1000
Ribbonism.	40 24	8	0	5	4	4 6 1/2	14	2	4	1325	
Ribeavate.	27 30	7	4	4	5	3 11	12	1 3/4	2	4	1050
Ribecco.	40 30	8	1	5	4	4 9	14	2	2	6	1425
Ribholisco.	54 30	8	8	5	10	4 11	14	2 1/4	2	6	1675
Ribucammo.	40 36	8	1	5	4	4 9	14	2	2	6	1520
Riburlato.	54 36	8	8	5	10	5 0	14	2 1/4	2	6	1770

NOTE—Capacities level full; weights and dimensions approximate only and not binding on us. End braces on cars of 40 cu. ft. and over.

Standard Coal Charging Cars.

This type of car is designed for charging coal directly from car through fire doors.

Body—Made of steel plate properly reinforced, and to dimensions and height which have been carefully worked out with relation to scientific coal firing.

Latches—Automatic and guarded. Hinge of door is coaltight, and offers no obstruction to the fireman's shovel.

Underframe—Made of heavy braced steel channels without couplings.

Wheels—Made of best charcoal iron, thoroughly annealed, with chilled treads, pressed on steel axles of

ample diameter with finished journals revolving in Easton standard dustproof roller bearing boxes.

Variations from Standard—Such as double doors, end doors, other gauges, flexible wheel base, etc., supplied if required. See other pages and send for Bulletin 16.

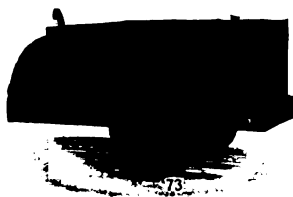


FIG. 73. STANDARD COAL CHARGING CAR

DATA, STANDARD COAL CHARGING CARS

Code word	Cap., tons	Gauge, in.	Lgth. of body, ft. in.	Width of body, ft. in.	Dpth. of body, ft. in.	Hgt. over all, ft. in.	Plates, in.	Wheels, in.	Wt., lbs.
Treckfuss.	1 1/2	24	4 6	3 4	1 6	3 0	1 1/2	14	750
Treckung.	1	24	5 0	3 10	2 0	3 8	1 1/2	16	1000
Treckler.	1 1/2	24	6 0	4 0	2 6	4 5	1 1/2	16	1300

Add 5 in. for width over all.

Standard Platform Cars.

This type is a widely used general utility car.

Platform—Made of yellow pine, carried on steel channel underframe thoroughly braced but without coupling.

Wheels—Extra heavy single plate type with chilled treads, pressed on steel axles with machined journals revolving in Easton dustproof roller bearing boxes.

Variations from Standard—Such as couplings, bumpers, sides, ends, partitions, spring draft rigging, spring pedestals, automatic couplers, etc. furnished as ordered. See other pages and Bulletins 1, 6 and 18.



FIG. 1005. STANDARD PLATFORM CAR

DATA, STANDARD PLATFORM CARS

Code word	Platform			Wheel diam., in.	Axle diam., in.	Hgt. of channel frame, in.	Wheel base, in.	Gauge, in.	Floor, in.	Cap., tons	Wt., lbs.
	Lgth., ft. in.	Width., ft. in.	Hgt., in.								
Stobrorum.	4 9	3 0	15	12	1 1/4	5	20	20	1 1/2	2-3	500
Stachetto.	5 0	3 4	15	12	1 1/4	5	24	24	1 1/2	2-3	550
Stockblind.	6 0	4 0	15	12	1 1/4	5	24	24	1 1/2	2-3	640
Saber.	6 0	4 0	18	14	2	6	30	24	1 1/4	5	825
Sable.	8 0	4 6	19	14	2 1/4	6	42	36	1 1/4	5	1200
Saccharine.	12 0	6 0	22	16	2 3/4	7	72	56 1/2	1 1/4	6	2000

Standard Scoop Cars.

A dump car, the body of which revolves on the underframe, and dumps to both ends and to both sides. Usually pushed by hand. Due to its ease of operation and general utility, it is very widely used for sand, ashes, concrete, gravel, coal and other loose materials.

Body—Made of steel plate strongly braced and reinforced, has an automatic latch and an easily operated turntable.

Underframe—Made of rolled steel channels securely tied together.

Wheels—Made of charcoal iron with chilled treads, and of the self-oiling type, revolving on square axles. Roller-in-the-hub wheels are furnished at a small extra charge.

Variations from Standard—In the way of partitions in the body, different shape or size of body, different gauge of track, etc., as ordered. See other pages and send for Bulletin 4.



FIG. 70. STANDARD SCOOP CAR

DATA, STANDARD SCOOP CARS

Code word	Cap., cu. ft.	Over all dimensions			Axles, in.	Wheel, in.	Channel frame, in.	Plate, in.	Wheel base, ft. in.	Wt. lbs.	
		Gauge, in.	Lgth.,	Wdth.,							Hgt.,
			ft. in.	ft. in.							ft. in.
Sporcheyza.....	18 18	4 7	2 6	3 1 1/4	1 1/2	10	5	1 1/2	1 4	540	
Sporison.....	18 24	4 7	2 6	3 2	1 1/2	10	5	1 1/2	1 4	550	
Sporobole.....	18 30	4 7	2 6	3 2	1 1/2	10	6	1 1/2	1 4	580	
Spora.....	18 36	4 7	2 6	3 2	1 1/2	10	6	1 1/2	1 4	690	
Sporocarp.....	27 18	5 4	2 8	3 6	1 1/2	12	6	1 1/2	1 9	740	
Sporotarne.....	27 24	5 4	2 8	3 6	1 1/2	12	6	1 1/2	1 9	750	
Sportfully.....	27 30	5 4	2 8	3 8	1 1/2	12	8	1 1/2	1 9	780	
Sport.....	27 36	5 4	2 8	3 8	1 1/2	12	8	1 1/2	1 9	790	

Standard Turntable.

The best turntable obtainable is the best known means for effecting change of direction in track work where there is no room for switches. This is an axiom. The Fig. 94 turntable is the best this company knows how to build.

The table is centered and carried by the machined ball race with its hardened, ground and polished steel balls; and by it alone. This eliminates all the sources of friction and trouble found in all other types of turntables. Both top and bottom are made of heavy reinforced cast iron. The top carries, cast integral in it, a right angle depressed track crossing. The balancing ring and pads are machined. The ball race top and bottom is, of course, also carefully finished. The balls are made of tool steel, hardened, ground and polished. The top is supplied with an automatic latch or stop. Rail supports are supplied cast in the frame.

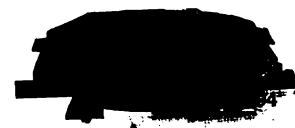


FIG. 94. STANDARD TURN-TABLE

Variations from Standard—In other crossings than those of 90°, double tracks, other gauges, etc., as ordered. See other pages and send for Bulletins 12 and 13.

DATA, STANDARD TURNABLES

Code word	Diam. of top, in.	Track, space, in.	Cap., tons	Standard gauge, in.	Wt., lbs.
Revolvedor	40	41 1/4	3	20	700
Revolving	44	45 1/4	4	24	800
Revolution	48	49 1/4	4	24	1,150
Revotaba	52	53 1/4	6	24	1,275
Revuelto	60	61 1/2	6	24	2,000
Revue	72	73 1/2	7	24	2,000
Revulsarum	84	86 1/2	8	24	3,400

Turntables 44 in. to 84 in. will also fit 21 1/2 in. outside track gauge. Other gauges than standard can be furnished at a slight additional cost.

Standard Portable Track.

Standard portable track is made any gauge, of any weight of rail, mounted on steel ties, complete in 15-ft. sections, 5 steel ties to the section, ready to lay. Curves and one-way, two-way or three-way switches of any radii, crossings of any angle, ground throws, switch-stands, etc., are furnished for complete track layouts.

Drawings to meet any conditions will gladly be furnished, and the track will be shipped complete in sections ready to lay, for rapid bolting up in the field.

Variations from Standard—In the way of permanent track, cast iron track, special switch work, etc., supplied, as ordered. See other pages and Bulletins 9, 10, 11 and 12.

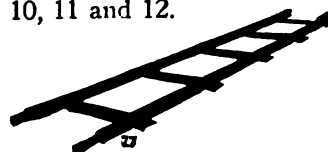


FIG. 77. INDUSTRIAL TRACK In 15-ft. or 5-meter sections



FIG. 80. PORTABLE SWITCH Also right- and left-hand switches

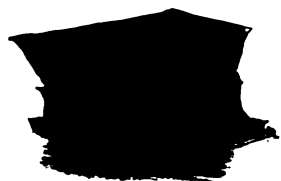


FIG. 1800. ROCKER DUMP CAR
With large body and double trucks for short curves

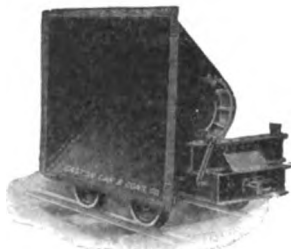


FIG. 622. SPECIAL ROCKER DUMP CAR

Designed and built to meet any specifications or conditions, and made either side or end dump



FIG. 277. END DUMP CAR
These all-steel cars are commonly used for mining service

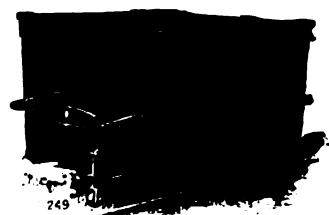


FIG. 249. GABLE BOTTOM CAR
All types built in standard and special designs with and without brakes, smaller sizes being 4-wheel construction; larger sizes double truck, or 8-wheel



FIG. 974. ROCKER DUMP CAR

Special for locomotive traction. Made in any capacity or design, for any track gauge and either with or without brakes and automatic couplers

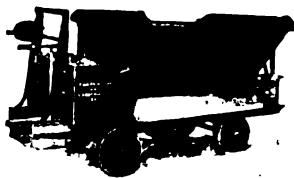


FIG. 1819. ELECTRIC MOTOR DRIVEN ROCKER DUMP TRUCK

With rubber tired wheels for operating in industrial plants without the use of tracks



FIG. 430. SPECIAL SIDE DISCHARGE CAR

With inclined bottom. Differs from other types in that a hinged side is substituted for the sliding gate



FIG. 1886. END DISCHARGE CAR
A special design with inclined bottom, chute and sliding gate



FIG. 268. SKIP CAR
Another type of skip built for any purpose and to meet any condition



FIG. 280. SIDE DISCHARGE CAR
With inclined bottom and gate for controlling flow of contents



FIG. 1837. CORE OVEN CAR
4-wheel core oven car of I-beams and channels. For all types of core oven cars, the use of the Easton core oven roller bearing box is recommended



FIG. 266. CORE OVEN CAR
Another type of core oven car with steel channel frame, with grid platform of flat steel bars

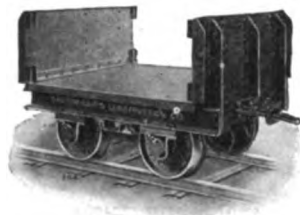


FIG. 264. PIG IRON CAR
Furnished either with or without sides or ends, with ends and sides removable, or with only one fixed side

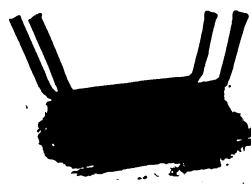


FIG. 273. BILLET CAR
For ingots, billets, pig iron, etc.



FIG. 414. DOUBLE SIDE DOOR COAL CHARGING CAR



FIG. 269. SKIP CAR
All-steel of various designs, built to meet special requirements



FIG. 1879. STANDARD PLATFORM CAR

Provided with removable sides and ends, and has automatic couplers and spring draft rigging



FIG. 274. STANDARD PLATFORM CAR

Double truck with wood floor and brake

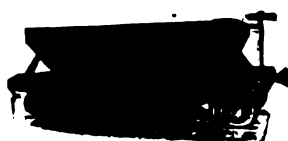


FIG. 226. HOPPER BOTTOM CAR

Large double truck, with brake and automatic coupler for locomotive traction



FIG. 444. HOPPER BOTTOM CAR

Built with all four sides inclined to insure the contents discharging between the rails

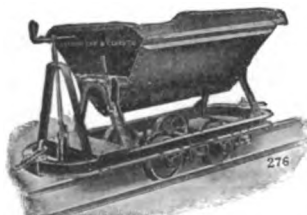


FIG. 276. CRADLE DUMP CAR

Built to dump side, end or rotary. A large stock of standard sizes is kept on hand



FIG. 450. DOUBLE END DOOR COAL CHARGING CAR



FIG. 2236. CHARGING BOX CAR

All types of Charging Box Cars in standard and special designs



FIG. 2694. CHARGING BOX CAR

Built to carry any load



FIG. 161. SPECIAL QUARRY CAR

With spring journals, extra heavy plates, and double wood and steel bottom



FIG. 403. MINE CAR FOR HEAVY WORK

This type is built in capacities ranging from 12 to 27 cu. ft.



FIG. 1769. ANNEALING FURNACE CAR

One of many designs of annealing furnace cars of which we are the largest builders in the world. Built in any length and capacity



FIG. 757. ANNEALING FURNACE CAR

Another type of annealing furnace car with platform for furnace door



FIG. 99. STANDARD PUSH CAR

With wood frame made extra strong but light for quick and easy removal from track

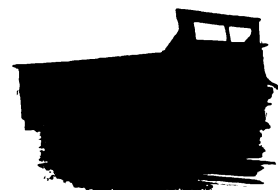


FIG. 184. QUARRY CAR
With automatic end doors. One of many designs



FIG. 452. STEEL PLANT CAR

Cars built for every steel plant and rolling mill service in both the four-wheel and double truck, or eight-wheel types. The one shown has a platform of heavy steel rails



FIG. 1184. ANNEALING FURNACE CAR

Widely used in steel mills, foundries, automobile, and other factories where annealing and heat treating of castings, chains, forgings, etc., are a part of the manufacturing process

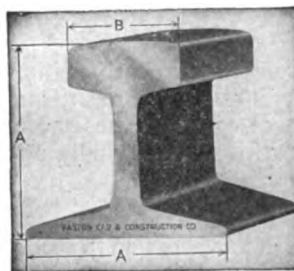


FIG. 9. RAIL
Rails of any weight. Large stock on hand



FIG. 135. CROSSING
Any design, angle, gauge, or weight of rail

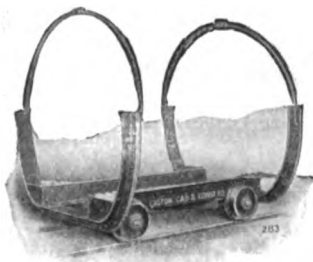


FIG. 283. CREOSOTING CAR
All types

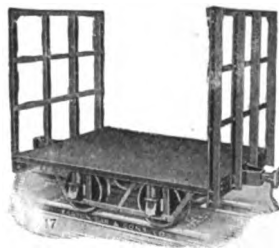


FIG. 147. SUGAR CANE CAR
All-steel car with end walls; used specially for carrying sugar cane



FIG. 2421. LARGE TURNTABLE

An unusually large ball bearing turntable with double ball race which was covered with lead and supported six special machines



FIG. 2543-B. TURNTABLE
One type of 50-ton capacity turntable with 90° manganese steel standard gauge track crossing



FIG. 1533. PLATFORM CAR
Double truck platform cars built to meet any specific requirements and in any desired size. Both with and without brakes

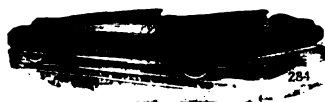


FIG. 284. TRANSFER CAR
Built in a number of designs, many of them being underslung, so that the load platform is very close to the ground

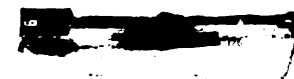


FIG. 176. STANDARD GROUND THROW

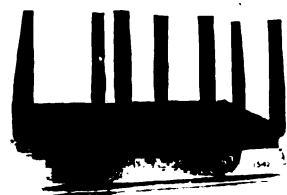


FIG. 1542. STANDARD PLATFORM CAR
Same as 1005, except equipped with stake pockets and stakes

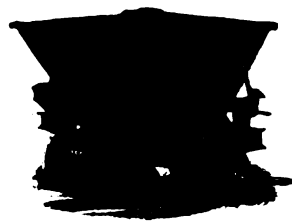


FIG. 3530. ROCKER DUMP TRAILER
With extra wide tired wheels for uneven, soft ground; used in connection with tractors



FIG. 81. EASTON TWO-WAY SWITCH



FIG. 82. EASTON THREE-WAY SWITCH

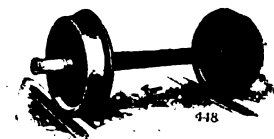


FIG. 448. WHEELS AND AXLE
Wheels and axles of any design and for all gauges



FIG. 185. CAST IRON PLATE SWITCH

C. W. HUNT COMPANY, INC.

Manufacturers of Industrial Railways and Coal Handling Machinery

GENERAL OFFICE AND WORKS:
WEST NEW BRIGHTON, N. Y.

REPRESENTATIVES

NEW YORK, N. Y., C. W. HUNT ENGINEERING CORP., 143 Liberty Street
BOSTON, MASS., DAY BAKER COMPANY, 110 Arlington Street
CHICAGO, ILL., PHILLIPS, LANG & COMPANY, INC., 538 South Dearborn Street
WASHINGTON, D. C., JAMES P. MEWSHAW, 710 Fourteenth Street, N. W.

Products.

INDUSTRIAL RAILWAY TRACKS; SWITCHES; MOTOR OPERATED and PUSH CARS; SCALES; ELECTRIC MINE and INDUSTRIAL LOCOMOTIVES; CABLE RAILWAYS; AUTOMATIC RAILWAYS; CONVEYORS; COAL CRACKERS; SKIP HOISTS; BIN and HOPPER GATES; WEIGHING LARRIES; COAL TUBS; "STEVEDORE" MANILA TRANSMISSION and HOISTING ROPE; DRILLING CABLE; TRANSMISSION ROPE COUPLINGS.

Co-operative Service.

Since every coal handling or railway proposition has specific requirements and conditions to meet, our engineering staff is at the disposal of all parties interested in the above classes of work. It will gladly advise, recommend, or furnish estimates.

Facilities.

Standard parts most in demand are carried in stock. The company's resources, including plant, capital and engineering force, are prepared for prompt action on the largest special requirements. Prompt deliveries are further assured through exceptional shipping facilities—Baltimore & Ohio R. R. tracks on the property and wharf accommodating the lighters of every railroad centering in New York City.

Industrial Railway and Equipment.

Tracks—MADE UP—Made in sections, 20 ft. long of standard light rails riveted to cupped or flat steel ties. Ties spaced, 24½-in. centers and 7½ in. from ends. Special lengths to order.



FIG. 1. CAST PLATE STRAIGHT TRACK
Sectional view

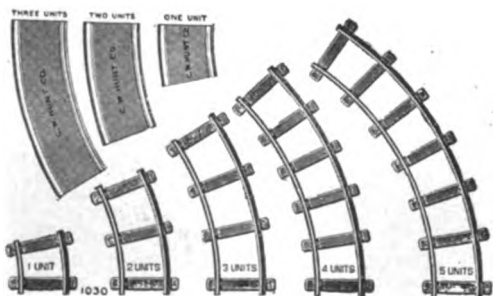


FIG. 2. ROLLED STEEL AND CAST PLATE CURVES



FIG. 3. LEFT-HAND SWITCH, WITH STAND



FIG. 4. TWO-WAY SWITCH

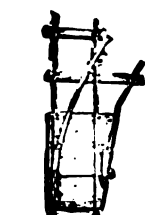


FIG. 5. RIGHT-HAND SWITCH



TRADE-MARK

KNOCKED DOWN—Made in sections 15 ft. long of standard light rails, bolted up in field to special cross ties with clips and bolts. Special lengths to order.

CAST PLATE—Track cast integral with plates and made in standard lengths up to 5 ft. (Fig. 1).

CURVES—Hunt short radius curves are made with a special guard rail which in conjunction with Hunt special running gears eliminate friction when cars are rounding sharp curves (Figs. 2, 9 and 10).

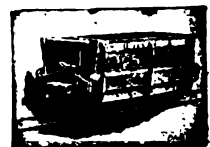
Switches—Left-hand, right-hand, 2-way or 3-way, with or without stands. Also can be furnished in cast plate (Figs. 3, 4 and 5). Frogs, crossovers and turntables are also manufactured. Any workman of ordinary intelligence can put together a whole system ready for use.



No. 011
Standard Eight-wheel Shop Car



No. 0355
Standard Charging Car



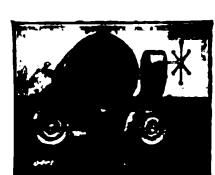
No. 07129
Standard Four-wheel Self-dumping Push Car



No. 014
Standard Tip Car



No. 0594
Standard Shop Car



No. 0491
Standard Foundry Car

FIG. 6. INDUSTRIAL RAILWAY CARS

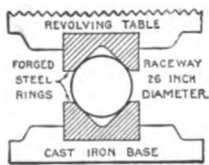


FIG. 7. TURNTABLE WITH SKETCH SHOWING CONSTRUCTION OF BALL BEARING

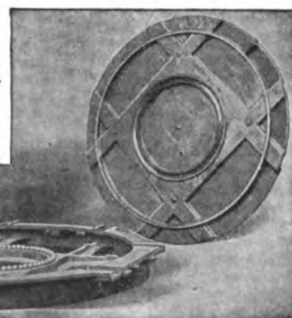


FIG. 8
ROLLER BEARING

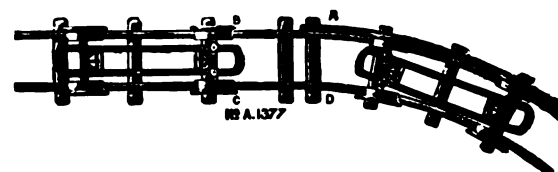


FIG. 9. POSITION OF TRUCK AXLES WHEN ROUNDING A CURVE

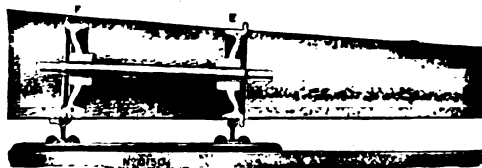


FIG. 10. THEORETICAL CONE AND CIRCULAR PATH BY AXLE AND WHEELS IN ROUNDING A CURVE

Cars—Bodies of various designs to meet a wide range of use, but all have essentially same truck construction. Axle bearings are either plain or roller bearing. Arrangement of running gear (Fig. 9) facilitates propulsion on short curves. Standard width for clearance of cars is 4 ft. Curve radius, 12 ft.

Track Scales—Made in both iron and wooden frames, especially designed for use with industrial railway, track ends connecting directly with either cast plate track or made-up steel track of railway system.

Both types of scales are provided with a tare beam to balance weight of empty cars so that load beam will give net weight of load. Beams are furnished graduated to pounds or kilograms as desired.

Cast iron type has track rails cast integral with both platform and frame. Platform is 27 in. wide, and clearance distance from center of platform to beam box, when beam is parallel with car track, is 44 in. Where necessary, an extension to base can be fitted to frame, moving beam 4 ft. further or a lesser distance away. Beam box is cast iron and can be made to face in any direction to secure best light on beam. Weights are attached to beam to prevent their being misplaced or lost.

Electric Locomotives for Industrial and Mine Service—Narrow gage electric locomotives in connection with industrial railways further reduce cost of handling material. Designed to take full load around 12-ft. radius curves as easily as on straight track. Various types of locomotives are made to pull loads up to 50 tons.

Standard machine as shown (Fig. 11) is built for any track gage from 18 to 36 in. Minimum curve radius 10 ft. Rated draw bar pull, 800 lbs., at 4 miles per hour; steel wheels slip at 1600 lbs. starting pull. The operator is protected by sliding top on cab. Over all height from top of rail to top of cab 52 in. Battery capacity ample for full day's work. Battery box easily removable for extra set of cells for 24 hours' service.



FIG. 11. STANDARD ELECTRIC LOCOMOTIVE



FIG. 12. MOTOR DRIVEN SELF-DUMPING CAR

Locomotives can be equipped with storage battery for motive power, or current can be taken from overhead trolley or from third rail. Motors and gears are housed to protect them from injury and dust. Speed, variable, from 1 to 10 miles.

Also load carrying motor cars (Fig. 12), 1-ton to 10-ton capacities for overhead trolley or third rail systems.

Cable Railways.

Adapted for handling coal and for carrying heavy material from point to point. Used extensively in conveying coal from barge to storage bins. Standard gage, 21½ in.; curve radius, 12 and 30 ft.

Hunt's Automatic Railway.

Designed primarily for transporting coal, sand, rock, cement and similar bulk materials from railway cars or vessels to storage bins where run does not exceed 600 ft. Operation is entirely automatic. Time consumed for round trip of 300 ft., dumping its load and returning, is about 50 seconds. Requires services of only one man—the craneman.

In operation, loaded car is started down an inclined track, and a few feet ahead of discharging point picks up a cross bar which is attached to a cable leading to a weight box. This raises weight box, and when load is discharged from car the reaction due to falling weight returns empty car to loading point.

Two sizes of cars are manufactured: 1-ton and 2-ton capacity. Made of wood, lined with sheet steel.



FIG. 13. HUNT SKIP HOIST AND AUTOMATIC RAILWAY

Skip Hoists.

Consists of load-carrying bucket, wire hoisting rope, head and leading sheaves, electric single drum hoisting engine with motor, traveling cam control and electrically operated brake, bucket guides, loading pit valve or loading chute, control panel and push button station for operating machine.

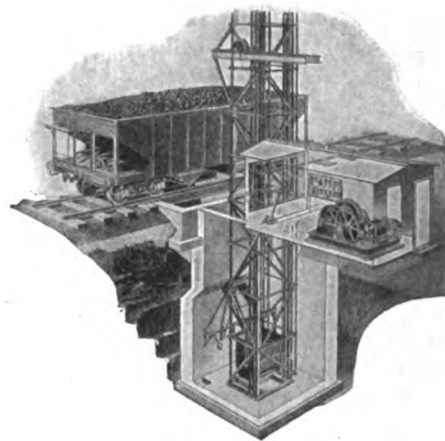


FIG. 14. STANDARD SKIP HOIST

Single bucket skip is counterweighted and guides constructed for properly guiding counterweight and bucket. Electric skips with drum type controller and steam hoist friction operated skips of high speed can be furnished if desired. Skip hoists can be operated equally well whether vertical or inclined. Capacities from 25 to 300 tons per hour.

Overhead Weighing Larries.

Built to meet existing conditions with one way or bifurcated chutes to serve a single or double line of stoker hoppers. Accurate records of coal consumption registered on cards. Manually or electrically operated either from boiler room floor or cab. Capacities ½ ton and up.



FIG. 15. OVERHEAD WEIGHING LARRY

Conveyors.

The Hunt pivoted bucket conveyor carries bulk material, dry or liquid, noiselessly in any direction without shock, breakage or violence. Three types of conveyors are manufactured: "Standard," with independent buckets, being separately filled; "Continuous," with edges of buckets in contact; "Lip Type," with edges of buckets overlapping—material being spouted into conveyor in constant stream without spill or scatter.

Buckets are suspended on pivots so that gravity keeps them upright whether track be horizontal, vertical or inclined. Conveyor driven by pawls which run smoothly on driving pins on chains. Whole conveyor designed for thorough lubrication of all bearings.

Capacity secured not by speed but by enlarged bucket. Operation entirely automatic. All parts interchangeable. Conveyor will operate on 5 to 10 h.p.

Special automatic machinery is designed for filling each "Standard" type bucket with definite quantity of material. Several fillers can be arranged for measuring and mixing different materials.

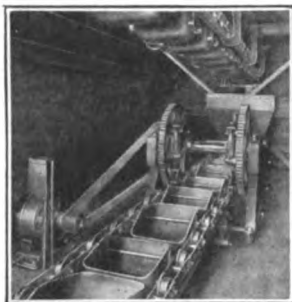


FIG. 16. INSTALLATION OF PIVOTED BUCKET CONVEYOR

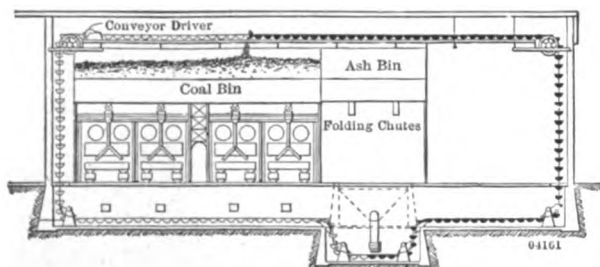


FIG. 17. SECTION THROUGH A POWER PLANT EQUIPPED WITH HUNT PIVOTED BUCKET CONVEYOR

Coal Crackers.

Designed for breaking lump bituminous coal into pieces small enough to feed through automatic stokers. Rolls have hardened steel chisel points that split or crack instead of crushing the lumps. Steel points renewable. Bearings and mechanisms protected from dust. Cracker may be placed below hopper under railway car track, so that coal feeds directly from car into conveyor. Can also be suspended from overhead beams, or be supported from below. Steam or electrically operated.

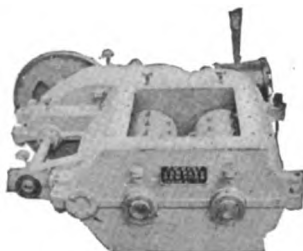


FIG. 18. COMPLETE COAL CRACKER

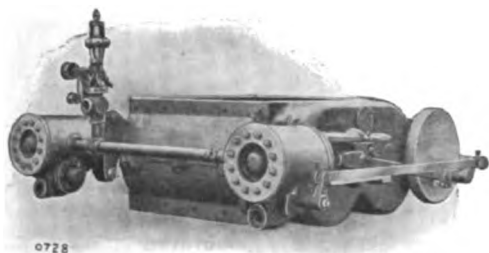


FIG. 19. HUNT STEAM DRIVEN COAL CRACKER

Cut-off Valves or Gates.

For controlling flow of coal, broken stone, sand, etc., from storage bins to mechanical stokers, mixers or cars. Installed at side or bottom of bins, or at end of spout. Hand operated by single lever, but power can be applied to larger sizes. Have no sliding parts or gears, but jaws rotate on centers, cutting through material without jamming. Normal tendency of valve is to close automatically by gravity. Almost every requirement may be met with standard types or modifications.

Fig. 22 shows a low body duplex valve with outside flanges particularly suitable for ash hoppers. If the conditions are unfavorable for the operation of any other type of cut-off valve, these duplex valves will be successful. They are heavily built and are not quickly burned out.

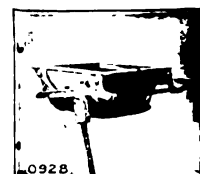
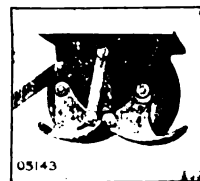


FIG. 20. CUT-OFF VALVES

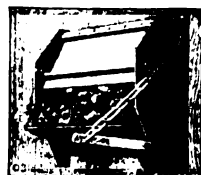


FIG. 21. VALVES AND CHUTES



FIG. 22. LOW BODY DUPLEX VALVE

Steel Coal Tubs.

For unloading coal, stone, ore, etc., from canal boats, and in similar uses. Approximately spherical in shape, fitted with side or back lever catch. Strongly made of heavy steel plate, top heavy when loaded, bottom heavy when empty and low in height—easily loaded and dumped. Capacities $\frac{1}{2}$ to 1 ton of coal.



FIG. 24. HUNT STEEL COAL TUBS

"Stevedore" Transmission and Hoisting Rope.

This rope is made of selected Manila fiber treated with a plumbago and tallow lubricant to reduce wear. With our "Stevedore" transmission rope we supply the Hunt coupling for controlling the stretch of ropes and eliminating splicing. "Stevedore" hoisting rope is designed for heavy hoisting purposes and is made cable-laid for well drilling.



FIG. 23. HUNT TRANSMISSION ROPE COUPLING

THE JOHN VAN RANGE COMPANY

Equipment for the Preparation and Serving of Food

CINCINNATI, OHIO

BRANCH OFFICES

DETROIT, MICH.

CHICAGO, ILL.

Products.

Complete CULINARY INSTALLATIONS for Industrial Plants, Hotels, Restaurants, Cafeterias, and Public and Private Institutions.

A partial list of the culinary equipment which is furnished includes:

- Cutlery
- Brushes
- Glassware
- Silverware
- Chinaware, "Shenango"
- Electric Chocolate Warmers
- Bread Slicers
- Gas Ranges
- Cast Iron Cooking Ware
- Dining Room Tables
- Aluminum Cooking Ware
- Vegetable Slicers and Cubers
- Trays
- Bread and Biscuit Tin Pans (a full line)
- Electric Ranges
- Hall's China (fireproof)
- Vegetable Peelers
- Pyrex Glass Cooking Ware
- Woodenware
- Dining Room Chairs
- Electric Window Grills
- Bakers' Machinery
- Electric Toasters

Experience.

THE JOHN VAN RANGE COMPANY's experience extends over a period of seventy years.

For seven decades we have planned, manufactured, and installed equipment for the preparation and serving of food.

During all this time our best efforts, knowledge, and experience have been put into this work. The result is that the name of the House of Van is known for quality all over the United States.

Industrial plants, hotels, restaurants, and institutions demanding the best have come to us for their culinary equipment.

Regarding the Quality of Our Products.

Everything turned out by the House of Van must be of the highest quality. This idea prevails throughout the entire institution.

The last word in labor-saving devices is incorporated in our equipment.

Complete Service.

We are able to render service that is complete in every detail.

We know how to—and do—produce equipment for kitchens and dining rooms that is unsurpassed for quality.

Hundreds of letters of endorsement from satisfied users of our equipment are on file.

Any information desired will be sent on request. Our engineers are at your service.

Write or wire us and permit us to take charge of any cooking or serving equipment installations you may have in mind.

References.

This partial list of factory cafeterias, hotels, hospitals, institutions, and public lunch rooms speaks volumes for the quality of the goods we manufacture.

Burroughs Adding Machine Co.	Detroit, Mich.
Oakland Motor Co.	Pontiac, Mich.
Nordyke & Marmon Co.	Indianapolis, Ind.
General Electric Co.	Fort Wayne, Ind.
Pollack Steel Co.	Cincinnati, Ohio
Dodge Motor Co.	Detroit, Mich.
Baldwin Cotton Mills	Chester, S. C.
Statler Hotel	St. Louis, Mo.
Statler Hotel	Cleveland, Ohio
Statler Hotel	Detroit, Mich.
Blackstone Hotel	Chicago, Ill.
LaSalle Hotel	Chicago, Ill.
French Lick Springs Hotel	French Lick, Ind.
West Baden Springs Hotel	West Baden, Ind.
New LaFayette Hotel	Lexington, Ky.
Fort Pitt Hotel	Pittsburgh, Pa.
Radisson Hotel	Minneapolis, Minn.
Rainbow Hotel	Great Falls, Mont.
Galvez Hotel	Galveston, Tex.
Deming Hotel	Terre Haute, Ind.
Cincinnati General Hospital	Cincinnati, Ohio
Peoria State Hospital	Peoria, Ill.
Topeka State Hospital	Topeka, Kans.
Henry Ford Hospital	Detroit, Mich.
City Hospital	Indianapolis, Ind.
Kresge's "Arbor Inn"	Columbus, Ohio
Wolf & Dessauer Co.	Fort Wayne, Ind.
Maison-Blanche Co.	New Orleans, La.
Sanger Bros.	Dallas, Tex.
Detroit Athletic Club	Detroit, Mich.
Fred Harvey Restaurants on	Sante Fe R. R.
Union News Co.'s Restaurants on	Southern R. R.
Mabley & Carew Co.	Cincinnati, Ohio
Masonic Club	Syracuse, N. Y.

Catalogue.

"Supplement A" will be sent on request. It is a booklet that should be on the desk of every purchasing agent.

ALBERT PICK & COMPANY

Industrial Welfare Projects

208-224 West Randolph Street
CHICAGO, ILL.

PITTSBURGH OFFICE: Room 504, 230 Fifth Avenue DETROIT OFFICE: Room 407, Stevens Building
FACTORY AND WAREHOUSE: 1200 West 35th Street, CHICAGO, ILL.
WOODWORKING PLANT: 1864 Wilmot Avenue, CHICAGO, ILL.
SILVERWARE FACTORY: BRIDGEPORT, CONN.

Products and Services.

EQUIPMENT, FURNISHINGS and SUPPLIES for Industrial Restaurants, Cafeterias, Clubs, Rest Rooms, and Housing Projects.

Complete Equipment for such installations is a specialized service of ALBERT PICK & COMPANY.

The furnishings, equipment and supplies provided by ALBERT PICK & COMPANY are manufactured expressly for rigorous *public* service and are not to be confused with ordinary grades.



TRADE-MARK

The cafeteria is the most approved type of industrial eating place. It serves quickly and economically, with fewer employees, less waste and less overhead than any other form of restaurant. Arrangement and equipment are matters for technical knowledge, but once determined can be handled easily. To produce a scientific eating place requires technical skill of a high order, with wide experience in the actual problems to be met.

Standardized Cafeteria Outfits.

The cafeteria is practical for the small concern as well as for the large. ALBERT PICK & COMPANY, after extended study and experience, have prepared standardized outfits of special design to meet the needs of small plants, making lunch service possible at low cost. The equipment in these special outfits has been simplified and cut down to actual necessities, but so designed that it may be amplified later. By standardizing the merchandise and producing in large quantities, a notable saving in price has been effected.

These special outfits may be purchased complete as specified. The size of the equipment required for a cafeteria can readily be gauged by referring to the outfits and the number of people that can be fed in each.

Special literature, fully covering these standardized outfits, is available and will be sent promptly. If a special project is in mind, you will effect a saving in time by giving such information as size of plant, number of employees to be served, space available and any special requirements.

Technical Consulting Service.

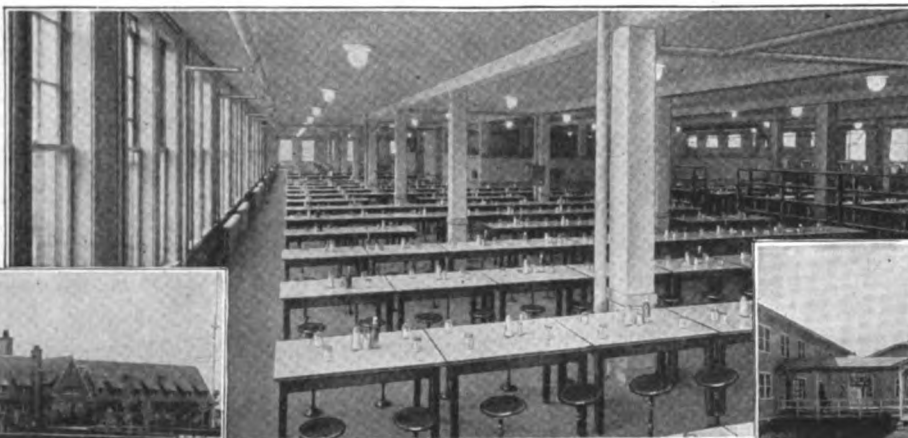
Industrial engineers and those planning housing or welfare projects are invited to make use of the extensive advisory service maintained in this organization. Suggestions, data and actual plans based on years of experience as leaders in the field, will be furnished promptly on request. A department of specialists will assist without charge in the preparation of plans for any type of welfare department.

Facilities.

This company is the largest restaurant, hotel, club and institution supply house in the world. It offers the greatest scope of services, as well as the greatest resources in merchandise, for all forms of welfare work.

The Industrial Restaurant.

Institutions in every branch of industry have proved that plant restaurants pay actual dividends by increasing efficiency and reducing labor turnover. There is now practically no new plant of large size that does not provide for feeding its employees.



THE WESTINGHOUSE LUNCH CLUB, OPERATED BY THE WESTINGHOUSE ELECTRIC & MFG. CO., EAST PITTSBURGH, PA.

The largest cafeteria in the world, feeding 9000 people per hour. It was planned, equipped and installed complete by ALBERT PICK & COMPANY



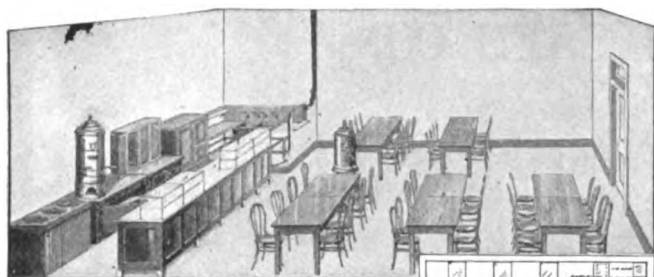
THE AMERICAN CLUB, OPERATED BY THE KOHLER COMPANY, KOHLER, WIS.

A large club building devoted to Kohler Company employees furnished complete by ALBERT PICK & COMPANY



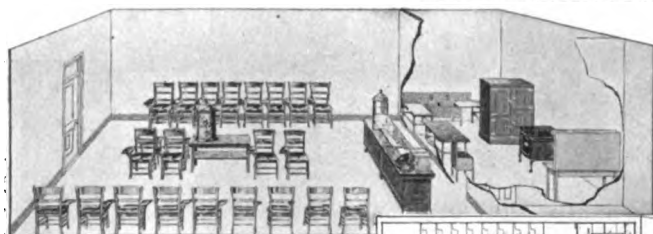
HOUSING PROJECT FOR EMERGENCY FLEET CORPORATION, HOG ISLAND, PA.

Furnishings provided for 2000 rooms in the great dormitory buildings used for housing workers



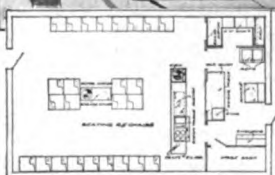
PICK'S STANDARDIZED OUTFIT NO. 1

For partial lunch service. Seats 40 persons. Feeds about 80 persons per hour. Floor space required, about 700 sq. ft. Size of room shown, 22 by 32 ft.



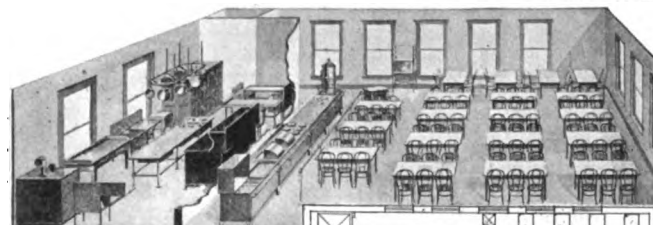
PICK'S STANDARDIZED OUTFIT NO. 2

For dairy lunch service. Seats 25 persons. Feeds about 100 persons per hour. Floor space required, about 1000 sq. ft. Size of room shown, 25 by 40 ft.



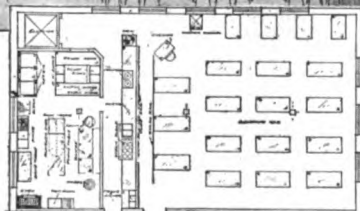
PICK'S STANDARDIZED OUTFIT NO. 3

For cafeteria service. Seats 52 persons. Feeds about 175 persons per hour. Floor space required, 900 to 1000 sq. ft. Size of room shown, 25 by 36 ft.

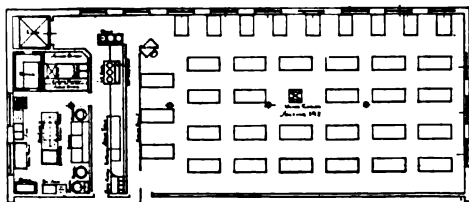


PICK'S STANDARDIZED OUTFIT NO. 4

For cafeteria service. Seats 106 persons. Feeds 275 to 300 persons per hour. Floor space required, from 1800 to 2000 sq. ft. Size of room shown, 33 by 57 ft.



For cafeteria service. Equipment similar to Outfit No. 4. Seats 192 persons. Feeds 450 to 500 persons per hour. Floor space required, 2700 to 2800 sq. ft. Size of room indicated, 33 by 82 ft.



PICK'S STANDARDIZED OUTFIT NO. 5

Industrial Clubs, Hospitals and Housing Projects.

Industrial clubs, rest rooms and hospitals have an established place in industry. For installations of every size, complete furnishings are provided by this company at a minimum of cost. The large Kohler American Club, operated by the Kohler Company, Kohler, Wis., is an example of ALBERT PICK & COMPANY complete equipment service.

Large industrial housing projects can be handled most efficiently by centralization of purchases. By providing everything from a central point, with installation and advisory service, engineers and their clients are assured expeditious handling and an actual saving of expense.

Consultation is invited, without fee or obligation.

Catalogues.

"The Employee Betterment Book," a comprehensive exposition of the principles and practice of industrial welfare, including lunch rooms, clubs, rest rooms, housing and other industrial welfare projects, will be sent promptly on request. Pick's Standardized Outfits are described and pictured in detail. Ask for Book A F 61.

A general catalogue, listing furnishings and equipment, such as furniture, floor coverings, table ware, utensils, janitors' supplies, etc., will be of great service in the selection of equipment. Ask for Catalogue A F 23.

References.

A partial list of prominent concerns which have availed themselves of ALBERT PICK & COMPANY's complete equipping services:

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
 Texas Company, Port Arthur, Tex.
 Chevrolet Motor Co., Flint, Mich.
 Hart, Schaffner & Marx, Chicago, Ill.
 Cadillac Motor Car Co., Detroit, Mich.
 Reo Motor Co., Lansing, Mich.
 Union Switch and Signal Co., Swissvale, Pa.
 Continental Can Co., Clearing, Ill.
 Hydraulic Pressed Steel Co., Cleveland, Ohio
 Illinois Steel Co., Chicago, Ill.
 American Radiator Co., Bremen, Ind.
 Burroughs Adding Machine Co., Detroit, Mich.
 Kellogg Toasted Corn Flakes Co., Battle Creek, Mich.
 Hamilton National Bank, Chattanooga, Tenn.
 Michigan State Telephone Co., Detroit, Mich.
 National Lamp Works, Cleveland, Ohio
 National Cash Register Co., Dayton, Ohio
 H. W. Johns-Manville Co., Milwaukee, Wis.
 Chandler Motor Car Co., Cleveland, Ohio
 Timken Roller Bearing Co., Canton, Ohio
 Packard Motor Car Co., Detroit, Mich.
 Fairbanks, Morse & Co., Indianapolis, Ind.
 Liggett & Myers, New Orleans, La.
 Ford Motor Company, Detroit, Mich.
 Steger & Sons, Steger, Ill.
 Lycoming Foundry & Machinery Co., Williamsport, Pa.
 Columbian Rope Co., Auburn, N. Y.
 American Snuff Co., Memphis, Tenn.
 Bemis Brothers Bag Co., St. Louis, Mo.
 Firestone Tire & Rubber Co., Akron, Ohio
 Buick Motor Car Co., Flint, Mich.
 Kohler Co., Kohler, Wis.
 Armour & Company, Chicago, Ill.
 Morris & Co., Chicago, Ill.
 Cudahy Bros. Packing Co., Cudahy, Wis.
 General Motors Co., (Remy Electric Division) Anderson, Ind.
 By-Products Coke Corporation, South Chicago, Ill.
 Washburn-Crosby Co., Minneapolis, Minn.
 Wm. Wrigley, Jr., Co., Chicago, Ill.
 West Virginia Pulp & Paper Co., Tyronne, Pa.
 Bradley Knitting Mills, Delavan, Wis.
 Sinclair Refining Co., Ranger, Tex.
 International Harvester Co., Chicago, Ill.
 Denver Rock & Drill Co., Denver, Colo.

THE HALL'S SAFE CO.

CABLE ADDRESS:
"HALL'S SAFE, N. Y."

P. O. BOX 846
CINCINNATI, OHIO

SALESROOM: WALKER SAFE Co., INC., 388 Broadway, NEW YORK, N. Y.

Products.

Manufacturers of FIREPROOF VAULT FRONTS and VAULT WORK; FIREPROOF SAFES.

Also Deposit Boxes, Vault Equipment and Wall Safes for apartment buildings.

Fireproof Vault Fronts.

Specifications—The contractor shall provide and place in position fireproof vault fronts known as the No. 1-AA manufactured by THE HALL'S SAFE Co., P. O. Box 846, Cincinnati, Ohio. The wall opening to be 79 in. high, 32 in. wide, 20 in. deep and must be built square, plumb and level. The single outer door to have 4 cross bolts, 1 up and 1 down, locking with a 4-tumbler combination lock, swinging on pin hinges, and the double inner doors to have flat bolts and key lock.

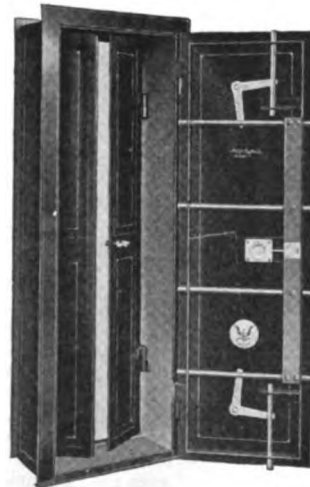
All handles, tips, dials and bolts to be nickelplated. Outer and inner doors to be painted black with ornamentation. Interior of vestibule to be painted a light color.

Installation—Setting of vault fronts is so constructed that they can readily be placed in position by any mechanic after the vault walls are built and plastered, thus affording an opportunity for the walls to dry out thoroughly before the doors are set and avoid injury to the finished parts by dampness, plastering, etc.

Closing Device—An added feature to Hall vault doors is the self-closing device, which operates and closes the inner doors automatically. When the outer door closes this device eliminates the possibility of leaving the inner doors open when they should be closed. This closing device is not applied to the standard vaults unless specified, and an additional charge will be made.

Construction—The standard vault fronts are constructed for wall openings 79 in. high, 32 in. wide and 20 in. deep; thickness of door plates, number of bolts, bolt frames and weights as shown in table. The outer and inner door frames are fastened together with No. 16-gage steel plates, forming vestibule reinforced at all corners with $1\frac{1}{2}$ by $1\frac{1}{2}$ by $\frac{1}{8}$ -in. angles and having a 3 by $\frac{1}{4}$ -in. sill bar.

The outer frames or architraves $3\frac{1}{2}$ by $\frac{3}{8}$ in., bolts 1-in. diameter, lock plate $4\frac{1}{2}$ by $\frac{3}{8}$ in., inner doors No. 14-gage, reinforced with $1\frac{3}{4}$ by $\frac{1}{8}$ -in. panel bars; the back flanges are removable 3 by $\frac{1}{4}$ in.



NO. 1-AA FIREPROOF VAULT FRONT



TRADE-MARK

quired height entirely independent of the building walls and floor construction. Walls to be of any desired thickness but not less than 8 in. thick and if of brick to be laid up in portland cement mortar. Added security against destruction by fire will be obtained by providing a lining of brick or hollow tile not less than

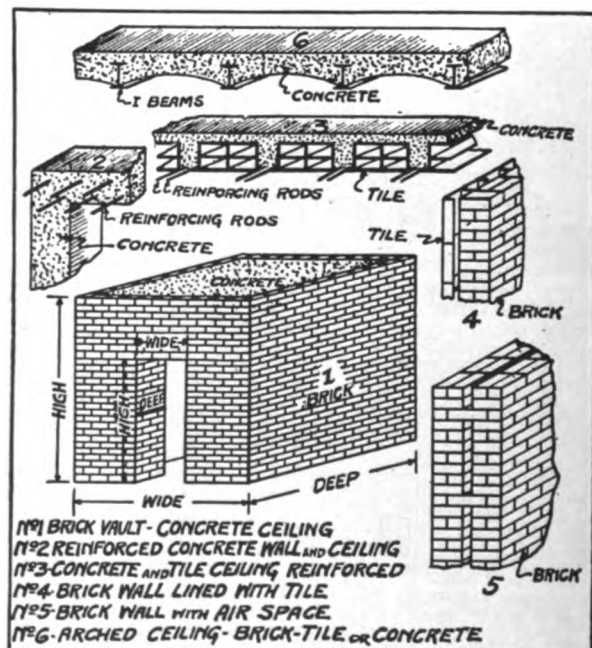
4 in. thick, with 2-in. air space between lining and outer wall.

Where hollow tile is used for walls in fireproof vault construction the tile should be made of good refractory clay, burned uniformly to a high temperature and set together with portland cement mortar. The tile to be not less than 6 in. thick and to weigh not less than 44 lbs. per cu. ft.

Note: Burglarproof vaults are usually of special construction. Information in reference to the construction of burglarproof vaults furnished on application.

DATA, FIREPROOF VAULT FRONTS

No.	Wall opening, in.			Door plate, in.	Door on edge, in.	Bolts			Bolt frames, in.	Door	Weight, lbs.
	High	Wide	Deep			Cross	Up	Down			
Tile A	76	26	13½	¾	¾	2	1	1	Angle, 2x2x ¼	Single	500
1-AA	79	32	20	¾	¾	2	1	1	Angle, 2x2x ¼	Single	635
1-AAA	79	32	20	¾	¾	3	2	2	Angle, 2x2x ¼	Single	635
3-C	79	32	20	¾	¾	2	2	2	Bar 1½x ¼	Single	1050
3-D	79	32	20	¾	¾	4	1	1	Bar 1½x ¼	Single	950
10-AA	82	44	24	¾	¾	8	2	2	Angle, 2x2x ¼	Double	1000



TYPICAL DETAILS OF FIREPROOF VAULT CONSTRUCTION

Construction Data for Fireproof Vaults.

Floors and Ceilings—Floors and ceilings should be strongly constructed with approved fireproof material such as concrete, hollow tile or brick. Ceilings should be of sufficient strength to withstand falling weights.

Walls—The most satisfactory construction for fireproof vault walls consists of brick or concrete walls starting at the foundation and built up to the re-



NO. 10-AA FIREPROOF VAULT FRONT

Hall's Fireproof Safes.

The Hall's patent filling used in the manufacture of Hall's safes is the greatest improvement in safe making for sixty years. Safes made under this patent are as near fireproof as is possible for human ingenuity to invent.

Construction—The Hall's patent filling is made up of hermetically sealed cement tubes in conjunction with Hall's special cement filling. The tubes are made in our works, under our formula and on forms of our design. They are placed within the space between the inner and outer shells and in the doors between the outside

plate and the inside cap. The special cement filling is poured in around them, making a safe with cement filling in addition to air space in the filling, giving a double security in case of fire, as illustrated.

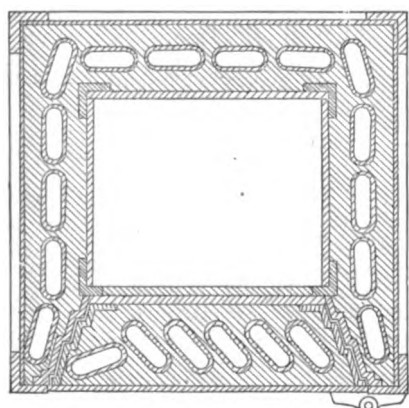
Advantages—By the use of these tubes a stronger, lighter, fireproof safe is obtained; one free from dampness, with no possibility of swelling, which heretofore has been the bane of safe makers.

Sizes—Hall's fireproof safes are made in all types, with any desired arrangement of inside cabinet construction.

Made in all sizes for any use. Write for catalogue.



DETAILS OF THE HERMETICALLY SEALED TUBES USED IN FILLING



DETAILS OF HALL'S PATENT FILLING CONSTRUCTION
Method of placing tubes in walls

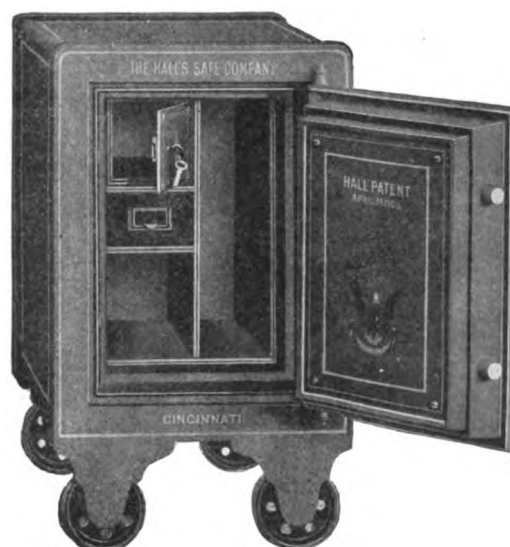


SAFE NO. 360 (WITH INSIDE DOORS)

Combination lock-key lock if desired—size 53½ by 34½ by 27½ in. (outside dimensions)



SHOWING HALL'S PATENT FILLING IN WALLS AND DOOR



SAFE NO. 200 (NO INSIDE DOOR)

Combination lock-key lock if desired.
Size 27½ by 16½ by 18 in. (outside dimensions)

DURAND STEEL LOCKER COMPANY

TELEPHONE:
CENTRAL 6302

1538 Fort Dearborn Bank Building
CHICAGO, ILL.

NEW YORK OFFICE, 515 Park Row—Telephone, Barclay 9005, 9006

FACTORY, CHICAGO HEIGHTS, ILL.

AGENCIES

ATLANTA, GA., FIELDER & ALLEN Co., 44 Marietta Street—Telephone, Ivy 800
BALTIMORE, MD., H. G. LELAND, P. O. Box 766—Telephone, St. Paul 4053
BOSTON, MASS., C. S. ANGELL Co., 128 Pearl Street—Telephone, Fort Hill 6676
BUFFALO, N. Y., WM. KRAETZ, 256 Main Street, Telephone—Seneca 3554
CHATTANOOGA, TENN., CAMPBELL SALES Co., 823 Chestnut Street—Telephone, Main 3277
CLEVELAND, OHIO, A. S. HOLDEN, 504 Swetland Building—Telephone, Prospect 1887
COLUMBUS, OHIO, DICK OFFICE SUPPLY Co., 202 Hartman Building—Telephone, Bell 5439
DAYTON, OHIO, DICK OFFICE SUPPLY Co., 11 West First Street—Telephone, Main 519
DENVER, COLO., HINE DESK & FIXTURE Co., 1640 California Street—Telephone, Main 8134
DETROIT, MICH., C. A. MARION, 816 Union Trust Building—Telephone, Main 2598
EL PASO, TEX., SHEEHAN-NORTH Co., 324 Mills Building—Telephone, 802
ERIE, PA., H. P. WELLER SUPPLY Co., 1302 Peach Street—Telephone, Bell 70
GRAND RAPIDS, MICH., A. C. SLOSS, 912 Grand Rapids Savings Bank Building—Telephone, Main 2116
INDIANAPOLIS, IND., J. J. TUITE Co., 501 Fidelity Trust Building—Telephone, Main 2476
KANSAS CITY, MO., McCORD-VAN BRUNT & COMPANY, 301 Security Building—Telephone, Harrison 4814
LOS ANGELES, CAL., E. L. BOWEN, 908 South Hill Street—Telephone, Sunset 531
LOUISVILLE, KY., BELKNAP HARDWARE & MFG. Co., 13th and Washington Streets—Telephone, Main 2500
MILWAUKEE, WIS., ROBT. B. PETLEY, 1316 Majestic Building—Telephone, Grand 1683
MINNEAPOLIS, MINN., H. S. NESBITT Co., Builders Exchange—Telephone, N. W. Main 1268
OKLAHOMA CITY, OKLA., C. C. TALIAFERRO, 201 Scott Thompson Building—Telephone, Maple 1128
PITTSBURGH, PA., M. H. BUFFINGTON Co., 132 Seventh Street—Telephone, Grant 3986
PORTLAND, ORE., GLASS & PRUDHOMME Co., 65 Broadway—Telephone, Broadway 1158
ROCHESTER, N. Y., ZIMMERLI BUSINESS FURNITURE CORPORATION, 156 Main Street, East—Telephone, Stone 5510
SALT LAKE CITY, UTAH, CHARLES S. PULVER, 504 Scott Building—Telephone, Wasatch 3726
SAN DIEGO, CAL., BENTON ROOF Co., 250 Fifth Street—Telephone, Main 4574
SAN FRANCISCO, CAL., GEO. H. TRASK, 76 Sacramento Street—Telephone, Sutter 3474
SEATTLE, WASH., S. W. R. DALLY, 332 Pioneer Building—Telephone, Main 678

Products.

STEEL LOCKERS and WARDROBES; STEEL SHELVING, RACKS and BINS for factories, warehouses, foundries and stores.

Also manufacturers of Stationery and Storage Lockers.

Specifications for Durand Steel Lockers

Standard Sizes—

Width, 12", 15", 18", 24" and 36".

Depth, 12", 15", 18" and 24".

Height, double tier, 36" or 42"; single tier, 60" or 72".

All except the 42" lockers stand on 6" legs; this must be added to get the over all height. The 42" lockers stand on 3" legs.

Material and Construction—Locker doors to be made of No. 16 U.S.S. gage steel, and ventilated by means of louver vents or round hole perforations. Doors to be flanged on all four edges for reinforcement, and all doors 18" or wider to have additional reinforcement consisting of a $\frac{3}{4}$ " x $\frac{3}{4}$ " x $\frac{1}{8}$ " angle, electrically welded to inside of door in the shape of a K-brace.

Doors to be hung in a strong and rigid frame composed of 1" x 1" x $\frac{1}{8}$ " angles, welded together at the corners. Angles are to be machine polished before enameling.

Doors to be hung by means of strong and secure hinges (two to a 36" door, three to a 42" door, three to a 60" door and four to a 72"

door). Hinges to be firmly riveted both to door and to door frame to prevent any hinge from working loose.

Body of locker to be made of not lighter than No. 22 U.S.S. gage sheet steel. Backs to be flanged and firmly bolted to partitions and ends by means of special bolts, spaced not over 8" apart on centers. All bolts exposed on ends to be flat head end slotless.

Bottoms to be made flush with front cross piece, so that dust and dirt settling on bottom can be easily brushed out.

Tops to be flat. (They can be made slanting, thus making locker 6" higher at back than at front, and the average extra cost for slanting top is 8% of the total cost of locker.)

Lockers to be built on the unit principle. Each door having its own complete frame surrounding that door. All similar parts cut to gage and interchangeable. All shearing, punching and perforating shall be done so as to leave no burrs or fins anywhere exposed.

Locking—Doors to be locked by means of Durand multiple locking device, locking door at two points on 36" or 42" lockers and at three points on 60" or 72" lockers. This device to be operated by lift handle; handle to be malleable. The following types of locks can be furnished to control this multiple locking device:

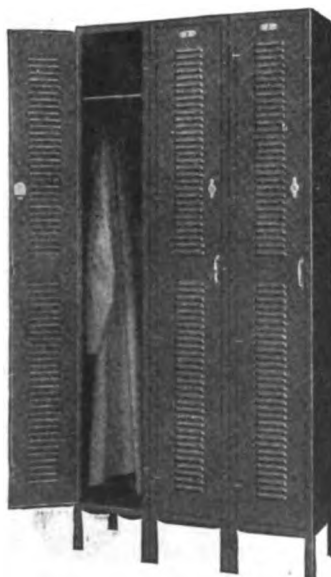
Flat key locks.

Combination locks.

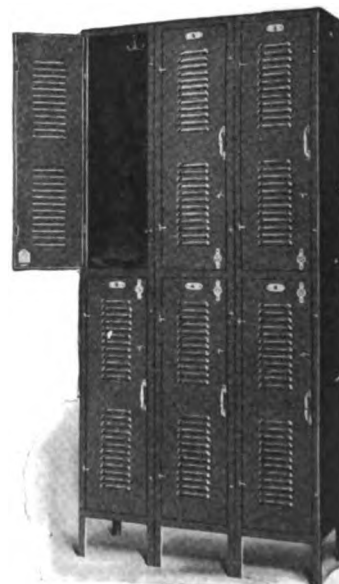
Padlocks.

Or if no padlocks are desired, just padlock attachment without locks.

Equipment—All 60" and 72" lockers to be fitted with shelf spaced 10" from the top. All lockers fitted with electrogalvanized rustproof hooks. Lockers measuring 12" wide and 12" deep to be fitted with 4 hooks; lockers measuring 15" wide and 15" deep to be fitted with 5 hooks; lockers measuring 18" wide and 18" deep or deeper to be



SINGLE TIER LOCKERS
Type F. L. S.



DOUBLE TIER LOCKERS
Type F. L. D.

fitted with 7 hooks. Lockers measuring 24" deep to be also fitted with cross rod for coat hangers.

Numbering—Each locker to be numbered by means of a brass plate with sunken and black enamel figures.

Finish—All parts to be thoroughly cleaned and then given 2 coats of best quality baked enamel, either black or olive green; each coat applied by dipping, and baked on separately.

Shipment—Lockers are usually shipped knocked down, and in this way take the lowest freight rate; all parts are well crated.

On large equipments the company can also arrange to send mechanics to the building and install the lockers ready for use.

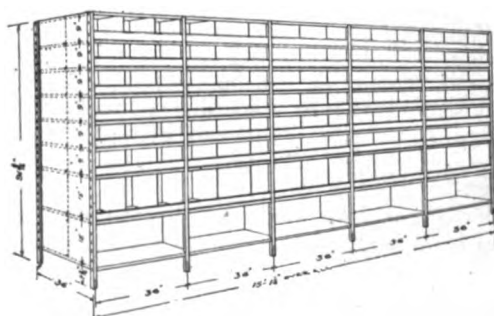
Durand Steel Rack Construction.

Durand steel racks are simple in construction and interchangeable throughout and are made in two types: Durand Standard and Durand Skeleton.

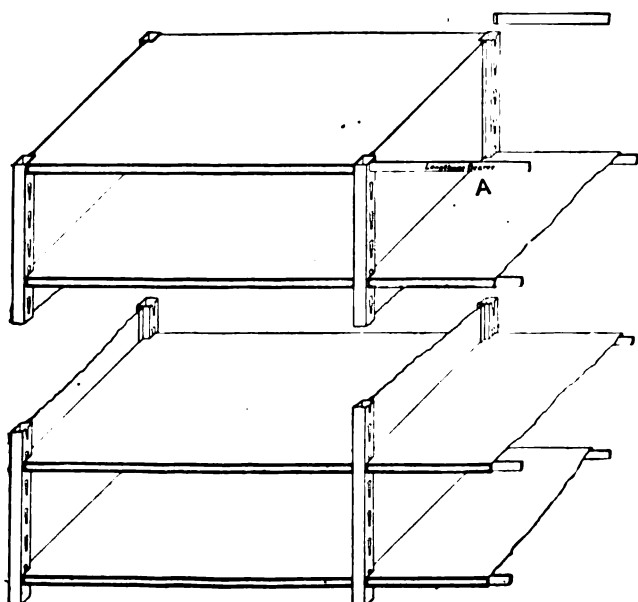
Durand Standard—A closed type of shelving consisting of uprights and shelves, to which can be added interchangeable compartment dividers, bin fronts, counters, backs and label holders.

Durand Skeleton—An open boltless structure for storage of patterns and packaged stock.

Durand Shelves—Both standard and Skeleton types have sustained a load of 1000 lbs. per sq. ft. without exceeding their bending strength, and will carry an unevenly distributed load of 200 to 400 lbs. per sq. ft., depending on their area, without taking a permanent deflection.



ASSEMBLY OF DURAND STEEL RACKS



ISOMETRIC VIEW OF STANDARD RACK, SHOWING DETAILS OF CONSTRUCTION

A. Lengthwise bearer

Specifications for Durand Steel Racks.

Standard Uprights—To be composed of two 1¼" square tubes of No. 16 U.S.S. gage steel with a flat sheet welded between. (These sheets vary from No. 22 to No. 16 U.S.S. gage, according to the depth and height of the uprights.)

Skeleton Uprights—To consist of two 1¼" square tubes.

All uprights punched on 3" centers for shelf adjustment.

Standard Shelves—Shelves in standard racks to be made of No. 16 U.S.S. gage steel flanged downward 1" and back ⅝" at front and back, and downward 1" at sides. Front and back of shelves to be carried on, and reinforced by, ¼" x 1" high carbon bars (lengthwise bearers) and at sides fastened to the uprights by ¼" bolts.

Skeleton Shelves—Shelves in skeleton racks to be flanged at front and back the same as standard shelves, and at sides downward. These shelves to be carried front and rear on ¼" x 1" high carbon bars (lengthwise bearers) and at sides on 1" x ⅝" x ⅛" angles (crosswise bearers), no bolts being used.

Lengthwise Bearers—To be ¼" x 1" rolled steel bars grooved at ends, grooves being tapered so that they are a wedging fit in the shelf adjustment slots.

Crosswise Bearers—To be 1" x ⅝" x ⅛" angles having tapered notches that wedge on lengthwise bearers and lugs that engage in slots in upright tubes. Long legs of angles have tangs pressed out to bear side flanges of shelves.

Backs—To be a flat sheet varying in gage according to size.

Bin Fronts—To be formed of No. 16 U.S.S. gage so that a label card the full length of front can be inserted if desired, and fastened to uprights by clips that enter shelf adjustment slots and bolt to bin fronts.

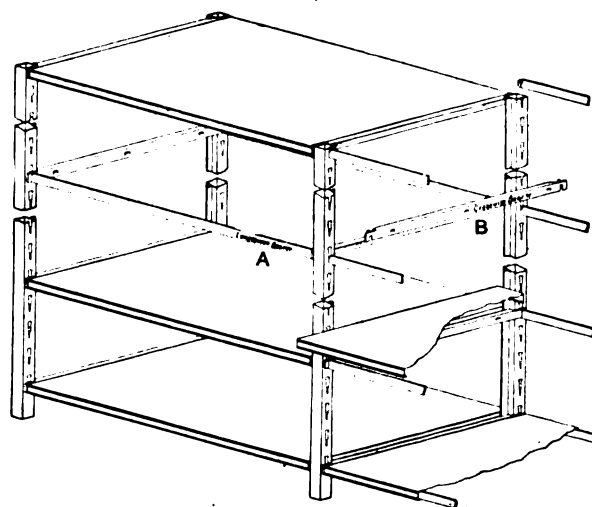
Label Holders—To be ⅝" wide and full length of shelf; drawn from No. 22 U.S.S. gage steel.

Finish—Black japan and olive green enamel baked on are this company's two standard finishes.

Black will stand a higher temperature in baking and therefore is recommended where shelves are to receive rough usage.

STANDARD SIZES STEEL RACKS

Uprights.....	Depth..	12"-15"-18"-21"-24"-30"-36"-42"-48"
	Height..	49 ½"-55 ½"-61 ½"-67 ½"-73 ½"-79 ½"-85 ½"-91 ½"-109 ½"-121 ½"-133 ½"-145 ½"
Shelves.....	Width..	24"-30"-36"-42"
	Depth..	12"-15"-18"-21"-24"-30"-36"-42"-48"
Backs.....	Width..	24"-30"-36"-42"
	Height..	49 ½"-55 ½"-61 ½"-67 ½"-73 ½"-79 ½"-85 ½"-91 ½"-109 ½"-121 ½"-133 ½"-145 ½"
Bin fronts.....	Width..	24"-30"-36"-42"
	Height..	3"-4"-5"-6"
Crosswise dividers..	Depth..	12"-15"-18"-21"-24"
	Height..	6"-9"-12"-15"-18"-21"-24"-27"-30"
Lengthwise dividers..	Length..	24"-30"-36"-42"
	Height..	6"-9"-12"-15"-18"-21"-24"-27"-30"



ISOMETRIC VIEW OF SKELETON RACK, SHOWING DETAILS OF CONSTRUCTION

A. Lengthwise bearer. B. Crosswise bearer

FRED MEDART MFG. CO.

Manufacturers of Steel Lockers, Shelving, Racks and Bins

ST. LOUIS, MO.

BRANCH OFFICES

NEW YORK, N. Y., 52 Vanderbilt Avenue

SAN FRANCISCO, CAL., Rialto Building

Products.

STEEL LOCKERS, SHELVING, RACKS and BINS.

Also manufacturers of Gymnasium and Playground Apparatus.

Steel Lockers.

Medart lockers are built on the unit principle with all parts interchangeable.

Doors and frames are of No. 16-U. S. gauge pickled, re-rolled and patent leveled sheet steel; balance of locker is No. 22-gauge.

Door frames formed into channel shape with rounded edges. Doors flanged and paneled. All joints spot-welded and ground smooth, making joints invisible after painting. All doors hang on heavy hinges properly spaced to provide substantial support. Double tier doors provided with strong 2-point locking device; single tier doors have 3-point locking device, with individual keys or padlocks. Combination locks furnished special.

Ample ventilation provided by either louvered or perforated doors.



MEDART STEEL LOCKER



TYPICAL INSTALLATION OF MEDART STEEL LOCKERS

All lockers finished with 2 coats of either black or olive green enamel, each baked on separately.

Completely equipped with coat hooks, hangers and shelves provided in different combinations in the various sizes and types of lockers.

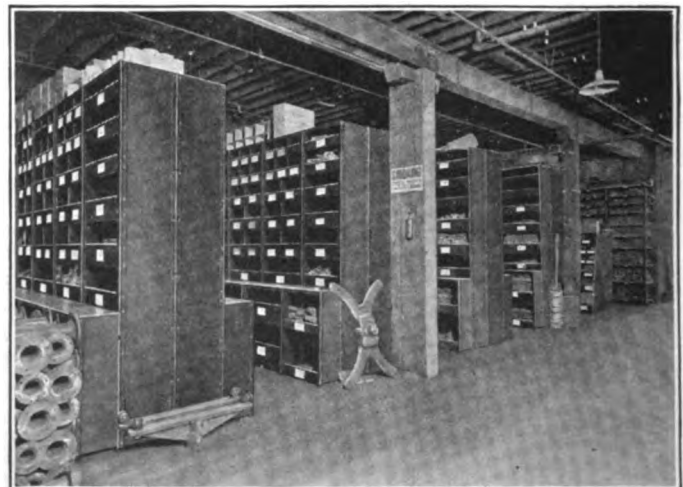
DATA. MEDART STEEL LOCKERS

Preferred sizes					Standard sizes				
Cat. No.	Size, in.			Tier	Cat. No.	Size, in.			Tier
	Width	Depth	Height			Width	Depth	Height	
320	12	12	36	Double	340	15	12	36	Double
321	12	15	36	Double	341	15	15	36	Double
322	12	12	42	Double	342	15	15	36	Double
323	12	15	42	Double	343	15	12	42	Double
324	12	12	60	Single	344	15	15	42	Double
325	12	15	60	Single	345	15	15	42	Double
326	12	18	60	Single	346	15	12	60	Single
327	12	12	72	Single	347	15	15	60	Single
328	12	15	72	Single	348	15	15	60	Single
329	12	18	72	Single	351	15	12	72	Single
330	15	15	72	Single	...	...	...	...	...
331	15	18	72	Single	...	...	...	...	...
332	18	18	72	Single	...	...	...	...	...
333	18	24	72	Single	...	...	...	...	...

Steel Shelving.

Medart shelving is built of standardized parts, easily bolted together. Shelf and partition adjustment can be readily made to suit any special requirement; if necessary, entire shelving can be easily knocked down and re-assembled elsewhere. All shelves made of No. 18-U. S. gauge sheet steel, flange stiffened. Uprights of No. 14-U. S. gauge. Partitions and backs of No. 22-U. S. gauge.

Shelving is furnished according to weight of materials to be stored. State approximate load per square foot.



TYPICAL INSTALLATION OF MEDART STEEL SHELVING

Engineering Department.

The services of this company's engineering department are freely extended to any one planning an installation of any of the products the company manufactures.

Because of a long and varied experience, this company is very often able to offer suggestions that lead to important economies in space and installation.

THE FAIRBANKS COMPANY

Steel Factory Equipment

ADMINISTRATIVE OFFICES

416 Broome Street
NEW YORK, N. Y.

For Branch Offices, See Page —

Products.

STEEL FACTORY EQUIPMENT: Shelving, Bins, Bar Racks, Tool Cabinets, Tool Stands, Tote Boxes, Desks, Tables, Bench Legs and Drawers, Lockers and Lathe Pans.

For Super-Diesel Oil Engines, see page 851; for Trucks, Wheelbarrows, Cars and Dragscrapers, see page 1220.



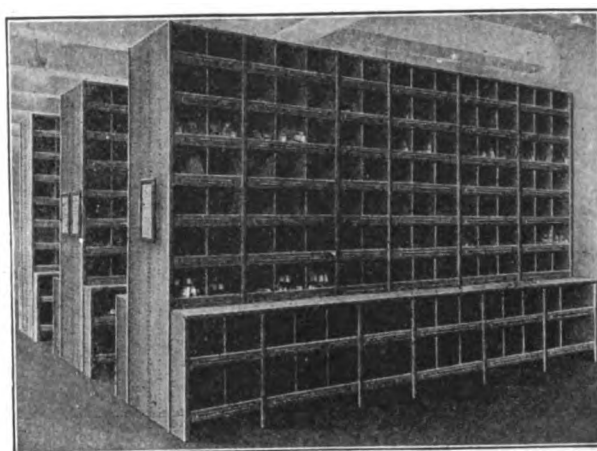
TRADE-MARK

The "Fairbanks O. K."

The "Fairbanks O. K." tag, a mark of merit, is attached to every Fairbanks product. It protects the purchaser against faulty equipment and assures him of standard quality, fair prices and dependable after-service.



STEEL FACTORY DESK



STEEL SHELVING



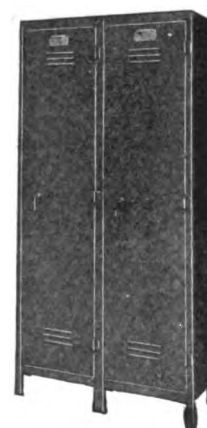
STEEL TOOL STAND



STEEL BENCH DRAWER



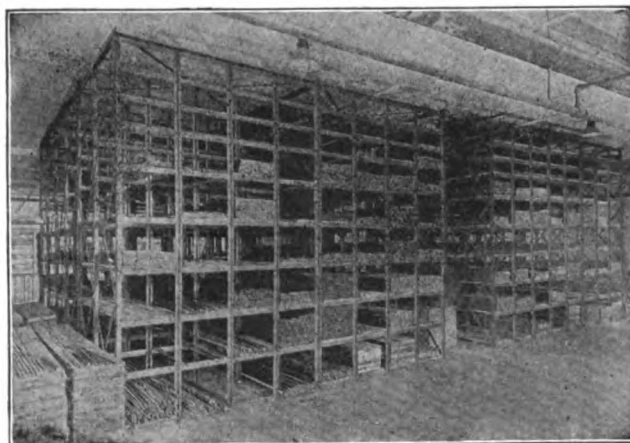
WORK BENCH EQUIPPED WITH STEEL BENCH LEGS AND STEEL DRAWER



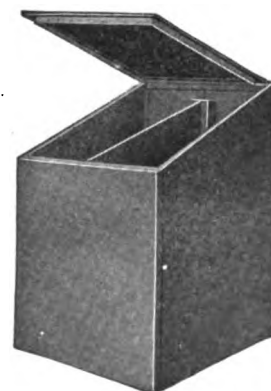
STEEL LOCKERS



STEEL TOOL CABINET



STEEL BAR RACKS



STEEL BIN FOR WASTE AND PACKING MATERIALS

FEDERAL STEEL FIXTURE COMPANY

TELEPHONE:
FRANKLIN 4327

CHICAGO, ILL.

CHICAGO OFFICE, 607 Security Building
DETROIT OFFICE, 913 Dime Bank Building
MILWAUKEE OFFICE, 1334 First National Bank Building

NEW YORK OFFICE, 706 Park Row Building
CLEVELAND OFFICE, 403 Marion Building
MINNEAPOLIS OFFICE, 609 Fifth Avenue, South

Products.

FEDERAL STEEL LOCKERS and SHELVING.

Also manufacturers of Metal Racks, Bins, Boxes, Filing Cabinets, Metal Furniture, Hospital Equipment.

Federal Unit Steel Lockers.

Simple in design, with all parts thoroughly standardized, interchangeable and uniform. The welded angle steel frame and special overlap door absolutely guarantee against door troubles. The Federal locker has fewer parts, erects more easily and is clean cut, handsome and strong.

Specifications—DOORS—Full pickled, cold rolled furniture steel, No. 16 U. S. gauge (.0625 in. thick) if 15 in. wide by 72 in. high or larger; smaller sizes No. 18 U. S. gauge (.05 in. thick). Doors shall have reinforcing panels of hard steel angle bars ($\frac{3}{4}$ by $\frac{3}{4}$ by $\frac{3}{32}$ in.) riveted or welded to reverse side. Doors shall overlap locker frame and allow $\frac{1}{2}$ -in. clearance between door panel and locker frame to prevent binding.

FRAMES—Front frames shall be of hard angle steel (1 by 1 by $\frac{1}{4}$ in.) assembled by oxy-acetylene weld. They shall be unit in principle to give absolute squareness and rigidity and allow for rearrangement of lockers.

BODY—Locker body shall be pickled and cold rolled steel No. 22 U. S. gauge (.0312 in. thick). Single row lockers shall have angle steel framed backs ($\frac{3}{4}$ by $\frac{3}{4}$ by $\frac{3}{32}$ in.) for each second unit. All parts shall be properly flanged or braced to give uniform strength.



Tops—Tops shall be inserted below top cross angles at front and back and shall overlap adjoining top 1 in. Slant tops shall have 6-in. pitch with $\frac{1}{4}$ -in. cave at front.

Bottoms—Bottoms shall be flush and supported by 1 by 1 by $\frac{1}{8}$ -in. angle reinforcement.

SHELVES—Shelves shall be 9 in. below top. They shall be flanged on all sides with double $\frac{1}{2}$ -in. smooth edged flange at front.

LOCKING DEVICE—Locking device shall be 3-point, operating with quarter turn of handle to engage locker frame immediately opposite lock and on top and bottom cross bars. Locking bars shall be $\frac{1}{2}$ in. by No. 10 gauge stock. Door handles shall be provided with loop for padlock. (Quote extra for Eagle, Miller or Yale R381 $\frac{1}{2}$ -master-keyed locks with 2 keys each, or Miller 3332 B combination lock.

HINGES—Hinges shall be 2 $\frac{1}{2}$ -in. fixed pin heavy steel butts with concealed flanges. 72-in. doors shall have 3 hinges, smaller doors 2 hinges.

HOOKS—Hooks shall have sherardized, rustless finish. Locker backs shall have 2-point hook for coat and hat. Sizes 15 in. or less shall have a single prong hook attached with 2 bolts. Larger sizes shall have special 2-prong hooks with $\frac{3}{8}$ -in. steel rod for coat hanger on 60-in. or 72-in. sizes. A 2-prong ceiling hook shall be supplied if coat rod is omitted.

LEGS—All front legs shall have a simple screw adjustment (to allow for any unevenness in floor). Back legs in single row locker sections shall be of $\frac{3}{4}$ -in. angle steel and shall be integral part of locker frame.

VENTILATION—Doors shall have embossed, hooded or louver ventilators. They shall be 7 in. long and 1 in. apart on centers with $\frac{1}{4}$ -in. opening at lower edge. There shall be nine embossings near top and also near bottom.

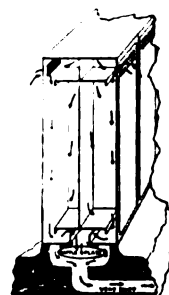
NUMBERS—Lockers shall be numbered with black figures $\frac{3}{4}$ in. high sunk in polished brass plates near top of door.

FINISH—Two-coat olive green or pigment black enamel baked at a temperature of 300° Fahr.

Standard Sizes—Any combination of dimensions as listed:

12 in. wide, 12 in. deep, 36 in. high, on 6-in. legs
15 in. wide, 15 in. deep, 42 in. high, on 6-in. legs
18 in. wide, 18 in. deep, 48 in. high, on 6-in. legs
60 in. high, on 6-in. legs
72 in. high, on 6-in. legs

Note: 36-in. and 42-in. sizes made 2 lockers high.



SECTION OF
FEDERAL
VENTILATED
LOCKERS



PLAN OF CEMENT BASE
FOR VENTILATED
LOCKERS



Section of
Door and
Locker
Frame



Key Lock



Time Lock



Adjustable Legs
Cove and Regular



Regular
Door Handle



Handle with
Padlock Loop



Side Hook



Coat Rod Hook



Ceiling
Hook

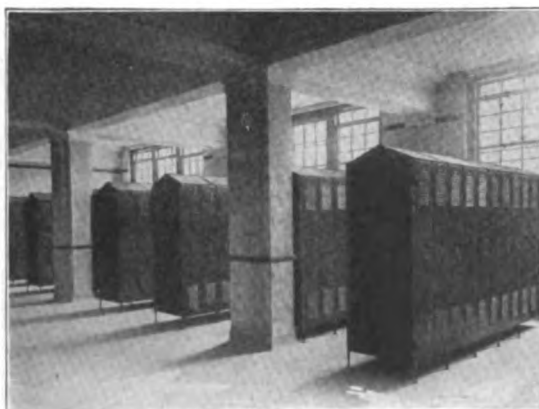


Back
Hook

PARTS OF FEDERAL UNIT STEEL LOCKERS



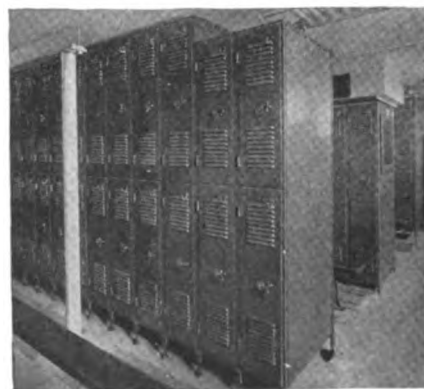
SINGLE
TIER
LOCKER



FEDERAL LOCKERS, SINGLE TIER WITH
SLANT TOPS



DOUBLE
TIER
LOCKER



DOUBLE FEDERAL LOCKERS, DOUBLE TIER WITH
SINGLE AND DOUBLE TIER IN
BACKGROUND



FEDERAL
EXPANDED
METAL
LOCKERS

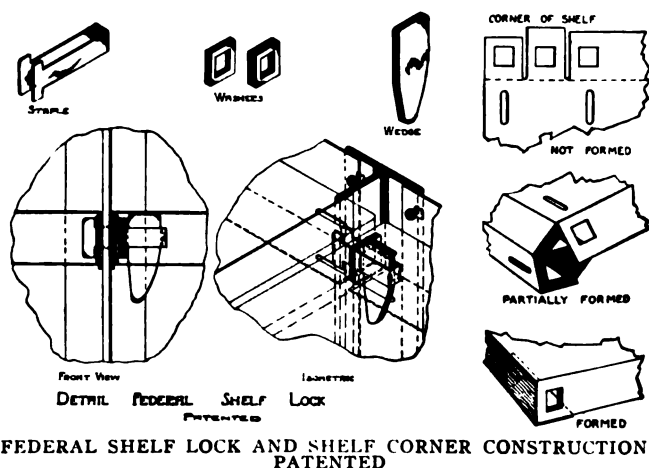
Federal Steel Shelving and Racks.

Simple in design, with all parts thoroughly standardized, interchangeable and uniform. The patented shelf formation and patented shelf adjustment give 32% more load capacity, and make adjustment actually possible, practical and probable.

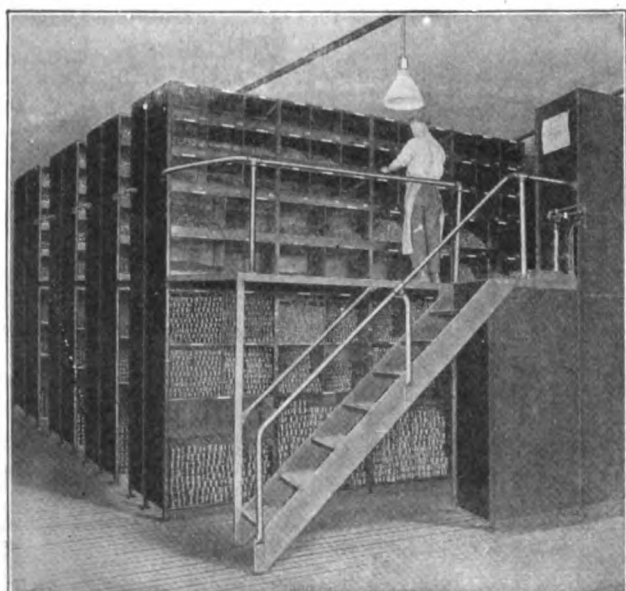
Standardization—We use but one type of construction. From the open rack (tee verticals and shelves) to the entire equipment (including closed sides, backs, bin fronts, shelf dividers, box dividers and stops, doors either hinged or sliding, ledge panels, ledge shelves, etc.), there is not a single item of parts that must be substituted or discarded.

Adjustability, Time and Labor Saving—The shelf attaches with a hammer blow and is released for re-adjustment in a similar way. This very simplicity economizes time, by enabling the storekeeper to provide shelf spaces of convenient size—near, handy and get-at-able.

Special Service—The Engineering Department is ready at all times to co-operate in designing and planning equipment to carry loads and economically handle and store the parts.



FEDERAL SHELF LOCK AND SHELF CORNER CONSTRUCTION, PATENTED



FEDERAL STEEL SHELVING, MEZZANINE FLOOR AND STAIRWAY
DIAMOND CHAIN AND MFG. CO., INDIANAPOLIS, IND.

Specifications—GENERAL—All parts shall be uniform and interchangeable. Each part shall adjust independently. The steel shall be a special rerolled stock which shall be stretched into shape so that all surfaces shall be flat, smooth and square. There shall be no raw cutting edges. Double row sections shall be such that they may be separated and used in single row arrangement.

UPRIGHTS—The vertical load shall be carried by 1½ by 1½ by ⅛-in. hard steel T-bars, which shall provide for 3-in. [optional 1½-in.] vertical shelf adjustment (closed uprights shall include No. 20 U. S. gauge [.0375 in. thick] cold rolled sheet steel).

SHELVES—Shelves shall be of No. 18 U. S. gauge (.05 in. thick) cold rolled flat steel properly reinforced to support 150 lbs. per sq. ft. of shelf [optional—specify maximum safe load required.].

All shelf flanges shall be 1 in. deep with 1-in. return at front and rear. Flanges shall be full section, continuous and locked together under compression with the vertical T-bars. To prevent tearing or shearing, square washers ⅞ by 1/10 in. thick shall reinforce the shelf flange corners.

BACKS—Closed backs shall be of No. 20 U. S. gauge (.0375 in. thick) cold rolled steel and shall attach so that they may be added or removed without moving rack sections.

Double row shelving shall have full length backs.

BIN FRONTS—Bin fronts shall be of No. 18 U. S. gauge (.05 in. thick) cold rolled steel. They shall overlap and engage the shelf or the bin front immediately below.

SHELF DIVIDERS—The shelf or compartment dividers shall be of No. 20 U. S. gauge (.0375 in. thick) cold rolled steel. They shall have ¼-in. vertical beads and shall attach through the shelf with no raw flanges exposed.

LEDGE SHELVES—Ledge shelves and ledge uprights shall be of same materials as main sections. They shall attach with a close smooth fit to front of main equipment.

LABEL HOLDERS—Label holders shall be of No. 24 U. S. gauge (.025 in. thick) steel. They shall be ⅞ in. high [optional 1⅞ in.], and shall extend entire length of shelf opening.

DOORS—All doors, whether hinged or sliding, shall be of No. 18 U. S. gauge (.05 in. thick) cold rolled, flat steel. They shall overlap and be so constructed that they can not bind.

Door hinges shall attach to main vertical adjustment holes so that doors may be added to any part of equipment entirely without special fitting, filing or drilling.

Sliding doors shall travel in double steel channels, shall have ball bearing rollers, and operate freely and easily.

ENAMEL FINISH—The entire shelving shall have an olive green [optional—pigment black] baked enamel finish which shall be applied after machining is completed and to surfaces thoroughly clean and free from rust.

STANDARD SIZES FEDERAL SHELVING PARTS

PART NO. 1. UPRIGHT PARTITIONS
Heights. 48"-54"-60"-66"-72"-78"-84"-90"-96"-102"-108"-114"-120"-126"-132"-144"-156"-168"
Depths. 9"-12"-15"-18"-24"-30"-36"

PART NO. 11. SKELETON UPRIGHTS
Same as Upright Partitions

PART NO. 2. SHELVES
Widths. 18"-24"-30"-36"-42"-48"
Depths. 9"-12"-15"-18"-24"-30"-36"

PART NO. 3. BACKS
Heights. Same as Upright Partitions
Widths. 18"-24"-30"-36"-42"-48"

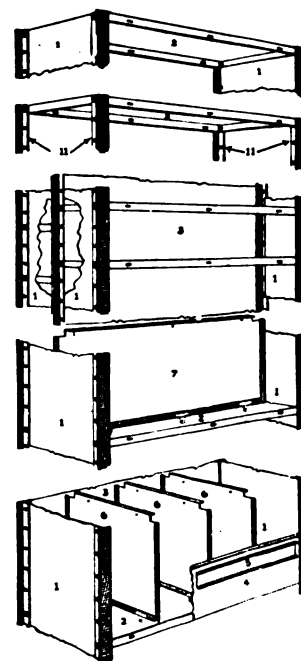
PART NO. 4. BIN FRONTS
Heights. 2"-3"-4"-5"-6"-8"
Widths. 18"-24"-30"-36"-42"-48"

PART NO. 5. LABEL HOLDERS
Heights. ⅞"-1⅞"
Widths. 18"-24"-30"-36"-42"-48"

PART NO. 6. SHELF DIVIDERS, CROSSWISE
Heights. 6"-9"-12"-15"-18"-21"-24"
Depths. 9"-12"-15"-18"-24"-30"-36"

PART NO. 7. SHELF DIVIDERS, LENGTHWISE
Heights. 5"-8"-11"-14"-17"-20"-23"
Widths. 18"-24"-30"-36"-42"-48"

PART NO. 8. LEDGE SHELVES
Widths. 18"-24"-30"-36"-42"-48"
Depths. 12"-15"-18"-24"



CONSTRUCTIONAL VIEWS
FEDERAL STEEL SHELVING

THE HART & HUTCHINSON COMPANY

Steel Lockers

NEW BRITAIN, CONN.

BRANCH OFFICES

BOSTON, MASS., 654 Oliver Building
CHICAGO, ILL., 73 East Lake Street

NEW YORK, N. Y., 501 Fifth Avenue
PHILADELPHIA, PA., Real Estate Trust Building

Products.

STEEL LOCKERS; STEEL SHELVING.

Standard Lockers.

Brief Specification—Metal—All sheet metal used is best grade cold rolled U. S. standard gage, free from scale and buckle. Partitions (intermediate sides and ends), tops, shelves and bottoms No. 21 gage. Backs No. 20 gage. Door frames and doors No. 14 gage.

Door Frames and Backs—Made from one sheet each, flanged 1-in. on both edges, formed at bottom to provide 6-in. legs.

Sides—Securely bolted to door frame and back.

Top Member—Projects over and locks on to front frame, giving a finish. Flat top is standard.

Bottoms—Formed without ledges so they can be brushed out easily.

Locking Device—Operated by rustproof T-handle, engages door frame at 3 points. So arranged that manipulation of latch is impossible when thrown.

Doors—Type "B-C," 6-louvered openings top and bottom; one piece with steel channel reinforcing; hung to door frame with 3 solid 2-in. fast pin butts.

Type "A-C," same as "B-C," except panels are perforated with $\frac{5}{8}$ -in. square holes on 1-in. centers.



Unlocked Position Locked Position $\frac{1}{2}$ SIZE OF LOCK, SHOWING BACK OF DOOR SHOWING LOCK COVER DETAILS

Equipment—All standard lockers have a solid brass, pin tumbler, paracentric master-keyed lock, with 2 keys to each lock; 5000 changes.

Each locker has suitable number of 2-prong rustproof hooks of ramshorn design, a towel or coat hanger rod and a solid brass number plate with $\frac{1}{2}$ -in. numerals etched in black.

Single tier lockers have hat shelf 3 ins. below top with rounded front edge.

No shelf in double tier.

Optional Equipment—21° angle sloping tops. Combination

SIZES AND SHIPPING WEIGHTS
STANDARD LOCKERS

SINGLE TIER				DOUBLE TIER			
Dimensions, ins.			Weight, lbs.	Dimensions, ins.			Weight, lbs.
W	D	H		W	D	H	
12	12	60	65	12	12	36	35
12	15	60	70	12	15	36	40
12	18	60	75	15	12	36	45
15	12	60	70	15	15	36	50
15	15	60	75	15	18	36	55
15	18	60	80	12	12	42	40
18	15	60	80	12	15	42	45
18	18	60	85	15	12	42	50
18	24	60	95	15	15	42	55
24	18	60	100	15	18	42	60
24	24	60	110				
12	12	72	75	12	12	48	50
12	15	72	80	12	15	48	55
12	18	72	85	15	12	48	60
15	12	72	85	15	15	48	65
15	15	72	90	15	18	48	70
15	18	72	95				
18	15	72	95				
18	18	72	100	In double tier style each compartment constitutes a locker.			
18	24	72	115				
24	18	72	125				
24	24	72	135				

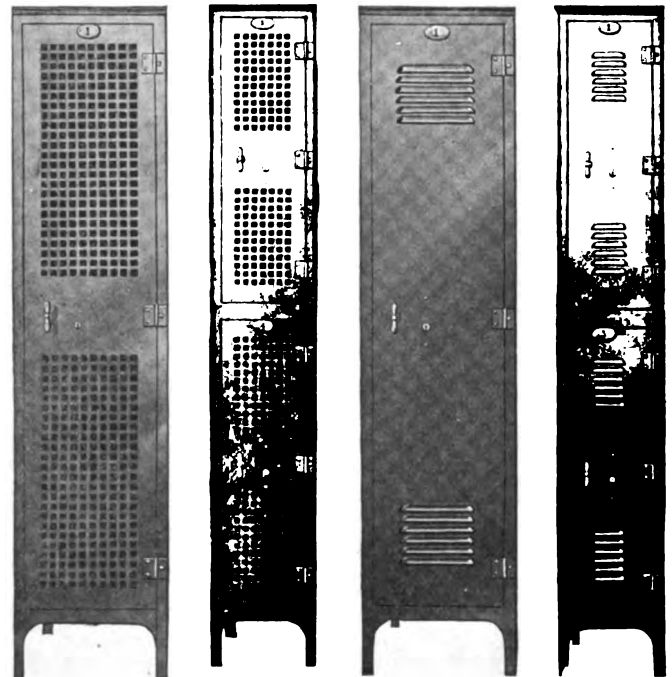
and keyless locks or padlock attachment.

Extra shelves for storage.

Finish—Standard olive green or black. Special finishes are produced to suit requirements.

Sizes—Tabulated sizes are carried in stock for prompt shipment.

Shipped—Knocked down flat, with assembling instructions, or shipped erected and crated, or erected in place by an efficient corps of trained mechanics.



"A-C" Single Tier "A-C" Double Tier "B-C" Single Tier "B-C" Double Tier

REPRESENTATIVE UNITS, "H & H" STEEL LOCKERS

Furnished in sections of any number of units. Details on following page

Standard Universal Unit Shelving.

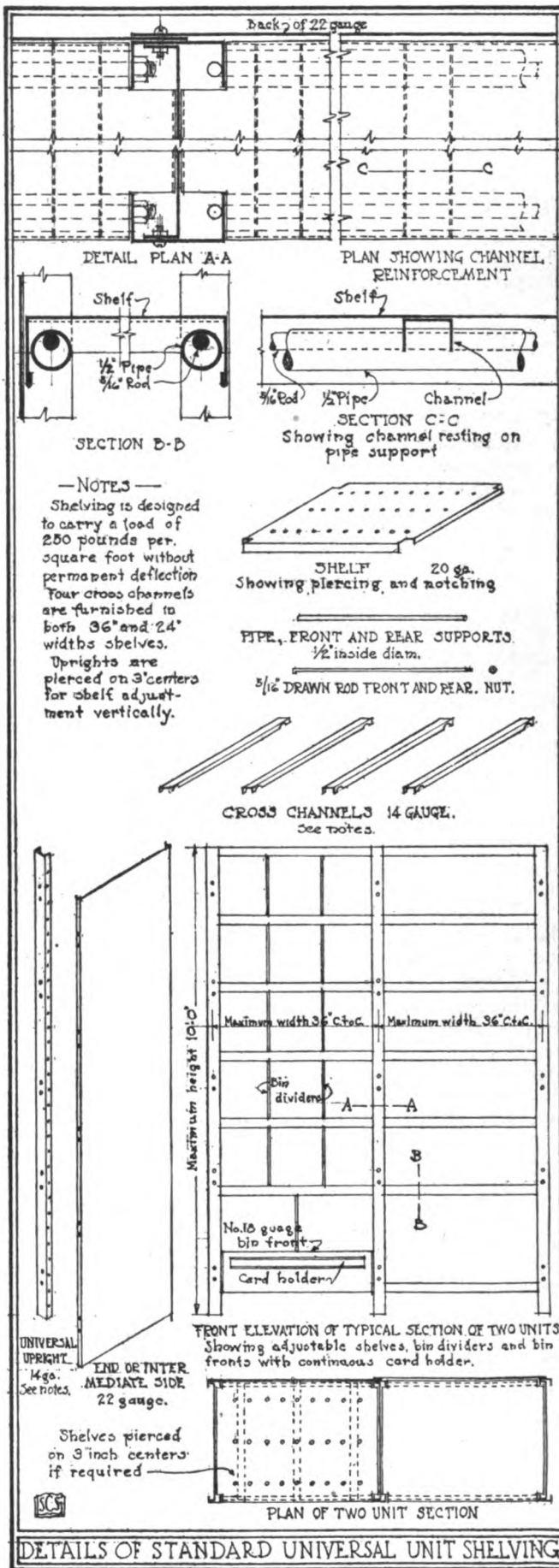
A standard unit type of steel shelving built on the "mill construction" principle. Substantial channel up-rights are bolted together by rods incased in pipe separators and on these rest channel cross supports (or girders) that carry the loads imposed on the shelves. The load is not carried by the shelf but by the structural members under it.

Each section is a separate unit with ends and back; and dividers, bin fronts, card holders, etc., are furnished to suit the desired conditions.

Made in heavy and light weight.

STANDARD DIMENSIONS OF
UNIT SHELVING PARTS
IN INCHES

SHELVES		UPRIGHTS	
Width	Depth	Length	Length
24	12	60	90
27	15	63	93
30	18	66	96
33	21	69	99
36	24	72	102
		75	105
		78	108
		81	111
		84	114
		87	117
			120



LYON METALLIC MFG. CO.

Manufacturers of Steel Shelving and Steel Lockers

AURORA, ILL.

CHICAGO OFFICE, 835 Peoples Gas Building
 NEW YORK OFFICE, 299 Broadway
 CINCINNATI OFFICE, 2305 Union Central Building
 PITTSBURGH OFFICE, 629 Oliver Building

DETROIT OFFICE, 1848 Penobscot Building
 ROCHESTER OFFICE, 1110 Granite Building
 BOSTON OFFICE, 161 Devonshire Street
 PHILADELPHIA OFFICE, 519 Bulletin Building

Products.

LYON ADJUSTABLE and EXTENSIBLE STEEL SHELVING and STORAGE RACKS; STEEL LOCKERS.

Also, Steel Cabinets, including Blue Print and Stationary Cabinets; Steel Boxes, Barrels, Tool Boxes and Bench Drawers; Steel Benches and Tables; Steel Factory Desks, and Steel Enclosure Panels.



Lyon Steel Shelving and Racks.

Standardization—Both "Open" (Skeleton) and "Closed" shelving are assembled from the same standard parts, which are interchangeable, reversible and adjustable. No special construction is required and racks may be easily rearranged to meet changing conditions.

Features of Lyon Standard Shelving—

SIMPLICITY—Weights less for guaranteed load than other types, fewer parts, easy to assemble.

RIGIDITY—Each stack rigid in itself. No fastening to floor or ceiling or bracing required.

STRENGTH—Carries greater guaranteed load per weight of shelving than any other rack made.

SPACE SAVING—Construction requires minimum floor area.

FIREPROOF—Approved by insurance authorities.

Lyon Standard Shelving for Heavy Loads—

Each shelf is put under compression against the face strip by two $\frac{7}{8}$ -in. diameter rods, on which it rests. The one-piece steel face strip is rolled and grips the partition sheet, to which it is spot welded, on both sides.

The face strip design avoids the usual pocket behind the upright. With an ample factor of safety, Lyon shelves will support from 200 to 350 lbs. per sq. ft.

Lyon Commercial Shelving—Shelving consists of three members: uprights, shelves and shelf supporting clips. The shelves may be adjusted on $1\frac{1}{2}$ -in. centers. A screwdriver is the only tool required for erection. The commercial type shelving is particularly designed for loads which do not require the great strength of the standard shelving.

SUGGESTED USES OF LYON SHELVING

Standard Open (Skeleton)	Standard Closed	Commercial Open (Skeleton)	Commercial Closed
For heavy material which piles or stacks	For heavy material requiring bins or pockets	For material which piles or stacks	For material requiring bins or pockets
Metal pattern storage	Public service corporation shops	Wood pattern storage	Repair shops
Wholesale hardware houses	Warehouses	Wholesale drug houses	Garages
Machinists supply houses	Tool rooms	Mercantile establishments	Retail hardware stores
Printing establishments for paper stock	Supply houses	Wholesale groceries	Supplies
Binderries	Machineries	Stationery houses	Repairs
Factories	Factories	For display purposes in retail supply houses	Light hardware
Warehouses	Stock rooms		

Complete plans, specifications and estimates on proposed installations will be furnished without charge.

SIZES OF LYON STANDARD RACK PARTS

PART NO. 1. UPRIGHT PARTITIONS
 Heights. 48"-54"-60"-66"-72"-78"-84"-90"-96"-102"-108"-114"-120"-126"-132"-144"-156"-168"-180"-192"-216"-240"
 Depths. 12"-15"-18"-24"-30"-36"-42"-48"

PART NO. 18. SKELETON UPRIGHTS
 Same as Upright Partitions

PART NO. 2. SHELVES
 Widths. 18"-24"-30"-36"-42"-48"
 Depths. 12"-15"-18"-24"-30"-36"-42"-48"

PART NO. 34. BACKS
 Heights. Same as Upright Partitions
 Widths. 18"-24"-30"-36"-42"-48"

PART NO. 4. CROSSWISE DIVIDERS
 Heights. 5"-8"-11"-14"-17"-20"-23"
 Depths. 12"-15"-18"-24"-30"-36"-42"-48"

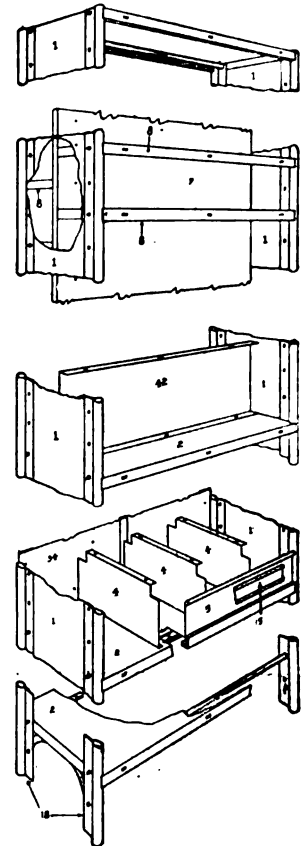
PART NO. 42. LENGTHWISE DIVIDERS
 Heights. 5"-8"-11"-14"-17"-20"-23"
 Widths. 18"-24"-30"-36"-42"-48"

PART NO. 5. BIN FRONTS
 Heights. 2"-3"-4"-5"-6"-8"
 Widths. 18"-24"-30"-36"-42"-48"

PART NO. 8. HALF SHELVES
 Widths. 18"-24"-30"-36"-42"-48"
 Depths. 12"-15"-18"-24"

PART NO. 7. DIVIDING BACKS
 Heights. 48"-54"-60"-66"-72"-78"-84"-90"-96"-102"-108"-114"-120"
 Widths. 18"-24"-30"-36"-42"-48"

PART NO. 15. LABEL HOLDERS
 Heights. $\frac{1}{4}$ "-2"
 Widths. 18"-24"-30"-36"-42"-48"



CONSTRUCTIVE VIEW, LYON STANDARD SHELVING PARTS

A Partial List of Lyon Shelving Installations, Each Amounting to More than \$20,000.00.

American Can Co., various Plants
 American Locomotive Co., Providence, R. I.
 Anheuser Busch Brewing Association, St. Louis, Mo.
 Bethlehem Steel Co., South Bethlehem, Pa.
 Bosch Magneto Co., Springfield, Mass.
 Boston Store, Chicago, Ill.
 City of New York
 Chicago Telephone Co., Chicago, Ill., various Divisions
 Dayton Engineering Laboratories, Dayton, Ohio
 Eastman Kodak Co., Rochester, N. Y.
 Fisk Rubber Co., Chicopee Falls, Mass., and Milwaukee, Wis.
 Ford Motor Co., Detroit, Mich.
 General Electric Co., various Plants and Branches
 General Motors Co., various Divisions
 General Vehicle Co., Long Island City, N. Y.
 Goodyear Tire & Rubber Co., Akron, Ohio, and Branches
 International Harvester Co., various Plants and Branches
 International Silver Co., various Plants and Branches

Other Lyon Steel Equipment for Factories, Warehouses, etc.

Blue Print Cabinets—For the storage of blue prints, drawings or other large flat pieces.

Work Benches, Counters, Foremen's Desks, Tables, Boxes, Barrels, etc.—Stock patterns.

BENCH DRAWER—All-steel, with one-piece dustproof and thiefproof top, combination device for flat key lock or padlock.

BENCH LEG—All-steel, non-breakable, sanitary bench leg.

Lyon Steel Locker.**Standard Sizes—**

SINGLE TIER		
Depth	Width	Height
12 in.	12 in.	60 in.
15 in.	15 in.	72 in.
18 in.	18 in.	
24 in.	24 in.	

DOUBLE TIER		
Depth	Width	Height
12 in.	12 in.	36 in.
15 in.	15 in.	42 in.
18 in.	18 in.	

Height does not include 6-in. legs.
Any combination of the above sizes makes up a Standard Locker.

Specifications and Equipment—**DOOR AND DOOR FRAME**

Construction—Full pickled cold rolled furniture steel. Sheet, lapped back on both sides, to form tubular reinforcement as shown, and provides double thickness of metal where hinges, locking device and handle are attached.

Upright member 1 x 1 x $\frac{1}{8}$ -in. hard steel angles. **Horizontal member** $1\frac{1}{2}$ x $\frac{3}{4}$ x $\frac{1}{4}$ -in. steel channels. All joints are lap-welded.

Hinges—Double butt hinge riveted to door frame and bolted to door. Number of hinges to be determined by height of door as follows:

- 72 in. high, 4 hinges
- 60 in. high, 3 hinges
- 42 in. high, 2 hinges
- 36 in. high, 2 hinges

Locking Device—Gravity actuated, controlled by special pivot handle and locked with either flat key, master-keyed Yale & Towne lock, or ordinary padlock. Number of locking points to be determined by height of door as follows:

- 72 in. high, 3 locking points
- 60 in. high, 3 locking points
- 42 in. high, 2 locking points
- 36 in. high, 2 locking points

Ventilation—By means of either "louver" or "standard" ($\frac{1}{2}$ in. round hole) perforations in doors. "Half" perforation as shown, or "full" perforated doors (perforations full length).

BODY

Back and Sides—Full pickled cold rolled steel, flanged on four sides to give additional strength. Reversible and interchangeable with other of same size.

Top—Full pickled cold rolled steel made either flat or sloping. Flat tops and bottoms of same size are interchangeable.

Bottom—Full pickled cold rolled steel offset to fit inside and flush with top of cross channel of door frame. Bottoms and flat tops are interchangeable with others of same size.

Legs—1 x 1 x $\frac{1}{8}$ -in. hard steel angles 6 in. long; adjustable; have feet punched for securing to floor.

HAT SHELF

In single tier lockers only, placed $9\frac{1}{2}$ in. from top in 72-in. lockers and 8 in. in 60-in. lockers.

HOOKS

All lockers have 1 double prong ceiling hook. Lockers 12 in. wide have 1 single prong hook on back and 1 on each side. Lockers over 12 in. wide have 2 single prong hooks on back and 1 on each side.

FINISH

Two coats of olive green or black enamel baked on at a temperature to secure maximum toughness and durability.

NUMBERING

Each locker is numbered by means of an etched aluminum plate with black enameled sunken figures.

Method of Shipment—According to existing conditions and quantity shipped, either erected or

**LYON STANDARD LOCKERS AND EXCLUSIVE FEATURES**

- (1) Door opening always true and square; reinforced one-piece door frame with welded corners.
- (2) Easily operated locking device; malleable handle; a single forward pull operates locking device and opens door.
- (3) All corner joints have double overlapping flanges.
- (4) Back legs strengthen and stiffen entire locker base.
- (5) Overlapping flanges at door corners.
- (6) Door will always shut and latch properly.
- (7) Gravity actuated locking device; engages automatically by merely pushing door shut; simple, strong, and secure.
- (8) Impossible to pry door open; three locking fingers and three door jambs interlock.
- (9) Locker door, because of rigid reinforcing, can not get out of alignment.
- (10) Hinge can not be forced; securely riveted in position. Door can not swing back against adjoining locker door.

knocked down with complete erection instructions. Prices will also be quoted for lockers installed complete.

Information for Prices—Prices are based on quantity, size and arrangement. Complete information of the installation desired should be furnished when possible for lowest prices. Our engineering department will make suggestions as to the arrangement of the lockers, the size required, interior fittings, etc., without charge.

Please advise on the following:

- (1) Quantity.
- (2) Size.
- (3) Arrangement: Single row (wall lockers); double row (back to back).
- (4) Sectionizing. Number of lockers or openings to each section in the above arrangement.
- (5) Furnish sketch of floor plan if possible.

Special Equipment.

All types of special steel equipment can be made, such as special cabinets, boxes, etc. Special sizes of shelving and lockers can also be made when absolutely necessary, but only at a higher cost.

Standard sizes are made in quantities and carried in stock, which enables the company to give better service with a lower cost. The wide ranges of sizes will be found to answer practically every requirement.

TERRELL'S EQUIPMENT CO.

Manufacturers of Steel Equipment

408 Hall Street
GRAND RAPIDS, MICH.

REPRESENTATIVES

ATLANTA, GA., J. M. VAN HARLINGEN, Candler Building
BALTIMORE, MD., M. L. HIMMEL & SON, 107 N. Frederick Street
BUFFALO, N. Y., NEAL COMPANY, 76 Pearl Street
CHICAGO, ILL., GEO. W. HUNT Co., 1438 First National Bank Building
LOS ANGELES, CAL., C. F. WEBER & Co., 222-24 South Los Angeles Street

NEW YORK, N. Y., STANTON M. CHILD, 100 Worth Street
PHILADELPHIA, PA., PHILADELPHIA METAL FURNITURE Co., Ninth and Sansome Streets
PITTSBURGH, PA., E. H. DERMITT, 336 Fourth Avenue
PORTLAND, ORE., NORTHWEST SCHOOL FURNITURE Co., 244 Third Street
SAN FRANCISCO, CAL., C. F. WEBER & Co., 985 Market Street

Products.

STEEL LOCKERS, WARDROBES, CUPBOARDS.
Also, Steel Shelving, Racks and Bins.

parts and construction and illustrations of this company's complete line comprising lockers, wardrobes, cupboards and shelving.

Terrell's Steel Lockers.

Built on the unit principle. Supporting frames made of special drawn steel angles 1 by 1 in. of not less than No. 14-gage U.S.S. steel. Corners mitered and acetylene welded. Bodies of high grade steel and smooth surface of not less than No. 24-gage U.S.S. or No. 22-gage B.&S. Ends reinforced with 2 strips of No. 20-gage steel welded inside of panel. Tops and bottoms reinforced with flanges on all sides. Backs have a flange on all sides. Doors made of No. 18-gage U.S.S. or No. 16-gage B.&S. high grade steel with smooth surface. Reinforced with special channels drawn from smooth strip steel. Panels welded to frames.

Standard Equipment—Three 2-prong hooks. Brass number plates numbered serially. Hat shelf in 60- and 72-in. lockers. Rod for hangers in 24-in. width and depth. Additional hooks furnished if desired.

Standard Sizes—Width, 12, 15, 18 and 24 in. Depth, 12, 15, 18 and 24 in. Height, single tier, 60 and 72 in.; double tier, 36 and 42 in. For over all height, add 6 in. for legs.

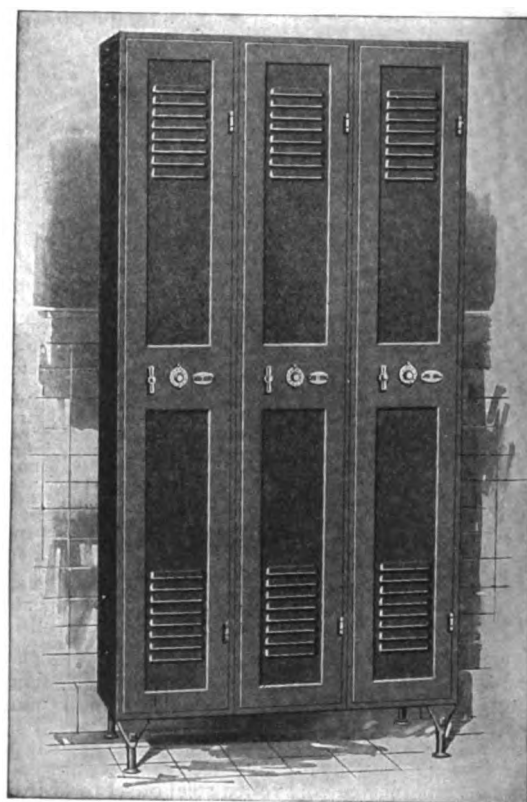
Ventilation—Doors furnished with louver ventilation, with perforations or with ventilation omitted.

Locks—Master-keyed flat key locks, master-keyed padlocks and combination keyless locks.

Finish—Baked enamel in olive green, black, grained oak and grained mahogany.

Literature.

Ask for catalogue No. 7, which shows details of

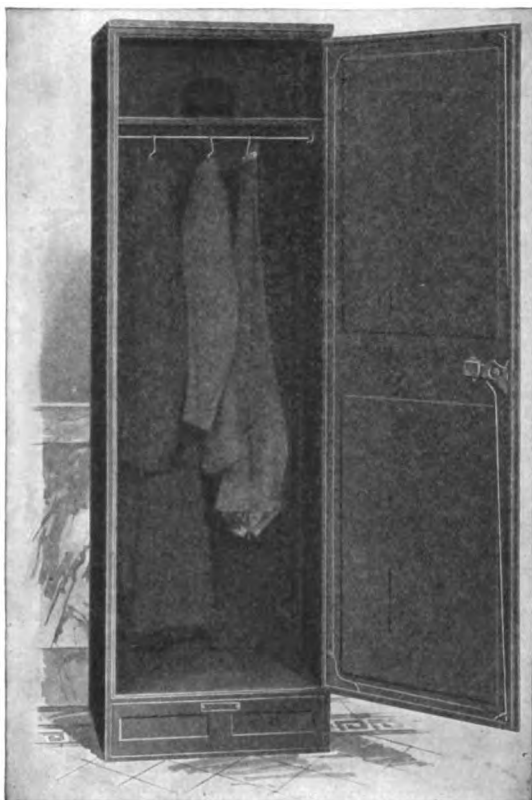


STEEL LOCKER TYPE N-L

Width, 12, 15, 18 and 24 in. Depth, 12, 15, 18 and 24 in. Height, single tier, 60 and 72 in.; double tier, 36 and 42 in. For over all height, add 6 in. for legs.
Finish, baked enamel in olive green, black, grained oak and grained mahogany

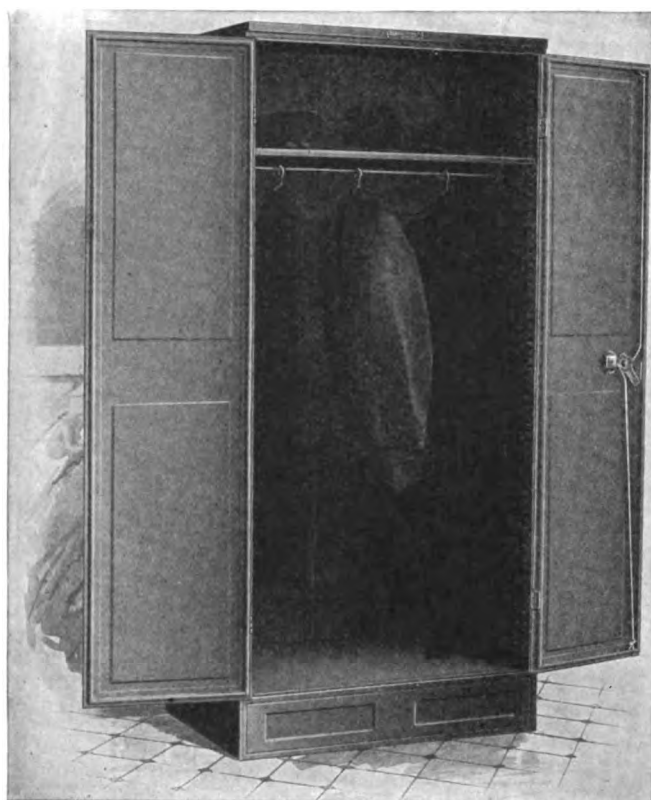


TYPICAL INSTALLATION OF TERRELL'S STEEL LOCKERS



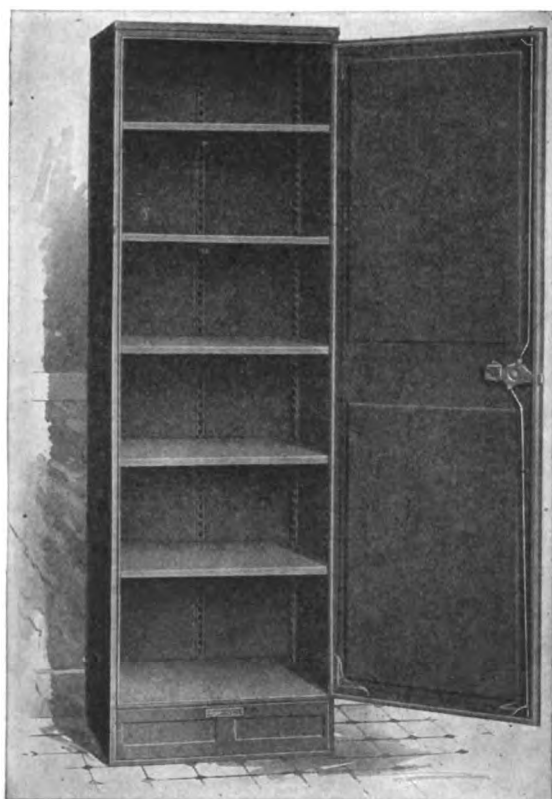
STEEL WARDROBE N-W-S

Width, 24 in. Depth, 15, 18 and 24 in. Height, 60 and 72 in. For over all height, add 6¾ in.
Made of heavier material than the clothes lockers described on the preceding page



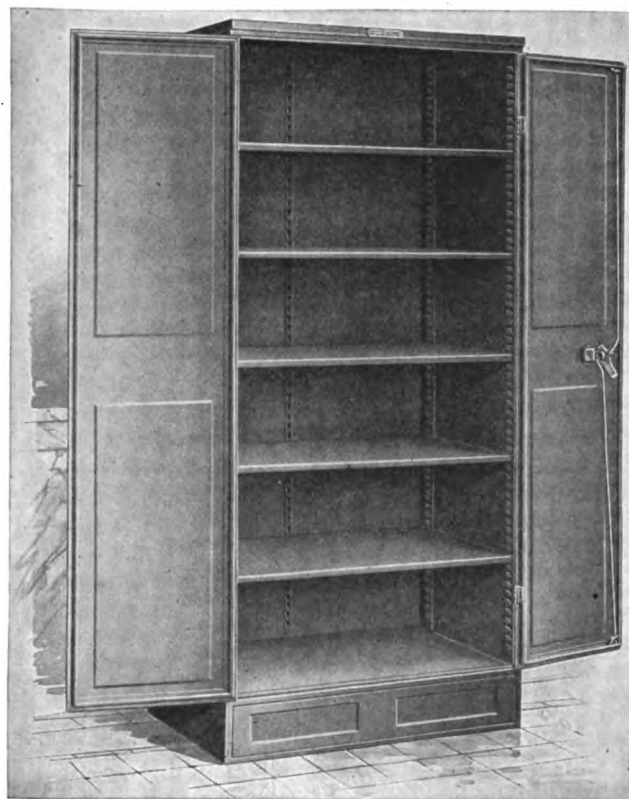
STEEL WARDROBE TYPE N-W

Width, 30 and 36 in. Depth, 15, 18 and 24 in. Height, 60 and 72 in. For over all height, add 6¾ in.
Made of heavier material than the clothes lockers described on the preceding page



STEEL CUPBOARD TYPE N-C-S

Width, 24 in. Depth, 12, 15, 18 and 24 in. Height, 60 and 72 in. For over all height, add 6¾ in.
Shelf adjustment on 1-in. centers.
Vertical divider adjustment for pigeon holes on 2-in. centers.
Made of heavier material than the clothes lockers described on the preceding page



STEEL CUPBOARD TYPE N-C

Width, 30 and 36 in. Depth, 12, 15, 18 and 24 in. Height, 36, 42, 60 and 72 in. For over all height, add 6¾ in.
Finish, olive green, grained mahogany and grained oak.
Can be shipped knocked down, flat or assembled.
Made of heavier material than the clothes lockers described on the preceding page

THE JOHN E. MANNEN COMPANY

Manufacturers of Sheet Metal Specialties

CLEVELAND, OHIO

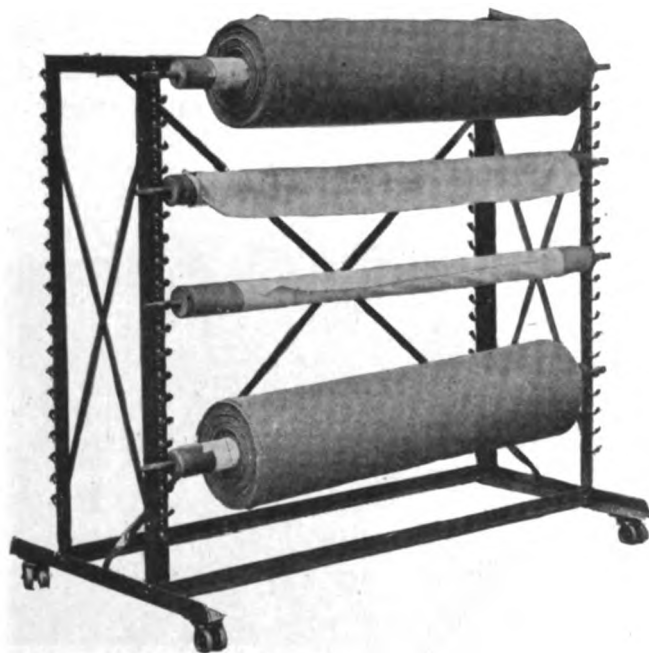
Products.

CLOTH RACKS and CARRIERS; PERFORATED METAL WASTE PAPER CANS; PERFORATED and PLAIN METAL GUARDS.

Also manufacturers of Shop Pans, Exhaust Systems, Japan Ovens, Tin Pans and Boxes, Metal Concrete Forms.

Cloth Racks and Carriers.

The illustration of this article will give the reader a good idea as to its strength and usefulness in large clothing and tailoring establishments, or wherever large rolls of cloth or paper are used continuously.



CLOTH RACK AND CARRIER

Dimensions: 73 in. wide; 40 in. deep at base, 20 in. deep at top; 60 in. high.

Full details will be given on application.

Perforated Metal Waste Paper Cans.

This can is used for collecting waste paper in schools, office buildings, factories, freight offices, and wherever large quantities of waste paper accumulate.

It has four rollers, and weighs but little due to the perforation, making it very easy to handle. It is sturdy in construction.

Sizes: 30 in. high; 16, 20, and 24 in. in diameter.

We also make shop cans of any description and will be pleased to quote from blue prints in any quantity.

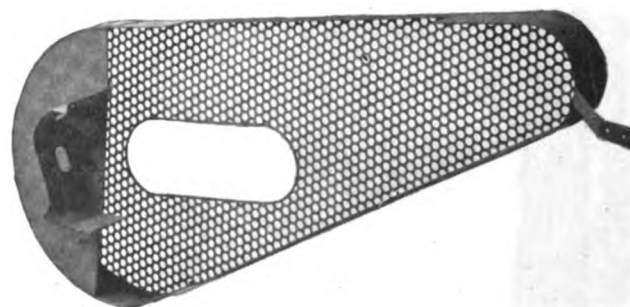


WASTE PAPER CANS

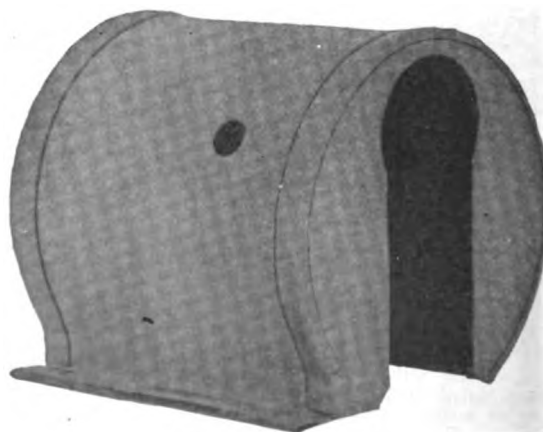
Perforated and Plain Metal Guards.

These guards can be made to fit any machine—either for gears, pulleys, shafts or rolls.

Prices quoted on application; full description or blue prints furnished on request.



PERFORATED METAL GUARD



PLAIN METAL GUARD

B. L. AKINS, INC.

FORMERLY BUILDING DIRECTORIES, BULLETIN & SIGN CO., INC.

Manufacturers of Building Directories and Bulletin Boards

TELEPHONE:
BRYANT 1557

120 West 43rd Street
NEW YORK, N. Y.

BRANCH OFFICES IN PRINCIPAL CITIES

Products.

BUILDING DIRECTORIES, CHANGEABLE LETTER DIRECTORIES and BULLETIN BOARDS, and IN-AND-OUT BOARDS, for clubs, office and loft buildings, city halls, post offices, government buildings, etc.

Also manufacturers of Time Schedules for Universities and Schools, Fire Department (calls, stations), Steamship Bulletins, Church Membership, Hospital, Hotel and Department Store Directories, and Announcement. Statistical and Sales Records Boards.

"Greeley" Changeable Letter Directories.

Three Styles—Style No. 1, is a solid grooved broadcloth covered board. Styles Nos. 2 and 3 consist of unit interchangeable grooved strips fitted into the bulletin frame (Fig 3).

Letters—The letters (including the groove tongues) are of one-piece half-hard brass, covered with a special ivory white solution making them the best manufactured on the market. Special colors to order. Made in sizes of $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, and $1\frac{1}{2}$ in., and in any quantity desired.

"Akins" Building Directories.

Made up of removable strips of white letters on a black background. In making changes, remove the door by the use of a key, leaving all name strips in place, always working from the front. This process of changing is the simplest on the market, permitting changes to be made with one operation.

Doors for "Akins" directories are made of cold rolled steel in the following standard sizes: $7\frac{1}{2}$ by 26 in. and $7\frac{1}{2}$ by 32 in., and are fitted with plate glass, plain or beveled. Special sizes to meet any requirements.

"Miller" In-and-Out Boards.

Adapted for clubs and fraternal organizations. They are made up of metal strips holding a

printed celluloid strip, showing members "in" or "out," letters, telephone calls, telegrams, etc.

Cork Bulletin Boards.

Constructed of a specially resistant cork composition. They will not crack, buckle or warp, and are the most durable and best cork bulletin boards manufactured. Made with or without frames, in all sizes.

Frame Designs and Finish.

"Akins," "Greeley" and "Miller" frames are manufactured of substantial materials in the best cabinet manner, in designs that harmonize with the surrounding architectural and ornamental treatment. They are made in bronze, steel and wood. Backboards will be made special to fit frames furnished by other manufacturers.

Special stock designs of bronze, oak, mahogany and steel are always on hand for immediate delivery.

Finish—Bronze frames are finished to meet specified requirements. Steel frames are finished with baked enamel in any color desired. Wood frames finished as desired.

Co-operative Service.

The company employs experts in making up designs, preparing data and providing suggestions as to the proper details and construction work regarding building directories and bulletin boards. These services are always at the command of clients.

Information.

Full information will be gladly furnished on request.

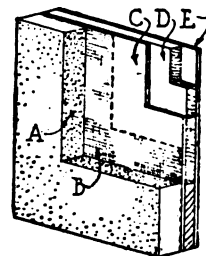


FIG. 4. SECTION THROUGH AKINS MULTI-PLY CORK BULLETIN BOARD
A—Cork composition.
B—Burlap binder.
C and E—Fiber board
D—Wood core

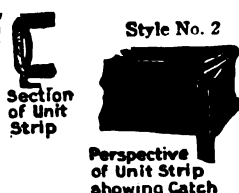


FIG. 8. DIRECTORY INSTALLED IN HOTEL PENNSYLVANIA, NEW YORK, N. Y.



FIG. 3. STYLE NO. 3 ILLUSTRATING PRINCIPLES OF STYLES NOS. 2 AND 3 "GREELEY" DIRECTORIES

SWEET'S CATALOGUE



Section of Unit Strip

Perspective of Unit Strip showing Catch



FIG. 5. STRIP FOR "AKINS" DIRECTORY, STYLE A



FIG. 6. STRIP FOR "MILLER" IN-AND-OUT BOARDS

Sectional View of Miller Strip

THE McCASKEY REGISTER CO.

Manufacturers of Labor Saving Inventory, Tool, Cost, Payroll and Production Systems

ALLIANCE, OHIO

Products.

McCAsKEY INDUSTRIAL SYSTEMS for Perpetual Inventories, Tool Records, Cost Records, Time and Payroll Records; Dispatching, Routing, Planning, Production and Machine Control Boards.

CARBONIZED FACTORY FORMS.

Also manufacture Ticket and Tote Box Holders, Transparent Envelopes for Blue Prints and Shop Orders.

McCAskey Service.

This company will co-operate with those using or intending to use McCAskey Industrial Systems and assist in working out the details of each system based on shop conditions and requirements. While conditions in various plants differ somewhat, the McCAskey method is so flexible that it can be applied with the necessary modifications and will be found superior to any system on the market.

McCAskey Industrial Systems.

The predominant feature of the McCAskey Industrial Systems is "One Writing"—the making of several records at one time, so as to eliminate as far as possible any additional re-writing or re-posting.

In using the McCAskey "One Writing" System, the original entry for the record is always used, the balance being carried forward from the last transaction and an addition or deduction is made, as the case may be. This procedure can be carried out in the application of the McCAskey System to the various departments for which it is designed.

This not only reduces the work and brings the chance for error down to a mini-



TRADE-MARK

mum, but saves an enormous amount of time in clerical work.

The McCAskey method can be adapted to any department in any industrial plant for the production of maximum results with minimum expense.

For the purpose of handling the McCAskey Industrial Systems, this company builds cabinets or registers (Figs. 2 and 4) in convenient and suitable sizes and styles. Most of the equipment is built to meet special needs, as conditions differ in each individual case.

The cabinets are made of wood or metal and the leaves are all metal reinforced to give strength without added weight. A visible index (Fig. 3) is provided which is always before the eye of the user. Cardholders (Fig. 1) are of high grade spring wire. The metal fire resisting registers (Fig. 2) are the cheapest in the end, as in case of fire, stock totals form a true basis for an adjustment of the fire loss.

Each space in the cabinet answers the same purpose as a card in a card system or a sheet in the loose leaf ledger system except that the same results are obtained with "One Writing" that in other systems require from two to four writings.

The various McCAskey cabinets will handle from 120 to 972 accounts, depending on the size of any of the standard forms used, the forms being printed in $3\frac{3}{8}$ by $3\frac{3}{8}$ -in. up to 4 by 6-in. sizes or larger. These cabinets are built in units so that the McCAskey System can be expanded to meet all requirements. The cabinet is made up of one or two banks of leaves, each bank containing from 7 to 15 leaves. The leaves are designed so that it is possible to get from 16 to 36 accounts on a leaf, thus there is before the



FIG. 2. Metal Fire Resisting McCAskey Register

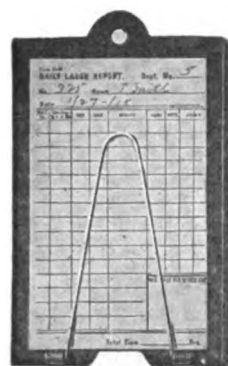


FIG. 1. Card and Slip Holder



FIG. 3. Visible Index
McCAsKEY REGISTERS FOR INDUSTRIAL SYSTEMS
Furnished in a wide variety of styles and sizes



FIG. 4. Wood McCAskey Register

operator at all times from 16 to 36 accounts and all other records in the cabinets are instantly accessible.

McCaskey Perpetual Inventory System.

The McCaskey Perpetual Inventory System can be applied to any industry and embodies the McCaskey "One Writing" method, making it unnecessary to re-post items to a card or loose leaf ledger, thereby greatly reducing labor and errors.

All items to appear on inventory or stores are listed on the visible index that is always before the eye of the person in charge of the records, thus making it unnecessary to refer to book or card records to obtain the stock or code number of each item. The items to be indexed can be grouped alphabetically according to size, commodities, or classes, depending entirely upon the nature of the business and the material to be carried in stock.

This company furnishes stock forms which can be readily changed to meet the requirements of any particular business. These forms, for use in connection with the McCaskey Register, provide efficient means of taking an inventory, requisitioning material from stock or stores, keeping track of material received in stock or store, for furnishing a daily report of the stock on hand, the amount used and amount received, also for distributing material to various charge accounts or various jobs in connection with distribution of costs.

McCaskey Tool Record System.

The McCaskey Tool Record System is a perfectly developed system for providing a complete record of tools given to workmen, with description of style, size, number, quality, etc.; complete information as to the total stock of tools in use and remaining in the stock room; quick information as to the location of tools, whether in stock or in use; standard practice instructions giving a list and description of all the tools required for each operation.

The McCaskey System supplants the inadequate brass check system and is giving satisfactory service in some of the largest manufacturing plants in the United States.

Under the McCaskey System, the tool room clerk has a receipt in full for every tool he gives out and can locate any tool in a few seconds.

The McCaskey Tool Record System is sufficiently flexible as to be easily adapted to any condition or requirement.

McCaskey Cost System.

The greatest loss of efficiency in the cost system is due to the posting and re-posting of the same items to different records. This loss the McCaskey System eliminates by manifolded the original data, filing the various copies to obtain the different records, instead of re-writing the original data.

The McCaskey Cost System provides for the recording and presentation, in intelligent form, of the three elements of factory cost, namely, *labor, material and overhead*.

The representatives of this company will gladly explain how the McCaskey Cost System has been applied to various lines of business. They will co-operate in the solution of cost accounting problems.

McCaskey Payroll System.

The McCaskey Payroll System eliminates re-posting or re-writing which is found necessary with a book system.

When a workman performs a certain operation on

a certain piece of work, a time card is made out on a form specially devised for the purpose. The original is used as a payroll record and is filed in the McCaskey register in a compartment assigned to that employee. The duplicate is used as a charge against the job order or production order on which the work is being done. This prevents any error in re-copying or transcribing a record, as both payroll record and cost record are identical, being made at one and the same time.

By bringing forward amounts from the previous time card each day, an up-to-date and accurate record can be kept of the amount due the employee at all times. At the same time, an accurate record can be kept in the order on which the work is being performed, giving accurate progress.

This system can be used where workmen make out their own time slips, also where mechanical devices such as cost recorders, calculagraphs, etc., are used. With these mechanical devices, a distinct, clear, readable copy can be made on a duplicate and triplicate, so that in order to use the same copy for payroll, planning and cost purposes, there is no necessity for re-writing.

McCaskey Dispatching, Routing, Planning and Production Systems.

The McCaskey Systems for this purpose are designed especially to be flexible enough to take care of all conditions and at the same time to be simple and devoid of unnecessary details.

There is no laborious clerical work such as re-copying and re-writing of records, as the nature of the McCaskey System eliminates these details.

The McCaskey System is being used successfully by a large number of manufacturers, a great many of whom have commended this company on the labor and time saved and the convenience of locating orders which are in process.

McCaskey Dispatching, Routing, Planning and Production Systems are made on metal leaves about 22½ by 39½ in., pivoted and mounted independently of each other on a bracket so that they can be screwed to the wall or post. The equipment can be made singly or in units as desired. Leaves are constructed to accommodate few or many orders and are built to accommodate practically any standard size card or sheet from 1½ by 3 in. up to 4 by 6 in. Special sizes can also be provided for.

By using different colored cards, it is possible to lay out and follow up shop orders in part, or plan the work ahead for a machine or group of machines, moving and changing the cards as the work progresses through the shop or from one department to another, also for obtaining machine control or control of any unit desired.

McCaskey Carbonized Factory Forms.

Printed upon special carbonized paper, eliminating the use of loose carbon sheets. They save time as well as the cost of carbon sheets.

The special SURETY carbon on the back of each original sheet in the duplicate forms and on the backs of both the first two sheets in the triplicate forms will not rub off and soil the hands with ordinary use and 100% perfect copies are always assured.

Because of this company's facilities for manufacturing shop and office forms *for all purposes* the cost of McCaskey Carbonized Forms is no greater and usually less than charged for ordinary factory forms printed on plain paper, not carbonized.

Send samples of the shop forms now being used and prices will be quoted on the quantities desired.

THE AMERICAN BRASS COMPANY

Manufacturers of Wrought Brass and Copper Materials for Engineering Purposes

MAIN OFFICES
WATERBURY, CONN.

MILLS AND FACTORIES

ANSONIA BRANCH, Ansonia, Conn.

KENOSHA BRANCH, Kenosha, Wis.

BUFFALO BRANCH, Buffalo, N. Y.

TORRINGTON BRANCH, Torrington, Conn.

WATERBURY BRANCH, Waterbury, Conn.

Products.

BRASS, COPPER and NICKEL SILVER in all forms of SHEETS, WIRE, RODS and TUBES.

Condenser Tubes; Admiralty and other special grades for marine and stationary installations.

Brass and Copper Pipe: iron pipe and plumbers' sizes, especially desirable for concealed work and hot water carriers.

Phosphor Bronze Tubes: for bushings and bearings.

Tobin Bronze Tubes, Rods and Sheets: highly resistant to corrosion and of high tensile strength. Have given most favorable results when used for marine or hydraulic construction.

Copper Tubes: in long lengths for bending into coils.

Boiler and Heater Tubes.

Pump Tubes.

Locomotive Tubes.

Evaporator Tubes.

Also manufacturers of Extruded Sections and Die

Pressed Parts: made from wrought brass and high tensile strength bronze alloys adaptable to many engineering purposes.

Copper Wire and Cable, Commutator and Busbar
Copper: for all kinds of electrical construction.

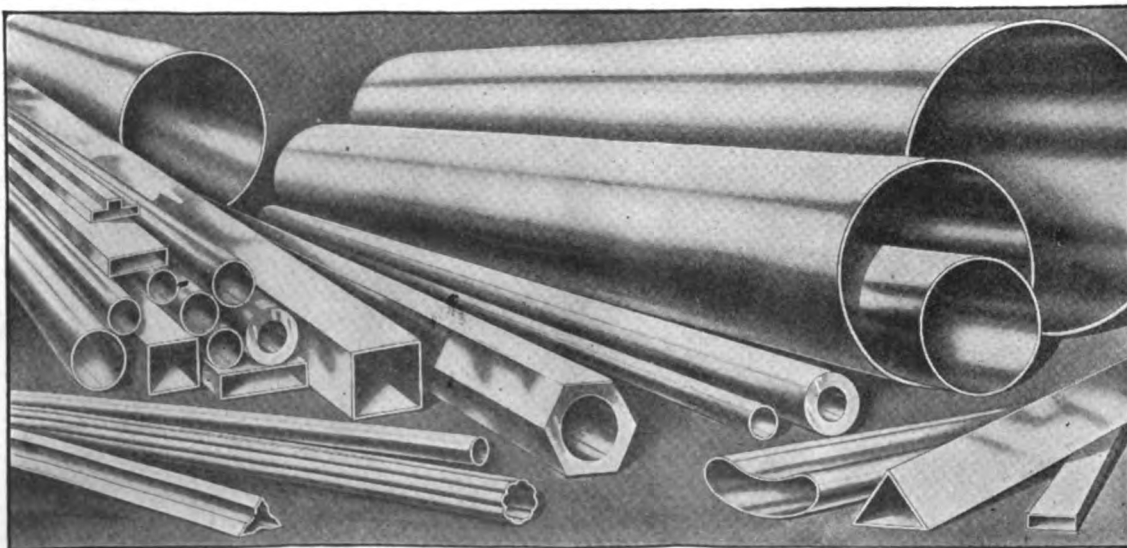
Service.

The mills of THE AMERICAN BRASS COMPANY are geographically located to insure prompt service to all important industrial sections of the country. These mills are equipped with extensive facilities for manufacturing a complete line of non-ferrous materials which will meet the fullest requirements as to quality, finish, accuracy and dependability.

Special metallurgical problems regarding the use and adaptability of American Brass products receive the attention of an efficient technical department.

This service is available to all those interested.

Send for price lists and illustrated pamphlets.



BRASS AND COPPER TUBES, REGULAR AND SPECIAL SHAPES

EUREKA MACHINE COMPANY

Manufacturers of Branding Machines, Superheaters, and Cooperage Coating Sprays

2615 Vega Avenue
CLEVELAND, OHIO

SOLE AGENT FOR GREAT BRITAIN: M. WYLIE & Co., GLASGOW, SCOTLAND

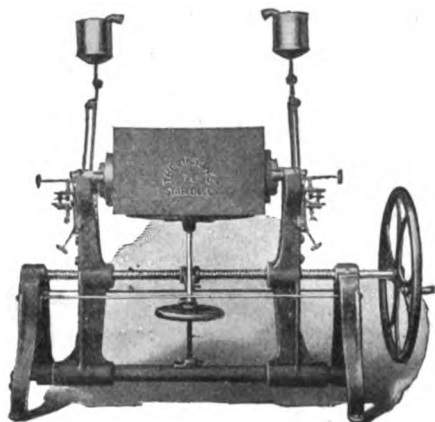
Products.

ELECTRIC BRANDING MACHINES, SUPERHEATERS and COOPERAGE COATING SPRAYS.

Also manufacturers of Number Brands, Barrel Sterilizing and Coating Machines; Pitch, Tar and Steam Jacket Kettles.

Electric Branding Machine.

The Duplex branding machine is used for branding name, location and trade-marks on barrels, kegs, tubs and boxes. This machine will brand both ends of a package in one operation. The branders are time and



ELECTRIC BRANDING MACHINE

Weight, 650 lbs. Two styles to be operated by electricity, gas or gasoline

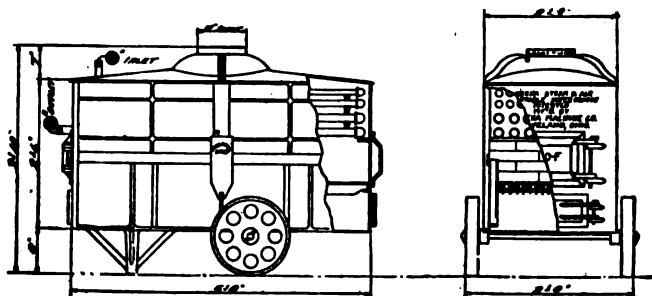
money savers and assure a perfect, even brand, and a lasting advertisement of firm name and goods. The brand will show and can be read as long as the package lasts.

We also manufacture number brands 1 in. and 1½ in. from 0 to 9.

Eureka Portable Superheater.

This machine is designed for superheating ordinary saturated steam to extremely high temperature and for compounding, cooking and rendering materials of heavy consistency such as tar, pitch, fats, heavy greases and oils, medicines, disinfectants, etc., where fire is ordinarily used.

The Superheater can be placed convenient to the



DIMENSION DIAGRAM EUREKA PORTABLE SUPERHEATER
Weight 2000 lbs. Two smaller sizes

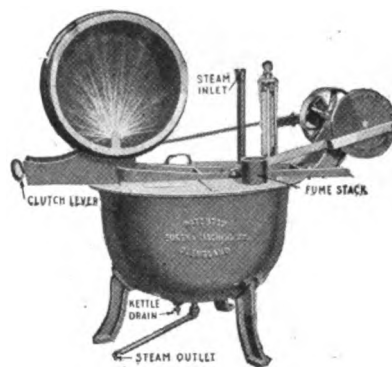
using point and gives a steady flow of high temperature steam with low steam pressure, saving the strain on steam boilers.

This machine is indorsed by the National Board of Fire Underwriters, as a safety appliance where high temperature is applied to combustibles.

Cooperage Coating Spray.

Cooperage coating spray, for coating the interior of barrels, drums, kegs, buckets, tubs, etc., with glue, paraffin, silicate of soda, pitch, paint or any protective lining.

One of these sprays will do the work of three men and do it better with a saving of time and material.



COOPERAGE COATING SPRAY MACHINE

Weight, 675 lbs.; floor space, 3 x 5 ft. Capacity, as fast as operator can handle the cooperage. Three sizes, hand or power. Material in kettle can be heated by steam or direct coal or gas fire

The spray will throw any liquid coating 40 ft. in all directions, and will cover the interior of a 100-gal. cask as readily as that of a small bucket. It does not matter how much coating is forced into a package, only a thin coating will adhere and the surplus flows back into the kettle.

A package is laid over spray nozzle, the clutch is thrown in and after pump has made from 6 to 8 strokes the clutch is thrown out and the package is coated.

If desired we equip this outfit with a pressure lever device to test barrels for leakers. This attachment will generate 3 lbs. pressure in 30 seconds.

This machine can also be used for *washing the interior of barrels and drums*. The washing solution and water are mixed in the kettle. A barrel is laid over spray nozzle and the pump clutch thrown in. This washes and flushes out the barrels. When barrels are washed the kettle is drained and barrels can then be coated.

Partial List of Firms Using Eureka Products.

H. J. Heinz Co.	California Barrel Co.
Michigan Sugar Co.	Upson-Walton Co.
E. I. du Pont de Nemours & Co.	Procter & Gamble Co.
Armour & Co.	American Electro Products Co.
Grasselli Chemical Co.	Lehigh Portland Cement Co.
Southern Cotton Oil Co.	Magnolia Petroleum Co.
Union Distilling Co.	Sherwin-Williams Co.
U. S. Navy	Gifford & Cullum



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